CAREERS360

CBSE Class 12 Chemistry

All Sets 2016-2020 papers

Answer Key 0/1015 Questions

Chemistry

Q. 1 (a) Write the chemical reaction involved in Wolff-Kishner reduction.

(b) Arrange the following in the increasing order of their reactivity towards nucleophilic addition reaction:

$$C_6H_5COCH_3, CH_3-CHO, CH_3COCH_3$$

(c) Why carboxylic acid does not give reactions of carbonyl group?

(d) Write the product in the following reaction

$$CH_3CH_2CH=CH-CH_2CN \xrightarrow[2.H_2O]{1.(i-Bu)_2AlH}$$

(e) A and B are two functional isomers of compound C_3H_6O. On heating with NaOH and I_2, isomer B forms yellow precipate of iodoform wheras isomer A does not form any precipte. Write the formulae A and B

Solution:

(a) $CH_3CH_2CHO + H_2N-NH_2 \xrightarrow{H^+} CH_3CH_2CH=N-NH_2 \xrightarrow[ethyleneglycol]{\Delta, KOH} CH_3CH_2CH_3 + N_2$

(b)

$$C_6H_5COCH_3 < CH_3COCH_3 < CH_3-CHO$$

(c) Carboxylic acid does not gves reactions of carbinyl group because carboxylic carbon is less electrophilic than carbonyl carbon because of possible reasonace structures.

(d) $CH_3CH_2CH=CH-CH_2CN \xrightarrow[2.H_2O]{1.(i-Bu)_2AlH} CH_3CH_2CH=CHCH_2CHO$

(e) A and B are the functional isomers of C_3H_6O.

$B \xrightarrow[\Delta]{NaOH, I_2} CHI_3 \downarrow$

yellow ppt.

$A \xrightarrow[\Delta]{NaOH, I_2}$ no reaction

For iodoform, B is a methyl ketone (CH_3CO-)

$$B = CH_3COCH_3$$

A is not a methyl ketone as it does not gives iodoform test.

$$A = CH_3CH_2CHO$$

Q. 2 (a) Write the structures of A and B in the following reactions:

(i) $CH_3COCl \overset{H_2,Pd-BaSO_4}{\rightarrow} A \overset{H_2N-OH}{\rightarrow} B$

(ii) $CH_3MgBr \xrightarrow[2H_3O^+]{1.CO_2} A \overset{PCl_5}{\rightarrow} B$

(b) Distinguish between:

(i) $C_6H_5-COCH_3$ and C_6H_5-CHO

(ii) CH_3COOH and $HCOOH$

(c) Arrange the following in the increasing order of their boiling points:

$CH_3CHO, CH_3COOH, CH_3CH_2OH$

Solution:

(a)

(i) $CH_3COCl \overset{H_2,Pd-BaSO_4}{\rightarrow} \underset{(A)}{CH_3CHO} \overset{H_2N-OH}{\rightarrow} \underset{(B)}{CH_3CH=N-OH}$

(ii) $CH_3MgBr \xrightarrow[2H_3O^+]{1.CO_2} \underset{(A)}{CH_3COOH} \overset{PCl_5}{\rightarrow} \underset{(B)}{CH_3-CO-Cl}$

(b)

(i) $C_6H_5-COCH_3$ and C_6H_5-CHO

C_6H_5-CHO being an aldehyde reduces Tollen's reagent and a bright sliver mirror is produced.

$C_6H_5-CHO+2\left[Ag(NH_3)_2\right]^+ + 3OH^- \rightarrow C_6H_5COO^- + 2Ag + 2H_2O + 4NH_3$

But $C_6H_5-COCH_3$ being a ketone does not react with Tollen's reagent.

(ii) CH_3COOH and $HCOOH$

$HCOOH$ (formic acid) is the only carboxylic acid that reduces Tollen's reagent to shiny silver mirror but CH_3COOH (acetic acid) does not give this test.

$HCOOH+2\left[Ag(NH_3)_2\right]^+ + 3OH^- \rightarrow CO_2 + 2Ag + 3H_2O + 4NH_3$

(c) Increasing order of boiling points

$CH_3CHO < CH_3CH_2OH < CH_3COOH$

Q. 3 The elements of 3d transition seires are given as:

Sc Ti V Cr Mn Fe Co Ni Cu Zn

Answer the following:

(i) Write the elements which shows the maximum number of oxidation states. Give reason.

(ii) Which element has highest m.p?

(iii) Which element shows only +3 oxidation state?

(iv) Which element is a strong oxidizing agent in +3 oxidation state and why?

Solution:
(i) Mn with atomic no. 25 shows maximum number of oxidation states(+2 to +7) due to its configuration $3d^5 4s^2$, it contains 5 unpaired electrons.

(ii) Vanadium (V) , Atomic no. - 25

(iii) Scandium (Sc), Atomic no. - 21

(iv) Fe^{3+} is a strong oxidising agent, as it readily accepts as electron to form Fe^{2+} as it has extra stable half filled configuration ($3d^5$)

Q. 4 (a) Account for the following:

(i) Mn shows the highest oxidation state of +7 with oxygen but with fluorine it shows the highest oxidation state of +4.

(ii) Cr^{2+} is strong reducing agent.

(iii) Cu^{2+} salts are coloured while Zn^{2+} salts are white.

(b) Complete the following equations:

(i) $2MnO_2 + 4KOH + O_2 \xrightarrow{\Delta}$

(ii) $Cr_2O_7^{2-} + 14H^+ + 6I^- \rightarrow$

Solution:
(a)

(i) Mn shows the highest oxidation state of +7 with oxygen but with flourine it shows the highest oxidation state of +4 because of ability of oxygen to form multiple bonds with transction metals $(d\pi - p\pi)$ but fluorine cannot do so.

(ii) Cr^{2+} is a strong reducing agent, it very easily does electrons to achieve its highest oxidation state of +6 to becomes extra stable.

(iii) Cu^{2+} salts are coloured whereas Zn^{2+} salts are white because Zn^{2+} does not have unpaired electrons, it has fully filled d-orbitals and unpaired electrons excite to give colour to compounds whereas Cu^{2+} salts have unpaired electrons.

(b)

(i) $2MnO_2 + 4KOH + O_2 \xrightarrow{\Delta} 2K_2MNO_4 + 2H_2O$

(ii) $Cr_2O_7^{2-} + 14H^+ + 6I^- \rightarrow 2Cr^{3+} + 3I_2 + 7H_2O$

Q. 5 (a) The conductivity of 0.001 mol L^{-1} solution of CH_3COOH is $3.905 \times 10^{-5} Scm^{-1}$. Calculate its molar conductivity and degree of dissiciation$(\propto)$.

Given $\lambda^\circ(H^+) = 349.6 Scm^2 mol^{-1}$ and $\lambda^\circ(CH_3COO^-) = 40.9 Scm^2 mol^{-1}$

(b) Define electrochemical cell. What happens if external potential applied becomes greater than E°_{cell} of electrochemical cell?

Solution:

(a)

$\lambda^\circ(H^+) = 349.6 Scm^2 mol^{-1}$

$\lambda^\circ(CH_3COO^-) = 40.9 Scm^2 mol^{-1}$

$K\ (CH_3COOH) = 3.905 \times 10^{-5} Scm^{-1}$

$\propto = ?$

$\Lambda_m = ?$

$c = 0.001 mol L^{-1} = 0.001 mo; cm^{-3}$

$$\Lambda_m = \frac{K \times 1000}{c}$$

$$\Lambda_m = \frac{3.905 \times 10^{-5} \times 10^3}{0.001}$$

$\Lambda_m = 3.905 \times 10^{-5+3-3} = 3.905 \times 10$

$\Lambda_m = 39.05 Scm^2 mol^{-1}$

$$\propto = \frac{\Lambda_m}{\Lambda^\circ_m} = \frac{39.05}{349.6 + 40.9} = 0.1$$

(b)

Electrochemical cell is a device which converts chemical energy of an indirect redox reaction into electrical energy. It is formed by two redox couples.

If the external potential applied becomes greater than E°_{cell} of the electrochemical cell the reaction gets reversed along with the flow of currents.

Q. 6 (a) Calculate E°_{cell} for the following reaction at 298K:

$$2Al(s) + 3Cu^{2+}(0.001M) \rightarrow 2Al^{3+}(0.01M) + 3Cu(s)$$

Given: $E_{cell} = 1.98V$

(b) Using the E° values of A and B, predict which is better for coating the surface iron $\left[E^{\circ}\left(Fe^{2+}/Fe\right) = -0.44V\right]$ to prevent corrosion and why?

Given : $\left[E^{\circ}\left(A^{2+}/A\right) = -2.37V\right]; \left[E^{\circ}\left(B^{2+}/B\right) = -0.14V\right]$

Solution:

(a)

E°_{cell} = ?

$$2Al(s) + 3Cu^{2+}(0.001M) \rightarrow 2Al^{3+}(0.01M) + 3Cu(s)$$

$$E_{cell} = 1.98V$$

Cell $Al\left|Al^{3+}(0.01M)\right|\left|Cu^{2+}(0.01M)\right|Cu$

Anode - $\left(Al(s) \rightarrow Al^{3+}(aq) + 3e^{-}\right) \times 2$

Cathode - $\left(Cu^{2+}(aq) + 2e^{-} \rightarrow Cu(s)\right) \times 3$

n = 6

$$E_{cell} = E^{\circ}_{cell} - \frac{0.0591}{n}\log\frac{[Al^{3+}]^2}{[Cu^{2+}]^3}$$

$$E^{\circ}_{cell} = 1.98 + \frac{0.0591}{6}\log\frac{(0.01)^2}{(0.01)^3}$$

$$E^{\circ}_{cell} = 1.98 + \frac{0.0591}{6}\log 10^2$$

$$E^{\circ}_{cell} = 1.98 + \frac{0.0591 \times 2}{6}$$

$$E^{\circ}_{cell} = 1.9997V$$

(b)

$E^{\circ}\left(A^{2+}/A\right) = -2.37V$

$E^{\circ}\left(B^{2+}/B\right) = -0.14V$

$E^{\circ}\left(Fe^{2+}/Fe\right) = -0.44V$

A is better for coating the surface of iron to prevent corrosion takes place when iron is oxidised therefore to prevent it element A with higher oxidation potential will oxidise first.

Q. 7 Due to hetic and busy schedule, Mr. Singh started taking junk food in the luch break and slowly became habitual of eating food irregularly to excel in his field. One day during meeting he felt severe chest pain and fell down. Mr Khanna, a close friend of Mr. Singh, took him to doctor immediately. The doctor diagnosed that Mr. Singh was suffering from acidity and prescribed some medicines. Mr. Khanna advised him to eat home made food and change his lifestyle by doing yoga, meditation and some physical exercise. Mr. Singh followed his friend advice and after few days he started feeling better.

After reading above passage, answer the following question:

(i) What are the values (atleast two) displayed by Mr. Khanna?

(ii) What are the antacids? Give one example.

(iii) Would it be advisable to take antacids for a long period of time? Give reasons.

Solution:
(i) Values displayed Mr. Khanna are adaptability and understandability.

(ii) Antacids are bases that neutralizes excess acid present in the stomach.

example - Milk of Magnesia

(iii) No, it is not adisable to take antacids for a long period of time because it only relieve symptoms and will not cure underlying problems i.e. masking some serious conditions

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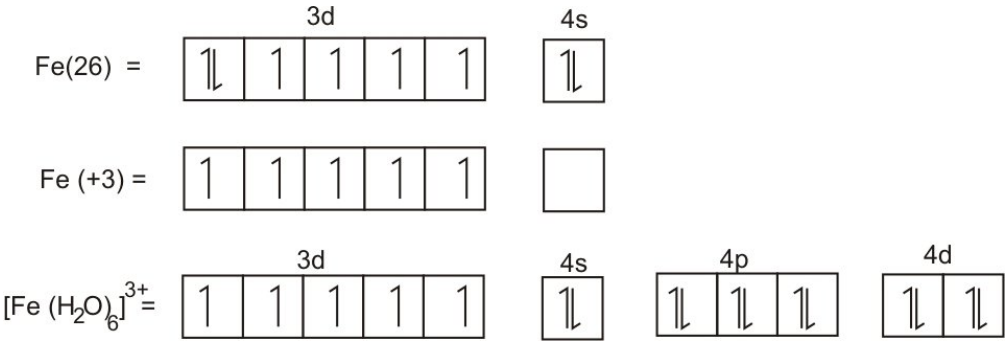
Q. 8 (a) For the complex $\left[Fe\left(H_2O_6\right)\right]^{3+}$, write the hybridization, magnetic character and spin of complex.(At. no. - Fe =26)

(b) Draw one of the geometrical isomers of the complex $\left[Pt\left(en\right)_2Cl_2\right]^{2+}$ which is optically inactive.

Solution:
(a) Coordination compounds

$\left[Fe\left(H_2O_6\right)\right]^{3+}$

At.no. Fe = 26

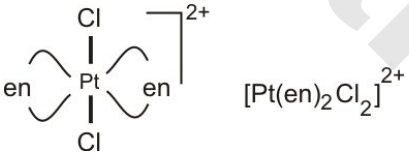


Hybridisation - sp^3d^2

Paramagnetic, high spin

(b)

$[Pt\,(en)_2\,Cl_2]^{2+}$



Trans-isomer is optically inactive.

Q. 9 (i) Write the structural difference between starch and cellulose.

(ii) What type of linkage is present in Nuclei acids?

(iii) Give one example each for fibrous protein and globular protein.

Solution:
(i) Starch is the mixture of two polysaccharides - amylose and amylopectin wheras cellulose is a linear polymer of $\beta - D - glucose$ in which C_1 of one glucose unit and C_4 of next are linked by glycosidic linkage.

(ii) Phosphodiester linkage is present in nuclei acids.

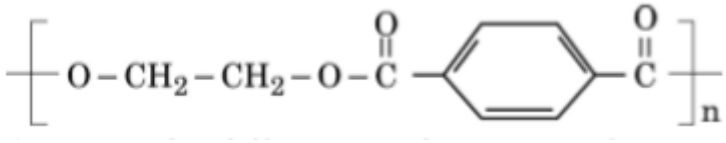
(iii) Examples:

Fibrous proteins - mysoin (in muscle)

Globular protein - insulin

Q. 10 (i) What is the role of Sulphur in the vulcanization of rubber?

(ii) Identify the monomers in the following polymer:

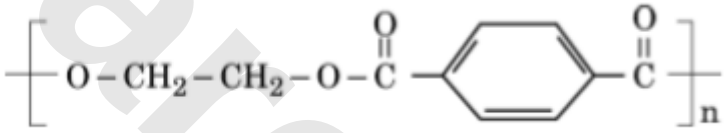


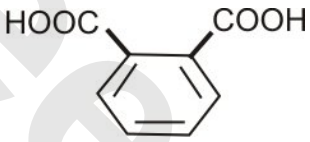
(iii) Arrange the following polymer in the increasing order of their intermolecular forces:

Terylene, Polythene, Neoprene

Solution:

(i) Vulcanization of rubber consists of heating a mixture of raw rubber with sulphur at temperature of 373K - 415K; sulphur forms cross links at the reactive sites of double bonds and thus gets stiffened.

(ii) Monomer of 

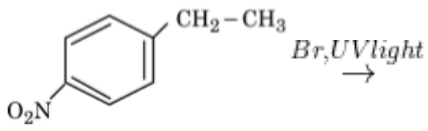
are $HO-CH_2-CH_2-OH$ and 

(iii) increasing order of their intermolecular forces -

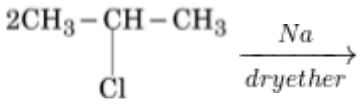
Neoprene<Polythene< Terylene

Q. 11 Write the major product(s) in the following:

(i)



(ii)

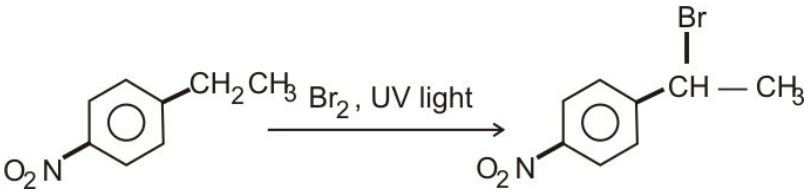


(iii)

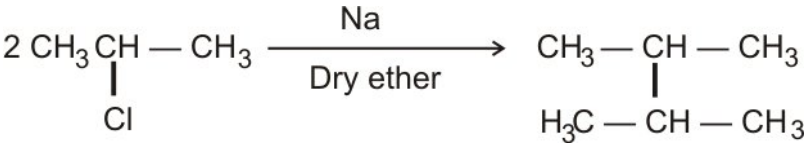
$$CH_3-CH_2-Br \xrightarrow{AgCN}$$

Solution:

(i)



(ii)



(iii)

$$CH_3 - CH_2 - Br \xrightarrow{AgCN} CH_3CH_2NC$$

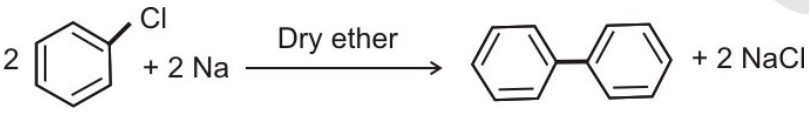
Q. 12 How do you convert:

(i) Chlorobenzene to biphenyl

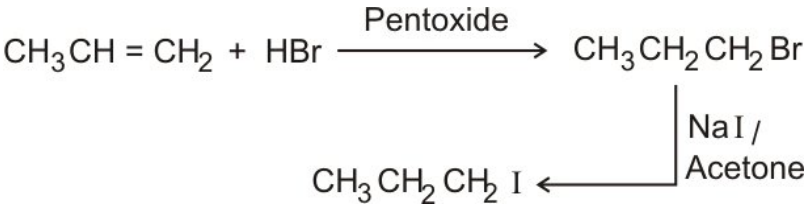
(ii) Propene to 1- iodopropane

(iii) 2-bromobutane to but-2-ene

Solution:
(i) Chlorobenzene to biphenyl



(ii) Propene to 1- iodopropane



(iii) 2-bromobutane to but-2-ene

Q. 13 Give reasons for the following:

(i) Aniline does not undergo Friedal - Crafts reaction.

(ii) $(CH_3)_2NH$ is more basic than $(CH_3)_3N$ in an aqueous solution.

(iii) Primary amines have higher boiling point than tertiary amines.

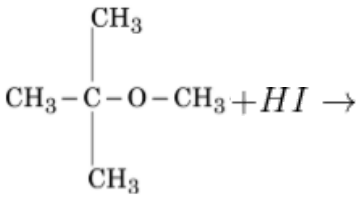
Solution:
(i) Aniline doesn't undergo Friedal-crafts reaction due to salt formation between aniline and catalyst Anhyd. $AlCl_3$ (Lewis acid) as a result nitogen acquires positive charge and hence acts as a strong deactivating group for further reaction.

(ii) $(CH_3)_2NH$ in aqueous solution is more basic than $(CH_3)_3N$ becuase stability depends H-bonding; more the number of H-bonds, more is the extent of stability of conjugate acid.

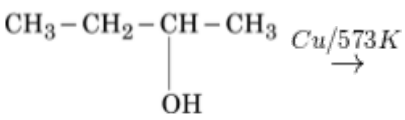
(iii) Boiling point of primary amines is higher than tertiary amines because they are more associated to each other through H-bonding due to presence of 2N-H bonds whereas there is none in tertiary amines.

Q. 14 Write the final product (s) in each of the following reaction:

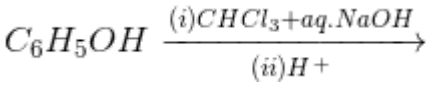
(a)



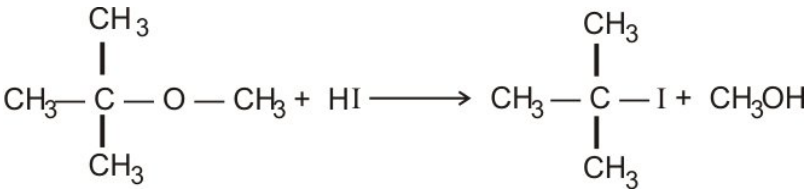
(b)



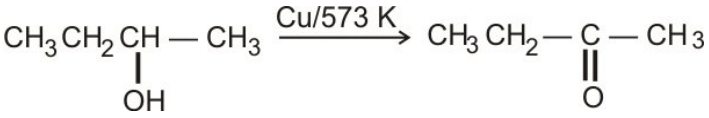
(c)



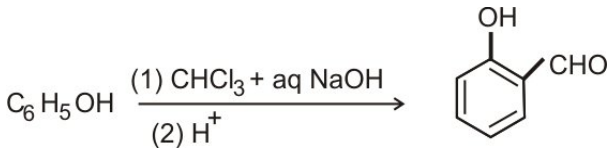
Solution:
(a)



(b)



(c)



Q. 15 Give reasons:

(i) SO_2 is reducing while TeO_2 is an oxidizing agent.

(ii) Nitrogen does not form pentahaldie.

(iii) ICl is more reactive than I_2

Solution:

(i) SO_2 is a reducing agent but TeO_2 is oxidising because Te is heavier element with electrons in f-orbitals which are poor shielders and due to inert pair effect higer oxidation state for Te is highly unstable whereas S acn extend its oxidaton state upto +6.

(ii) Nitrogen doesn't form pentahalide due to absence of Vacant d-orbitals, N cannot expand its octet and thus cannot have a coordination number beyond 4.

(iii) ICl is more reactive than I_2 because I- Cl bond is weaker than I-I bond due to less effective overlapping between orbitals of dissimilar atoms than those between similar atoms.

Q. 16 Calculate the boiling point of solution when 4g of $MgSO_4$ (Mg = 120 g mol^{-1}) was dissolved in 100g of water, assuming $MgSO_4$ undergoes complete ionization.

(k_B for water = 0.52 K kg mol^{-1})

Solution:

k_B for water = 0.52 K kg mol^{-1}

M = 120 g mol-1

Mass of solute = $MgSO_4$ = 4g

Mass of solvent = H_2O = 100g

Complete ionization of $MgSO_4$, i=2

T_b =?

$$\Delta T_b = T_b - T_b^\circ$$

$$T_b^\circ = 373.15K$$

$$\Delta T_b = iK_b m$$

$$\Delta T_b = 2 \times 0.52 \times \frac{4}{120} \times \frac{1000}{100}$$

$$\Delta T_b = 2 \times 0.52 \times \frac{1}{3}$$

$$\Delta T_b = 0.347K$$

$$T_b = \Delta T_b + T_b^\circ$$

$$T_b = 0.34 + 373.15$$

$$T_b = 373.49K$$

Q. 17 (i) Name the method of refining nickel.

(ii) What is the role of cryolite in the extraction of aluminium?

(iii) What is the role of limestone in the extraction of iron from its oxides?

Solution:
(1) Electrolytic refining is used for refining of nickel.

(2) In extraction of aluminium ,(Na_3AlF_6) cryolite is used to decreases the melting point and increase conductivity.

(3) Limestone is mixed with oxide ore of iron, after concentration through calcimation or roasting to remove water and to decompose carbonates to oxidise.

Q. 18 Define the following terms:

(i) Lyophilic colloid

(ii) Zeta potential

(iii) Associated colloids

Solution:
(i) Lyophilic colloid are these in which particles of dispersed phase have attraction for particles of dispersed phase have attraction for particles of dispersion medium.

Example - Sols of starch, proteins

(ii) Zeta potential or the electrokinetic potential is the potential difference between the fixed layer (first layer of ions which is firmly held) and the diffused layer of opposite charges (second layer is mobile).

(iii) Associated colloids or micelles are substances which act as electrolytes at ion concentration but at high concentration associate with each other to form particles having size in colloidal range. Example - soaps.

Q. 19 For the first order thermal decomposition reaction, the following data were obtained :

$$C_2H_5Cl(g) \rightarrow C_2H_4(g) + HCl(g)$$

Time/sec	Total pressure/atm
0	0.32
300	0.50

Calculate the rate constant

(Given: log 2 = 0.301, log 3= 0.4771, log 4 = 0.6021)

Solution:

$$C_2H_5Cl(g) \rightarrow C_2H_4(g) + HCl(g)$$

K = ?

Order =1

Time/sec	Total pressure/atm
0	0.32
300	0.50

$$K = \frac{2.303}{t} \log \frac{P_0}{2P_0 - P_t}$$

$$K = \frac{2.303}{300} \log \frac{0.30}{2(0.30) - 0.50}$$

$$K = \frac{2.303}{300} \log \frac{0.30}{0.10}$$

$$K = \frac{2.303}{300} \log 3$$

$$K = \frac{2.303}{300} \times 0.4771$$

$$K = 0.0036 s^{-1}$$

Q. 20 An element crystallizes in a b.c.c lattice with cell edge of 500pm. The density of the element is 7.5g cm^{-3}. How many atoms are present in 300g of the element?

Solution:

Mass = 300g

Density = 7.5g cm^{-3}

Edge = 500pm

Volume of unit cell = $(500)^3$

$= 1.25 \times 10^{-22} cm^3$

Volume of 300g = $\frac{mass}{density} = \frac{300}{7.5} = 40cm^3$

No. of unit cell in $40cm^3$ = $\frac{40}{1.25 \times 10^{-22}} = 32 \times 10^{22}$ unit cells

Total number of atoms in 300g = $2 \times 32 \times 10^{22} = 64 \times 10^{22} atoms$

Q. 21 Write the chemical equations involved in the following reactions:

(i) Hoffmann - bromamide degradation reaction

(ii) Carbylamine reaction

Solution:

(i) Hoffmann- bromamide degradation reaction

$$CH_3CO-NH_2+Br_2+4NaOH(aq) \rightarrow CH_2-NH_2+2NaBr+Na_2CO_3+2H_2O$$

(ii) Carbylamine reaction

$$CH_3-NH_2+CHCl_3+3KOH(alc.) \rightarrow CH_3NC+3KCl+3H_2O$$

Q. 22 For a reaction : $H_2 + Cl \xrightarrow{hv} 2HCl$

Rate = k

(i) Write the order and molecularity of this reaction.

(ii) Write the unit of k.

Solution:

$H_2 + Cl \xrightarrow{hv} 2HCl$

Rate = k

(i) Order = 0 (Rate is independent of concentration)

molecularity = 2

(ii) Unit of K = $molL^{-1}s^{-1}$

Q. 23 When coordination compound $CoCl_3.6NH_3$ is mixed with $AgNo_3$. 3moles of AgCl are precipiatated per mole of the compound. Write.

(i) Structural formula of the complex

(ii) IUPAC name of the complex.

Solution:
(i) Structural formla = $[Co\,(NH_3)_6]\,Cl_3$

(ii) Hexaammine cobalt (III) chloride

Q. 24 What happens when:

(i) SO_2 gas is passed through an aqueous solution Fe^{3+} salt?

(ii) XeF_4 reacts with SbF_5?

Solution:
(i)

$$SO_2 + 2Fe^{3+} + H_2O \rightarrow 2Fe^{2+}SO_4^{2-} + 4H^+$$

SO_2 reduces Fe (III) to Fe (II).

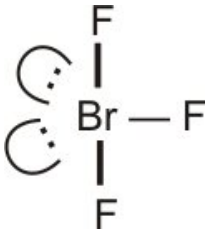
(ii) $XeF_4 + SbF_5 \rightarrow [XeF_3]^+\,[SbF_6]^-$ is formed

Q. 25 Write the structures of the following:

(i) BrF_3 (ii) XeF_4

Solution:
(i)

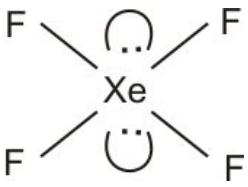
BrF_3



Bent - T shaped

(ii)

XeF_4



Square Planar

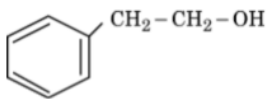
Q. 26 (i) Gas A is more soluble in water than Gas B at the same temperature. Which one of the two gases will have higher value of K_H (Henry's constant) and why?

(ii) In non - ideal solution, what type of deviation shows the formation of maximum boiling azeotropes?

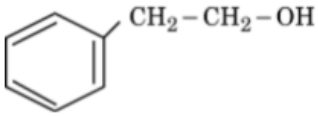
Solution:
(i) Gas B will have higher value of K_H as it has less stability.

(ii) Negative deviations are shown by maximum boiling azeotropes.

Q. 27 Write the IUPAC name of the given compound



Solution:



2-Phenylethanol

Q. 28 Give an example each of a molecular soild and ionic soild.

Solution:
Example of

molecular soild = Diamond

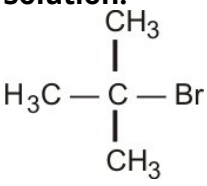
ionc soild = Sodium chloride (NaCl)

Q. 29 $Pb(NO_3)_2$ on heating gives a brown gas which undergoes dimerization on cooling? Identify the gas.

Solution:
Nitrogen dioxide (NO_2) is evolved on heating of $Pb(NO_3)_2$ which dimerizes on cooling.

Q. 30 Write the structure of an isomer of compound C_4H_9Br which is most reactive towards S_N1 reaction.

Solution:



t-butylchloride is the isomer of C_4H_9Br which is more reactive towards S_N1 reaction.

Q. 31 What is the reason for the stability of collodial sols?

Solution:
Stability of the colloidal sols is due to the presence of equal and similar charges on colloidal particles. They do not combine to form large particles when they come closer to one another due to replusive forces between charged particles.

Q. 32 On heating Copper turnings with conc. H_2SO_4, a colourless gas with pungent smell is evolved which decolourises acidified $KMnO_4$ solution. Identify the gas.

Solution:
On $\xrightarrow[conc H_2SO_4]{\Delta}$ colourless gas (pungent smell) $\xrightarrow[KMnO_4]{acidified}$ decolouries
sulphur dioxide is in the gas produced.

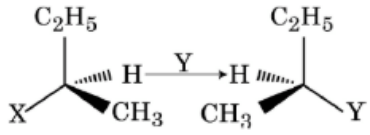
Q. 33 Write the main reason for the stability of colloidal sols.

Solution:

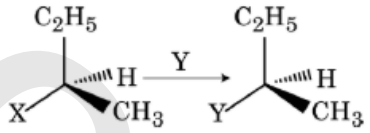
The reason for the stability of colloidal sols is the presence of equal and similar charges on colloidal particles, due to repulsive forces between charge particles, they do not combine to form large particles when they come closer to one anothe.

Q. 34 Which of the following reactions is S_N1 type?

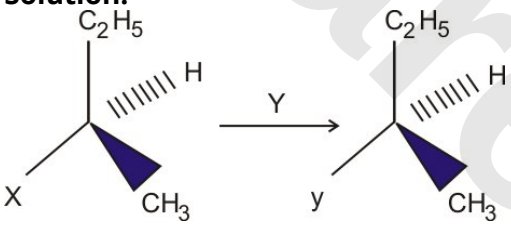
(i)



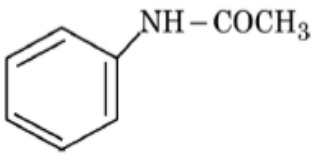
(ii)



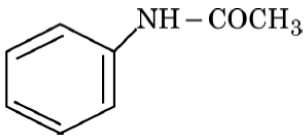
Solution:



Q. 35 Write the IUPAC name of the given compound:



Solution:



N- Phenyl ethanamide

Q. 36 What would be the nature of solid if there is no energy gap between valence band and conduction band?

Solution:

If there is no gap between valence band and conduction band, then electrons can flow easily and metal show conductivity Hence, the solid will be a good conductor.

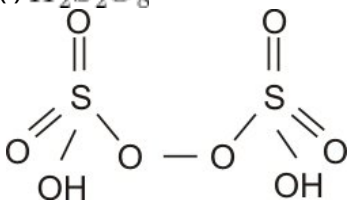
Q. 37 Write two differences between a solution showing positive deviation and a solution showing negative deviation from Raoult's law.

Solution:

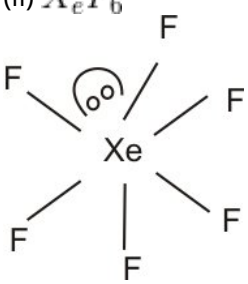
Solution showing positive deviations	Solution showing negative deviations
ΔH_{mix} = positive i.e formation of solution results in decrease in temperature	ΔH_{mix} = Negative i.e formation of solution results in increse in temperature
ΔV_{mix} = positive i.e formation of solution results in increase in volume	ΔV_{mix} = Negative i.e formation of solution results in decrease in volume

Q. 38 Write the structures of the following molecules:
(i) $H_2S_2O_8$
(ii) X_eF_6

Solution:
(i) $H_2S_2O_8$

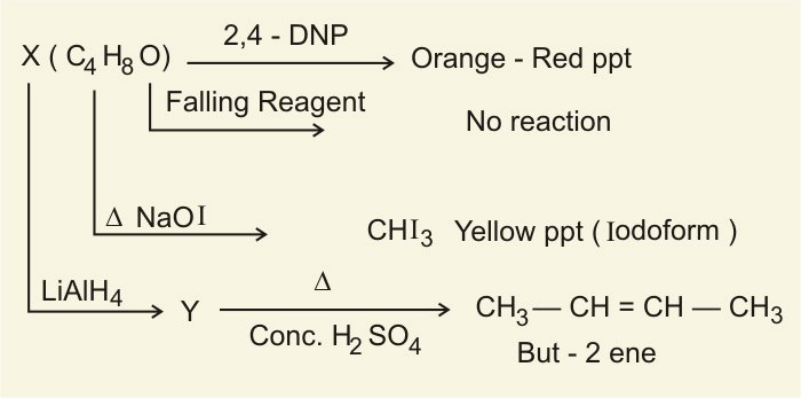


(ii) X_eF_6



Q. 39 An organic compound 'X' having molecular formula C_4H_8O gives orange - red ppt. with 2,4-DNP reagent. It does reduce tollen's reagent but gives yellow ppt. of iodoform on heating with NaOI. Compound X on reduction with LiA1H_4 gives compound 'Y' which undergoes dehydration reaction on heating with conc. H_2SO_4 to form But-2-ene. Identify the copounds X and Y.

Solution:



- No reaction with tollens reagent $\therefore$ not an aldehyde group.
- Gives iodoform test $\therefore$ X is a methyl ketons
- On reduction with $LiAlH_4$, ketons gives alcohol $\therefore$ Y is a alcohol which gives alkene on dehydration

$\Rightarrow X = CH_3COCH_2CH_3$ Butan -2 one

$Y = CH_3CHCH_2CH_3$ Butan - 2-oL

OH

Q. 40 Show that the time required for completion of $\frac{3}{4}$ th of reaction of first order is twice that of half-life $\left(t_{\frac{1}{2}}\right)$ of the reaction.

Solution:

For a first order reaction

$$t = \frac{2 \cdot 303}{k} \log \frac{a}{a-x}$$

$$t_{\frac{3}{4}} = \frac{2 \cdot 303}{k} \log \frac{a}{a - \frac{3a}{4}}$$

$$t_{\frac{3}{4}} = \frac{2 \cdot 303}{k} \log\ 4 - (1)$$

$$t_{\frac{1}{2}} = \frac{2 \cdot 303}{k} \log\ 2 - (2)$$

$$\frac{t_{\frac{3}{4}}}{t_{\frac{1}{2}}} = \frac{\frac{2 \cdot 303}{k} \log 4}{\frac{2 \cdot 303}{k} \log 2}$$

$$\frac{t_{\frac{3}{4}}}{t_{\frac{1}{2}}} = \frac{2 \log 2}{\log 2}$$

$$t_{\frac{3}{4}} = 2t_{\frac{1}{2}}$$

Q. 41 Derive integrated rate equation for rate constants of a zero order reaction.

Solution:

$R \rightarrow P$ [zero order reaction]

Rate $= \frac{-d[R]}{dt} = k[R]^0$

$= \frac{-d[R]}{dt} = k$

$-d[R] = kdt$

integrating, $\int d[R] = -k \int dt$

$[R] = -kt + I$

At $t = 0, [R] = [R]_0$

$[R] = -kt + [R]_0$

$kt = [R]_0 - [R]$

$k = \frac{[R]_0 - [R]}{t}$

where $[R]_0$ = metal concentration

$[R]$ = concentration at any instant of time

t = time

I = Integration constant

Q. 42 When a coordination compound $PtCl_4$, $6NH_3$ is mixed with $AgNO_3$, 4 moles of AgCl are precipitated per mole of the compond? Write:
(i) Structural formula of the complex
(ii) IUPAC name of the complex.

Solution:

$ptCI_4\ 6NH_3 + AgNO_3 \rightarrow 4AgCI$

(i) structural formula - $[pt\ (NH_3)_6]\ CI_4$

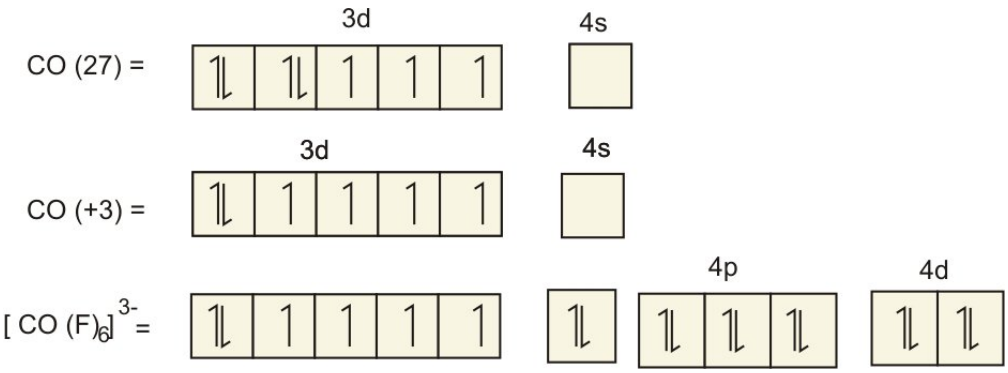
(ii) IUPAC name - Hexaamineplatinum (iV) chloride

Q. 43 (a) For the complex $[CoF_6]^{3-}$, write the hybridization type, magnetic character and spin nature of the complex. (At, number : Co = 27)
(b) why is the complex $[Co\ (en)_3]^{3+}$ more stable than the complex $[CoF_6]^{3-}$,?

Solution:

(a)

$[CoF_6]^{3-}$ Automic number = 27



Hybridisation = sp^3d^2
peramagnetic and high spin complex

(b)

$[Co\,(cn)_3]^{3+}$ is more stable than $[CoF_6]^{3-}$ because $[Co\,(cn)_3]^{3+}$ forms a chelate complex which are more stable than non-chelate complex due to formation of cyclic structure.

Q. 44 (i) Write the name of monosaccharides which are obtained after the hydrolysis of Lactose.
(ii) What type of bonding is resposible for the stability of α-helix?
(iii) Write the difference between Nucleotide and Nucleoside.

Solution:
(i) monosaccharides obtained are -β-D - glucose and β -D- galactose
(ii) Hydrogen bonding is responsible for the stability of α-Helix structure.
(iii) Nucleoside consists of nitrogen atom of base bonded to 1- carbon of sugar by a bond known as N-Glycocide linkage
Nucleotides are formed when a nucleoside is linked to phosphoric acid at 5'- position.

Q. 45 Write the principle behind the following:
(i) Vapour phase refining
(ii) Chromeatography
(iii) Froth floatation process

Solution:
(i) Vapour phase refiming is based on the principle that crude metal is converted to a volatile compound which should be easily decomposable.
(ii)Chromatography is based on the principle that the different components of a mixture are adsorbed to different extent on an adsorbent
(iii) Froth floatation process is based on the fact that the surface of sulphide ares is preferrentially wetted by ails while that of gangus is wetted by water.

Q. 46 Define the following terms:
(i) Peptization
(ii) Zeta potential
(iii) Brownian movement

Solution:
(i) Peptization is the process of converting a freshly prepared precipitate into colloidal form by addition of a small amount of electrotype (peptizing agent).
(ii)Zeta potential or electrokinetic potential is the potential difference between the fired layer (first layer of ions which is firmly held) and the diffured layer (second layer which is mobile) of opposite charges.
(iii)Brownian movement refers to the zig-zag motion of colloidal particles which occurs due to unbalanced bombardment of particles by molecules of dipression medium.

Q. 47 Give reasons:
(i) The α- hydrogen atoms of aldehydes and ketones are acidic in nature.
(ii) Oxidation of aldehydes is easier than ketones.
(iii)$CH_2 = CH - COOH$ is more acidic than $CH_3CH_2 - COOH.$

Solution:
(a) $\alpha - H$ atom of aldenhyde and keton are acidic in nature due to electron with drawing effect of - CO- group and reasonance stabilisation of resulting carbanion.
(b) oxidation of aldenyde is easier than ketone due to presence of H-atoms linked to carbonyl group carbon which is absent in ketones.
(c) $CH_2 = CH - COOH$ is more acidic than CH_3CH_2COOH as C adjacent to -COOH gp is sp^2 hybridised whereas in CH_3CH_2COOH, C adjacent to - COOH group is sp^3 hybridised and sp^2 C atom has higher s-character resulting in more acidity.

Q. 48 For the first order thermal decomposition reaction, the following data were obtained:
$C_2H_5CI\,(g) \rightarrow C_2H_4\,(g) + HCI\,(g)$

Time/sec	Total presure/ atm
0	0.30
300	0.50

Calculate the rate constant.
$(Given : \log 2 = 0 \cdot 301 \log 3 = 0.4771 \log 4 = 0.6021)$

Solution:
$C_2H_5CI\,(g) \rightarrow C_2H_4\,(g) + HCI\,(g)$
k = ?

Time/sec	Total pressure/ atom
0	0.30
300	0.50

$$k = \frac{2 \cdot 303}{t} \log \frac{p_0}{2p_0 - p_t}$$
$$= \frac{2 \cdot 303}{300} \log \frac{0 \cdot 30}{2\,(0 \cdot 30 - 0 \cdot 50)}$$
$$= \frac{2 \cdot 303}{300} \log \frac{0 \cdot 30}{0 \cdot 10}$$
$$= \frac{2 \cdot 303}{300} \log 3$$
$$= \frac{2 \cdot 303}{300} \times 0 \cdot 4771$$
$$k = 0 \cdot 0036\ s^{-1}$$

Q. 49 Complete the following reactions:

(i) $C_6H_5 - COOH \overset{NH_3}{\rightarrow} A \overset{heat}{\rightarrow} B \overset{Br_2/KOH}{\rightarrow} C$

(ii) $C_6H_5NO_2 \overset{Fe/HCI}{\rightarrow} A \xrightarrow[273-278K]{NaNO_2+HCI} B \overset{CuCN}{\rightarrow} C$

Solution:

(I) $C_6H_5COOH \xrightarrow{NH_3} C_6H_5COO^-NH^+ \xrightarrow{\Delta}$ (A)

$C_6H_5NH_2 \xleftarrow{Br/KOH} C_6H_5CONH_2$ (C) (B)

(Ii) $C_6H_5NO_2 \xrightarrow{Fe/HCl} C_6H_5NH_2$ (A) $\xrightarrow[273\ K - 273\ K]{NaNO_2 + HCl}$

$C_6H_5CN \xleftarrow{CuCN} C_6H_5-\overset{+}{N}=NCl^-$ (C) (B)

Q. 50 Give reasons:

(i) Red phosphorus is less reactive than white phosphours.

(ii) Sulphur shows greater tendency for catenation than oxygen.

(iii) ClF_3 is known but FCl_3 is not known.

Solution:

(i) Red phosphorous is less reactive than white phosphours because in red phosporous, p_y are joined through covalent bonds to give ploymeric structure whereas in white phosphorous, individual p_y molecules are held by weak vander waal forces which on easier to break.

(ii) Sulphur has more tendency for catenation than oxygen due to big size of sulphur lone pair -lone pair replsions are less and s-s bond is sronger than o-o bond.

(iii) ClF_3 is known but FCl_3 is not known beacause u has vacant d-orbitals of +3 but F due to its high electronegativity and absence of vacant d-orbitals can not show oxidation state other than +1.

u is bigger in size and can accomodate 3-F atoms while F bring smaller atom cannot accomodate large sized u atoms.

Q. 51 Calculate the freezing point of a solution when 3 g of $CaCl_2$(M = 111 g mol^{-1}) was dissolved in 100 g of water, assuming $CaCl_2$ undergoes complete ionization.(K_f for water = 1.86 K kg mol^{-1})

Solution:

T_f = ? K_f (water) = 1086 K kg mol^{-1}

Mass of $CaCl_2$ = 3g = 0.003 kg

Mass of water = 100g = 0.1 kg

M_B = 111 g mol^{-1} = 0.111 kg mol^{-1}

complete ionisation , i = 3

$$\left[CaCI_2 \rightarrow Ca^{2+} + 2CI^-\right]$$

$$\Delta T_f = i \times k_f \times m$$

$$\Delta T_f = \frac{3 \times 1 \cdot 86 \times 0 \cdot 003}{0 \cdot 111 \times 0 \cdot 1}$$

$$\Delta T_f = 1 \cdot 50k$$

$$T_f = T_f^0 - \Delta T_f$$

$$T_f = 273k - 1 \cdot 50k$$

$$T_f = 271 \cdot 5k$$

Q. 52 An element crystalizes in a a b.c.c lattice with cell edge of 400 pm.Calculate the density if 250 g of this element contain $2 \cdot 5 \times 10^{24}$ atoms?

Solution:

Cell edge = 400 pm

Density = ?

Mass = 250 g

No.of atoms $= 2 \cdot 5 \times 10^{24}$

Volume $= (400pm)^3$

$$= 6 \cdot 4 \times 10^{-23}\, cm^3$$

In bcc, Z = 2

$$d = \frac{z \times M}{V} \times N_A$$

No.of atoms $= \frac{w}{M} \times N_A$

$$2 \cdot 5 \times 10^{24} = \frac{500}{M} \times N_A$$

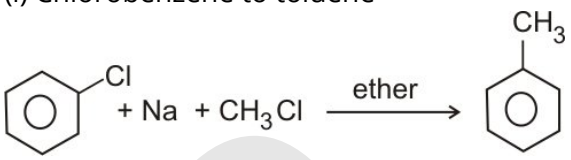
$$M = \frac{500 \times N_A}{2 \cdot 5 \times 10^{24}}$$

$$d = \frac{2 \times 500 \times N_A}{N_A \times 2 \cdot 5 \times 10^{24} \times 6 \cdot 4 \times 10^{-23}}$$

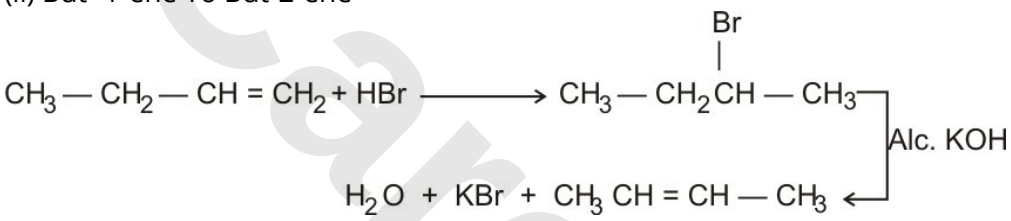
$$d = 6 \cdot 25 g/cm^3$$

Q. 53 How do you convert:
(i) Chlorobenzene to toluene
(ii) But- 1-ene To But-2-ene
(iii) Ethanol to ethyl iodide

Solution:
(i) Chlorobenzene to toluene



(ii) But- 1-ene To But-2-ene



(iii) Ethanol to ethyl iodide

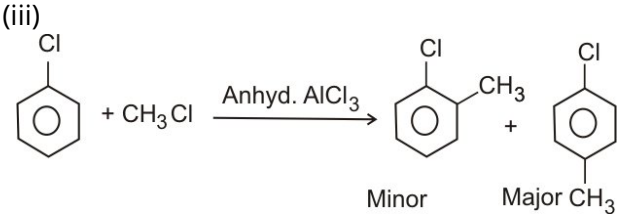
$$CH_3CH_2OH + HI \rightarrow CH_3CH_2I + H_20$$

Q. 54 What happens when:
(i) n- butyl chloride is treated with alcoholic KOH.
(ii)2-chloropropane is treated with sodium in the presence of dry ether.
(iii) Chlorobenzene is treated with CH_3Cl in the presence of anhydrous $AlCl_3$.
write the chemical equations involved in the above reactions.

Solution:
(i) $CH_3CH_2CH_2CH_2CI + alc \cdot KOH \rightarrow CH_3CH_2CH = CH_2 + KCI + H_2O$

(ii) $$CH_3 - \underset{\underset{CI}{|}}{CH} - CH_3 + Na \overset{dryether}{\rightarrow} CH_3 - \underset{\underset{CH_3 - CH - CH_3}{|}}{CH} - CH_3 + 2NaCI$$

(iii)



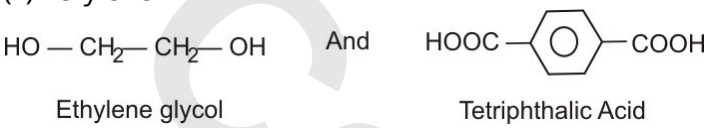
Q. 55 Write the name of monomers and their structures in the following:
(i) Buna -S
(ii) Terylene
(iii) Nylon-6

Solution:
(i) Buna -S

$CH_2 = CH - CH = CH_2$ and $C_6H_5 - CH = CH_2$

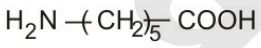
Buta -1,3-diene styrene

(ii) Terylene



Ethylene glycol Tetriphthalic Acid

(Iii) Nylon - 6



Amino caproic acid

Q. 56 Due to hectic and busy schedule, Mr. Singh started taking junk food in the lunch break and slowly became habitual of eating food irregularly to excel in his field.
One day during meeting he felt severe chest pain and fell down.
Mr. Khanna, a close friend of Mr. Singh, took him to doctor immediately. some medicines.
Mr. Khanna advised him to eat home made food and change his lifestyle by doing Yoga, meditation and some physical exercise , Mr. Singh followed his friend's advice and after few days he started feeling better.
After reading the above passage, answer the following:
(i) What are the values (at least two) displayed by Mr. Khanna?
(ii) What are antacids? Give one Example.
(iii) Would it be advisable to take antacids for a long period of time? Give reason.

Solution:
(i) values displayed by Mr. Khanna are friendly, a good advisor, and helpful
(ii) Antacids are bases that neutralises excess acids present in aour stomach.
Example - Milk of magnesia
(iii) No, it is not advisable to take antacids for a long. period of time because they only reliese symptoms and will not cure the underlying problem and mask some serious conditions

Q. 57 (a) Write the product(s) in each of the following reactions:

(i) $C_6H_5-O-CH_3 + HI \longrightarrow$

(ii) $CH_3-\underset{\underset{OH}{|}}{\overset{\overset{CH_3}{|}}{C}}-CH_3 \xrightarrow{Cu/573\ K}$

(iii) $C_6H_5-OH \xrightarrow{Zn\ dust}$

(b) Write the chemical equations involved in the following reactions:

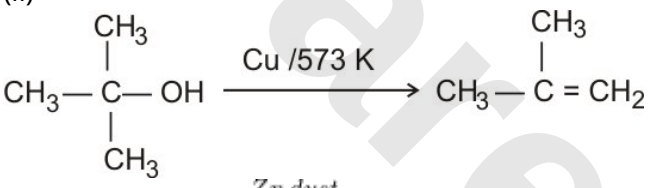
(i) Reimer-Tiemann reaction

(ii) Friedal-Crafts alkylation of anisole.

Solution:

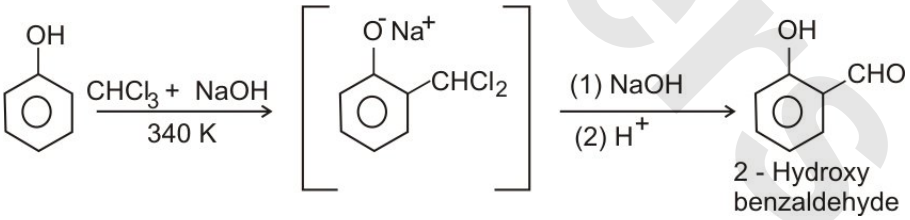
(a) (i) $C_6H_5-O-CH_3 + HI \rightarrow C_6H_5-OH + CH_3-I$

(ii)

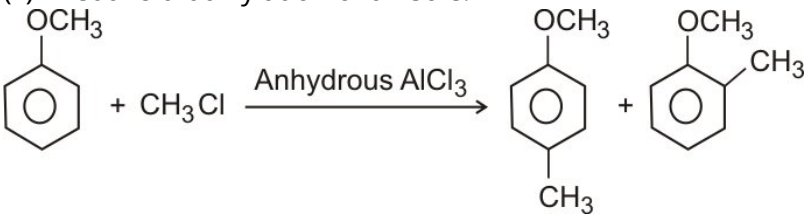


(iii) $C_6H_5-OH \overset{Zn\,dust}{\rightarrow} C_6H_6 + ZnO$

(b) (i) Reimer- Tiemann Reaction



(ii) Friedal craft alkylation of anisole.



Q. 58 (a) What happens when:

(i) phenol reacts with conc.HNO_3.

(ii) Salicycle acid reacts with $(CH_3CO)_2O/H^+$.

(iii) Ethyl chloride reacts with $NaOCH_3$.

Write the chemical equations involved in the above reactions.

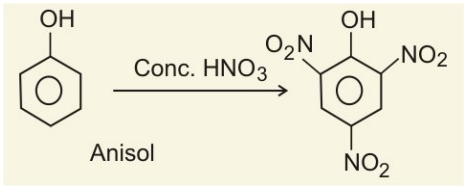
(b) Distiguish between:

(i) Ethanol and Phenol

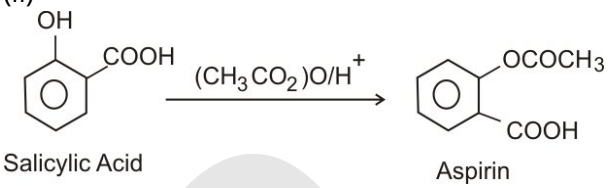
(ii) Propan -2-ol and 2-methylprpan-2-ol

Solution:

(a) (i)



(ii)

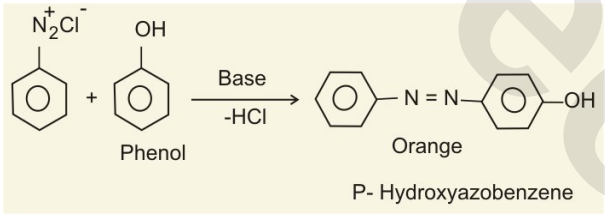


(iii) $CH_3CH_2CI + NaOCH_3 \rightarrow CH_3CH_2OCH_3$

Ethylchloride

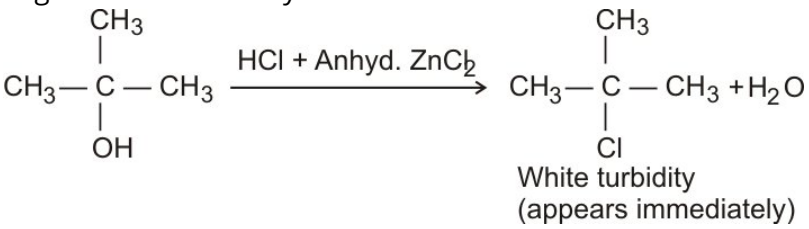
(b)(i) Ethanol and phenol

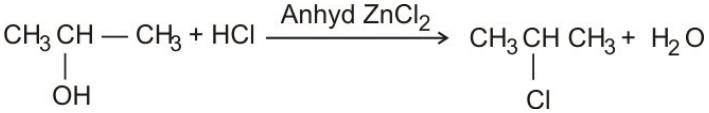
phenol on reaction with Benzene diagonism chloride gives an arange dye whereas ethanol doesnot reacts with it.



(ii) propan-2-0l and 2-methyl propan-2-0l

2-Methylpropan-2-ol on reaction with Luca's reagent gives white turbidty immediately whereas propan-2-ol gives white turbidity after 5 minutes.





Q. 59 (a) Calculate ΔG^0 and $\log K_c$ for the following reaction at 298 K:
$2AI(s) + 3Cu^{2+}(aq) \rightarrow 2AI^{3+}(aq) + 3Cu(s)$
Given: $E^0_{cell} = 2 \cdot 02V$
(b) Using the E^0 values of A and B predict which is better for coating the surface of iron $\left[E^0\left(Fe^2+/Fe\right) = -0 \cdot 44V\right]$ to prevent corrosion and why?
Given: $E^0\left(A^2+/A\right) = -2 \cdot 37V : E^0\left(B^2+/B\right) = 0 \cdot 14V$

Solution:
(a) $\Delta G^0 = ?\ \ \log K_c = ?$
$T = 298k \qquad E^0_{cell} = 2 \cdot 02V$
$2Al(s) + 3Cu^2 + (aq)\, rightarrow 2Al^{3+}(aq) + Cu(s)$
$\Delta G^0 = -nFE^0cu$
$n = 6; F = 96487C$
$\Delta G^0 = -6 \times 96487 \times 2 \cdot 02$
$= -1169422 \cdot 44Jmol^{-1}$
$\Delta G^0 = -2 \cdot 303RT \log k$
$E^0_{cell} = \dfrac{0 \cdot 0591}{n} \log k$
$2 \cdot 02 = \dfrac{0 \cdot 0591}{6} \log k$
$\log k = \dfrac{6 \times 2 \cdot 02}{0 \cdot 0591}$
$= 205 \cdot 076$
(b)
$E^0\left(A^{2+}/A\right) = -2 \cdot 37V$
$E^0\left(B^{2+}/B\right) = -0 \cdot 14V$
$E^0\left(Fe^{2+}/Fe\right) = -0 \cdot 44V$
A is better for coating the surface of iron to present corrosion as corrosion takes place when iron it oxidised therefore to prevent it element A with higher oxidation potentail will oxidise faster.

Q. 60 (a) The conductivity of 0.001 mol L^{-1} solution of CH_3COOH is $3 \cdot 905 \times 10^{-5}$ S cm^{-1}. Calculate its molar conductivity and degree of dissociation(α).
Given $\lambda^0\left(H^+\right) = 349 \cdot 6\, S\, cm^2\, mol^{-1}$ and
$\lambda^0\left(CH_3COO^-\right) = 40 \cdot 6\, S\, cm^2\, mol^{-1}$
(b) What type of battery is dry cell? Write the overall reaction occuring in dry cell.

Solution:
(a)

$\lambda^0\left(H^+\right) = 349 \cdot 6\, s\, cm^2\, mol^{-1}$
$\lambda^0\left(CH_3COOH\right) = 3 \cdot 905 \times 10^{-5}\, s\, cm^2$
$\alpha = ?\ \ \wedge_m = ?$
$C = 0 \cdot 001\, mol\, L^{-1} = 0 \cdot 001\, mol\, cm^{-3}$

$$\wedge_m = \frac{k \times 1000}{C}$$
$$= \frac{3 \cdot 905 \times 10^{-5}}{0 \cdot 001}$$
$$= 39 \cdot 05\, s\, cm^2\, mol^{-1}$$
$$\alpha = \frac{\wedge_m}{\wedge_m^0} = \frac{39 \cdot 05}{349 \cdot 6 + 40 \cdot 9}$$
$$= \frac{39 \cdot 05}{390 \cdot 5} = 0 \cdot 1$$

(b) Dry cell is a type of primary battery, in which reaction occures only once and after use over a period of time battery becomes dead and cannot be reused again.

Reaction occuribg in dry cell

Anode:

$$zn\,(s) \rightarrow zn^{2+} + 2e^-$$

Cathode:

$$\left(MnO_2 + NH_4^+ + C^- \rightarrow MnO\,(OH) + NH_3\right) \times 2$$

overall reaction:

$$zn\,(s) + 2NH_4^+\,(aq) + zMnO_2\,(s) \rightarrow [zn\,(NH_3)_2]^{2+}\,(aq) + Mn_2O_3\,(s) + H_2O\,(s)$$

Q. 61 (a) Account for the following:
(i) Mn_2O_7 is acidic whereas MnO is basic.
(ii) Zr and Hf exhibit similar properties.
(iii) Transition metals form a large number of complex compounds.
(b) Write the preparation of K_2MnO_4 from pyrolusite ore(MnO_2). Write the type of magnetism shown by $KMnO_4$ and K_2MnO_4.

Solution:

(a) (i) Mn_2O_4 is acidic but MnO is basic because in Mn_2O_4, oxidation state of Mn is +7 $\therefore$ Those oxide are covalent, due to higher charge it on accept electrons whereas in MnO, Mn is m +2 oxidation state and bring ionic they produce base in turn gives OH ions in solution

(ii) zn and Hf exhibit similar properties since there is an overall decrease in atomic radic of element of f-electrons which is unable to counter balance effect of increased nuclear charge

(iii) trasition metals can form large number of compounds due to presence of valence electrons in two different sets of orbitals ie outer ns and (n-1)d Both of them can get involved in bend formation due to small energy difference between them, they can show variable oxidation state.

(b) Preperation of K_2MnO_4 from MnO_2

$$2MnO_2 + 4KOH + O_2 \rightarrow 2K_2MnO_4 + 2H_2O$$

Black Dark Green

K_2MnO_4 is paramagnetic and $KMnO_4$ is diamagnetic.

Q. 62 (a) The elements of 3d transition series are given as:
Sc Ti V Cr Mn Fe Co Ni Cu Zn
Answer the following
(i) Copper has exceptionally positive $E^0\ \left(M^{2+}/M\right)$ value Why?
(ii) Which element is a strong reducing agent in +2 oxidation state and Why?
(iii) zn^{2+} salts are colourless. Why?
(b) Write the preparation of sodium dichromate from chromite ore($FeCr_2O_4$).

Solution:
(a) (i) On has exceptionally positive E^0m^{2+}/m value because 2nd e^- has to be removed from extra stable fully filled configuration $3d^{10}$. The low value of ΔH_{nyd} cannot compensate the high energy required to transform Cu to Cu^{2+}.
(ii) Cr is a strong reducing agent in +2 oxidation state , it havy nearly easily loss e^- to achieve its highest oxidation state of +6 to become extra stable.
(iii) zn^{2+} salts are colourless because zn^{2+} doesnot have unpaired electrons, it has fully filled d-orbital and unpaired excite to give colour to compounds.
(b) preparation of $Na_2Cr_2O_7$ from $FeCr_2O_4$

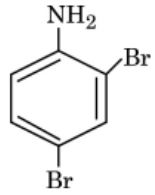
$$4FeCr_2O_4 + 8Na_2CO_3 + 7O_2 \rightarrow 8Na_2CrO_4 + 2Fe_2O_3 + 8CO_2$$

Chromire ore

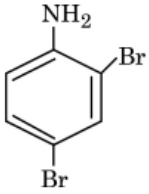
$$2Na_2CrO_4 + H_2SO_4 \rightarrow Na_2Cr_2O_r + Na_2SO_4 + H_2O$$

sodium dichromate

Q. 63 Write the IUPAC name of the given compound :



Solution:



2,4 - Dibromoaniline

Q. 64 What type of magnetism is shown by a substance if its domains are arrnged in equal number and in opposite directions ?

Solution:
Ferromagnetism is shown by a substance if its domains are arranged in equal number and in opposite directions.

Q. 65 What is the reason for the stability of colloidal sols ?

Solution:
The reason for the stability of collidal sols in the presence of equal and similar charges on collidal particles, due to repulsive forces between charged particles, they do not combine to form large particles when they come closer to one another.

Q. 66 Out of $CH_2 = CH - CH_2Cl$ and $CH_3 - CH_2 - CH_2Cl$, Which is more reactive towards S_N1 reaction ?

Solution:
$CH_2 = CH - Cl$ is more reactive towards S_N1 reaction as it is stabilised by reasonance.

Q. 67 When pyrolusite ore MnO_2 is fused with KOH in presence of air, a green coloured compound (A) is obtained which undergoes disproportion reaction in acidic medium to give a purple coloured compound (B) :

(i) Write the formulae of the compounds (A) and (B).

(ii) What happens when compound (B) is heated ?

Solution:

$$MnO_2 + KOH + O_2 \rightarrow \underset{(darkgreen)}{A} \xrightarrow[medium]{Acidic} \underset{(purple)}{B}$$

(i) $A = K_2MnO_4$

$B = KMnO_4$

(ii) On heating $KMnO_4$ is converted K_2MnO_4

Q. 68 When a coordination compound $PdCl_2.4NH_3$ is mixed with $AgNO_3$, 2 moles of $AgCl$ are precipitated per mole of the compound . Write :

(i) Structural formula of the complex

(ii) IUPAC name of the complex

Solution:
(i) structural formula - $[Pd(NH_3)_4]Cl_2$

(ii) IUPAC formula _ Tetraammine palladium (II) chloride.

Q. 69 For the given cells :

Lead storage cell, Mercury cell, Fuel cell and Dry cell

Answer the following :

(i) Which cell is used in hearing aids ?

(ii) Which cell was used in Apollo space programme ?

(iii) Which cell is used in automobiles and inverters ?

(iv) Which cell does not have long life ?

Solution:
(i) Mercury cell is used in hearing aids.

(ii) Fuel cells was used in Apollo space programme.

(iii) Lead storage cell is used in automobiles and inverters.

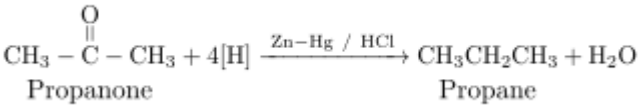
(iv) cell does not have long life .

Q. 70 Write the chemical equations involved in the following reactions :

(i) Clemmensen reduction

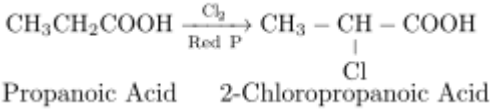
(ii) Hell-Volhard Zelinsky reaction

Solution:
(i) Clemmenson Reduction



Propanone Propane

(ii) Hell-Volhard Zeinsky Reaction



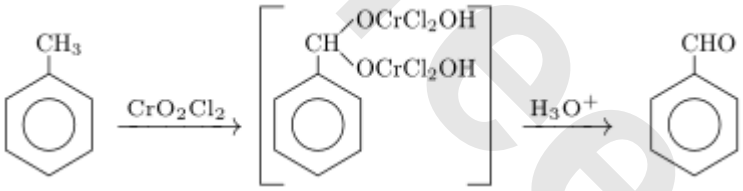
Propanoic Acid 2-Chloropropanoic Acid

Q. 71 How do you convert

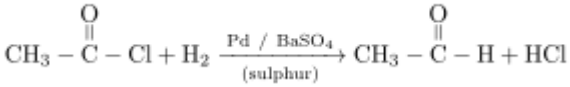
(i) Toluene to benzaldehyde

(ii) Ethanol chloride to ethanal

Solution:
(i) Toluene to benzaldehyde



(ii) Ethanochloride to ethanol



Q. 72 For a reaction : $2NH_3(g) \overset{Pt}{\rightarrow} N_2(g) + 3H_2(g).$

Rate = k

(i) write the order and molecularity of this reaction .

(ii) Write the unit of k.

Solution:
$2NH_3(g) \overset{Pt}{\rightarrow} N_2(g) + 3H_2(g).$

Rate = k

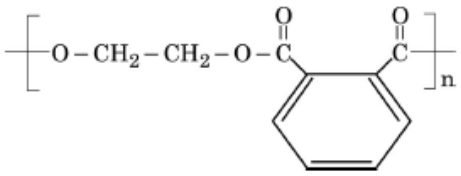
(i) Order $= 0$ (Rate is independent of concentration of reactants).

Molecularity $= 2$

(ii) Unit of $k = mol\ L^{-1} s^{-1}$

Q. 73 (i) What is the role ot t-butyl peroxide in the polymerization of ethane ?

(ii) Identify the monomers in the following polymer :

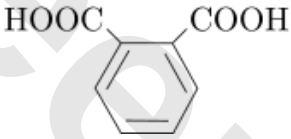


(iii) Arrange the following polymers in the increasing order of their intermolecular forces :

$$PVC, Nylon-6, Buna-N$$

Solution:
(i) A-butylperoxide acts as an initiator in the polymerisation of phenyl free radical.

(ii) Monomers are

$HO-CH_2-CH_2-OH$ and 

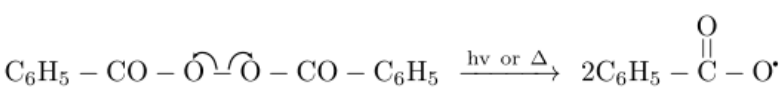
(iii)

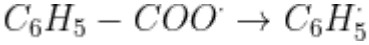
$$Buna-N < PVC < Nylon-6$$

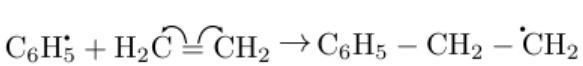
Q. 74 Write the mechanism of free radical polymerization of ethane.

Solution:
Mechanism of free radical polimerisation of ethane.

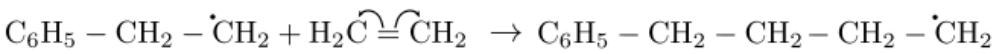
chain irritation step -







Chain propagating step -



Chain termination step -

$2C_6H_5\text{-}(CH_2-CH_2)_n CH_2-CH_2 \rightarrow C_6H_5\text{-}(CH_2-CH_2)_n\, CH_2-CH_2-CH_2-CH_2\text{-}(CH_2-CH_2)_n\, C_6H_5$

Q. 75 The rate constant for the first order decomposition of H_2O_2 is given by the following equation :

$$log\ k = 14.2 - \frac{1.0 \times 10^4 K}{T}$$

Calculate E_A for this reaction and rate constant k if its half -life period be 200 minutes. (Given : $R = 8.314\ JK^{-1}mol^{-1}$)

Solution:

$E_a = ?\quad k = ?$

$R = 8.314\ JK^{-1}mol^{-1}$

$t_{\frac{1}{2}} = 200\ min$

$$log\ k = log\ A - \frac{E_a}{2.303\ RT}$$

$$\frac{E_a}{2.303\ RT} = \frac{1 \times 10^4}{T}$$

$$E_a = 1 \times 10^4 \times 2.303\ R$$

$$= 2.303 \times 10^4 \times 8.314$$

$$= 191471.42\ J\ mol^{-1}$$

$t_{\frac{1}{2}} = 200\ min$

$$K = \frac{0.693}{T_{\frac{1}{2}}} = \frac{0.693}{200}$$

$$= 0.003465\ min^{-1}$$

$$= 0.2079\ sec^{-1}$$

Q. 76 Give reasons for the following :

(a) Aldehydes $(R-CHO)$ are more reactive than ketones $(R-CO-R)$ towards nucleophilic addition reaction.

(b) Benzaldehyde does not undergo aldol condensation reaction.

(c) Benzoic acid does not give Fridal-Crafts reaction.

Solution:
(i) Aldehydes are more reactive towards nucleophilic addition reaction than ketones because-

(a) Due to electron releasing effectb of alkyl group the electrophillicity of carbonyl carbon decreases since ketones contains two alkyl groups therefore they are less reactive.

(b) Carbonyl carbon in ketons is more sterically hindered due to presence of two bulkier alkyl groups making nucleophillic attack difficult.

(ii) Benzaldehyde does not gives aldol condensation reaction because it does not contains $\alpha-hydrogen$ atom which is lost during the reaction .

(iii) Benzoic acid does not gives fridel-crafts reactions due to deactivating nature of $-COOH$ group and the catalyst $AlCl_3$ gets bonded to $-COOH$ group.

Q. 77 (i) Out of silica gel and anhydrous $CaCl_2$, which will absorb the water vapours ?

(ii) Out of H_2SO_4 and H_3PO_4, which one is more effective in causing coagulation of positively charged sol ? Give reason.

(iii) Out of sulphur sol and proteins, which one forms macromolecular colloids ?

Solution:
(i) Anhydrous $CaCl_2$ will absorb more water vapours.

(ii) H_3PO_4 is more effective in causing coagulation of positive charged sol because water is the charge of coagulating ion added, greater is its coagulating power.

(iii) Proteins forms macromolecular colloids.

Q. 78 Give reasons :

(i) Mn shows the highest oxidation state of +7 with oxygen but with fluorine it shows the highest oxidation state of +4.

(ii) Zn is soft whereas Cr is hard.

(iii) Eu^{2+} is a good reducing agent.

Solution:

(i) Mn shows the highest oxidation state of +7 with oxygen, but with fluorine it shows the highest oxidation state of +4, because of the ability of oxygen to form multiple bonds with transition metals $(a\pi - \rho\pi)$ but fluorine cannot do so.

(ii) Zn is soft but Cr is hard due to presence of strong metallic bonds in Cr and due to presence of 5 unpaired electrons in d-orbital, whereas Zn have weak metallic bonds in their lattices due to absence of unpaired d electrons.

(iii) Eu^{2+} is a good reducing agent because it has tendency to get oxidised to +3 state,and reach the most stable oxidation state.

Q. 79 What happens when :

(i) 2,4,6 -trinitrochlorobenzene is treated with warm water.

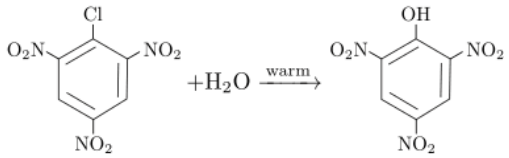
(ii) 2- chlorobutane is treated with alcoholic KOH.

(iii) ethyl chloride is treated with Na metal in presence of dry ether.

Write the equation involved in the above reactions.

Solution:

(i)



Picric Acid

(ii) $\underset{\underset{\text{Cl}}{|}}{\text{CH}_3\text{CH}_2\text{CHCH}_3} + \text{alc. KOH} \longrightarrow \underset{\text{(Major)}}{\text{CH}_3\text{CH} = \text{CH} - \text{CH}_3} + \underset{\text{(Minor)}}{\text{CH}_3 - \text{CH}_2 - \text{CH} = \text{CH}_2}$

(iii) $CH_3CH_2Cl + Na \overset{dryether}{\rightarrow} CH_3CH_2CH_2CH_3 + NaCl$

Ethylchloride Butane

Q. 80 Complete the following reactions :

(i)

$$C_6H_5 - COO^-NH_4^+ \overset{\Delta}{\rightarrow} A \overset{Br_2/KOH}{\rightarrow} B \overset{CH_3COCl/pyridine}{\rightarrow} C$$

(ii)

$$C_6H_5 - N_2^+BF_4^- \xrightarrow[\Delta]{NaNO_2/Cu} A \overset{Sn/HCl}{\rightarrow} B \xrightarrow[\Delta]{CHCl_3+alc.KOH} C$$

Solution:

(i)

$$C_6H_5COO^-NH_4^+ \xrightarrow{\Delta} \underset{(A)}{C_6H_5CONH_2} \xrightarrow{Br_2\ /\ KOH} \underset{(B)}{C_6H_5NH_2} \xrightarrow{CH_3COCl\ /\ Pyridine} \underset{(C)}{C_6H_5NH-CO-CH_3}$$

(ii)

$$C_6H_5N_2^+BF_4^- \xrightarrow[\Delta]{NaNO_2\ /\ Cu} \underset{(A)}{C_6H_5-NO_2} \xrightarrow{Sn\ /\ HCl} \underset{(B)}{C_6H_5NH_2} \xrightarrow[alc.\ KOH]{CHCl_3+} \underset{(C)}{C_6H_5NC}$$

Q. 81 (i) Write the name of two monosaccharides obtained on hydrolysis of maltose sugar.

(ii) Name the vitamin whose deficiency causes convulsions.

(iii) Write one example each for Fibrous proteins and Globular protein.

Solution:

(i) Two monosaccharides obtained on hydrolysis of maltose sugar are $\alpha - D\ glucose$ units.

(ii) On deficiency of vitamin B_6 (pyridoxine) convulsions are experienced.

(iii) Example of

Fibrous protein - keratin

Globular protein - insulin

Q. 82 (i) Name the method of refining Zirconium .

(ii) In the extraction of Al, impure Al_2O_3 is dissolved in conc. $NaOH$ to form sodium alluminate and leaving impurities behind. What is the name of this process.

(iii) What is the function of limestone in the extraction of iron from its oxides ?

Solution:

(i) Van - Arkel method is used for refining of zironium.

(ii) Leaching is the process in which Aluminium is extracted in this method.

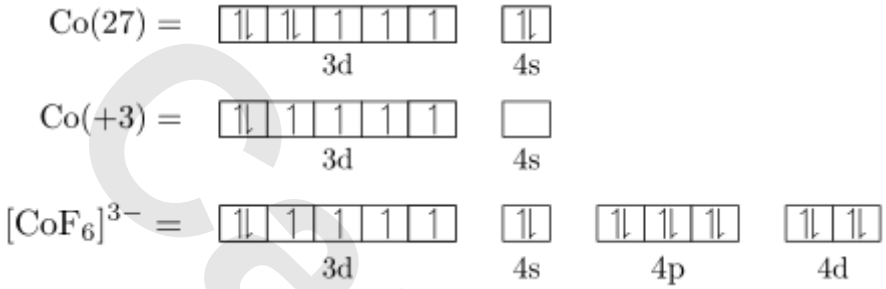
(iii) Limestone is mixed with oxide ores of iron after concentration through calcination or roasting to remove water and to decompose carbonate to oxide.

Q. 83 (a) for the complex $[CoFe]^{3-}$ $At.No. = 27$, write the Hybridisation, magnetic character and spin of the complex.

(b) Draw one of the geometrical isomers of the complex $[Co(en)_2Cl_2]^+$ which is optically active.

Solution:

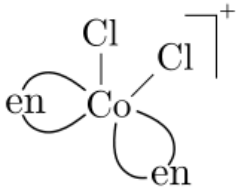
(a) $[CoFe]^{3-}$ $At.No. = 27$



Hybridisation $= Sp^3d^2$

paramagnetic and high spin complex.

(b) $[Co(en)_2Cl_2]^+$



cis-isomer is optically active.

Q. 84 Calculate E^0_{cell} for the following reaction at $298K$:

$2Cr(s) + 3Fe^{2+}(0.01M) \rightarrow 2Cr^{3+}(0.01M) + 3Fe(s)$'

Given : $E_{cell} = 0.261\ V$

Solution:

$E^0_{cell} = ?$ $T = 298K$

$2Cr(s) + 3Fe^{2+}(0.01M) \rightarrow 2Cr^{3+}(0.01M) + 3Fe(s)$

$E_{au} = 0.261\ V$

$Anode = (Cr(s) \rightarrow Cr^{3+} + 3e^-) \times 3$

$Cathode = \left(Fe^{2+} + 2e- \rightarrow Fe\right) \times 2$

$n = 6$

$E_{au} = E^{\circ}_{au} - \frac{0.0591}{n} log \frac{[Cr^{3+}]^2}{[fe^{2+}]^3}$

$E_{au} = 0.261 - \frac{0.0591}{6} log \frac{(0.01)^2}{(0.01)^3}$

$= 0.261 - \frac{0.0591}{6} log\ 10^2$

$= 0.261 - \frac{2 \times 0.0591}{6}$

$= 0.2413\ V$

Q. 85 An element crystallizes in a f.c.c. lattice with cell edge of $400\ pm$. The density of the element is $7\ g\ cm^{-3}$. How many atoms are present in $280\ g$ of the element ?

Solution:

$Edge(a) = 400pm \quad mfcc, z = 4$

$Density = 7g/cm^3$

$mass = 280\ g$

$No.\ of\ atoms = ?$

Volume = $(a)^3 = (400pm)^3$

$= 6.4 \times 10^{-23} cm^3$

Volume of $280\ g = \frac{mass}{density}$

$= \frac{280}{7} = 40\ cm^3$

No. of unit cells in $400cm^3 = \frac{40}{6.4 \times 10^{-23}}$

$= 6.25 \times 10^{23} unit\ cells$

Total no. of atoms in $280\ g = 4 \times 6.25 \times 10^{23}$

$= 25 \times 10^{23} atoms$

Q. 86 Due to hectic and busy schedule, Mr. Awasthi made his life full of tensions and anxiety. He started taking sleeping pills to overcome the depression without consulting the doctor. Mr. Roy, a close friend of Mr. Awasthi, advised him to stop taking sleeping pills and suggested to change his lifestyle by doing Yoga, meditation and some physical exercise. Mr. Awasthi followed his friend's advice and after few days he started feeling better.

After reading the above passage, answer the following :

(i) What are the values (at least two) displayed by Mr. Roy ?

(ii) Why it is not advisable to take sleeping pills without consulting doctor ?

(iii) What are tanquilizers ? Give two examples.

Solution:
(i) Values shown by Mr. Ray - A good advisor , friendly and sympathatic.

(ii) It is not advisable to take sleeping pills without consulting a doctor because taken in high doses, it is harmful and may cause death, These drugs also effects the nervous system.

(iii) Tranquilizers are chemical substances used to cure mental diseases. They are used to treat mental tension,reduce anxiety and are a constituent of sleeping pills. Example - luminal, veronal.

Q. 87 (a) Calculate the boiling point of solution when $2\ g$ of $Na_2SO_4 (M = 142\ g\ mol^{-1})$ was dissolve in $50g$ of water, assuming Na_2SO_4 undergoes completer ionization.

(K_b for water $= 0.52\ K\ kg\ mol^{-1}$)

(b) Define the following terms :

(i) Colligative properties

(ii) Ideal solution

Solution:
(a)

$T_b = ?\qquad K_b(water) = 0.52\ K\ kg\ mol^{-1}$

$M(Na_2SO_4) = 142\ g\ mol^{-1} = 0.142\ K\ kg\ mol^{-1}$

Mass of $Na_2SO_4 = 2g = 0.002\ kg$

Mass of water $= 50\ g = 0.050\ kg$

complete Ionization , $i = 3$

$\Delta T_b = i \times K_b \times m$

$$= \frac{3 \times 0.520.002}{0.142 \times 0.05}$$

$$= 0.439\ K$$

$$T_b = \Delta T_b + T_b^\circ$$

$$= 0.439 + 373.15$$

$$= 373.589\ k$$

(b) (i) Colligative roperties are there properties of solution which depend only on the number of solute particles present in a given quantity of solution or solvent but are indipendent of nature of solute.

(ii) Ideal solution is a solution of two liquids if it obeys the following charcteristics :

- Each component obeys Raoult's law in solution i.e. $p_1 = p_1^\circ x_1, \quad p_2 = p_2^\circ x_2$

$$p_{total} = p_1^\circ x_1 + p_2^\circ x_2$$

- $\Delta H_{mix} = O$ (no heat is involved or absorbed during formation of solution)
- $\Delta V_{mix} = O$ (Volume reamins unchanged on mixing)

Q. 88 (a) When 2.56 g of sulphur was dissolved in 100 g of CS_2, the freezing point lowered by 0.383 K. Calculate the formula of sulphur (S_X)

(K_f for $CS_2 = 3.83\ K\ kg\ mol^{-1}$ Atomic mass of sulphur $= 32\ g\ mol^{-1}$)

(b) Blood cells are isotonic with $0.9\ ^o/_o$ sodium chloride solution. What happens if we place blood cells in a solution containing ?

(i) $1.2\ ^o/_o$ sodium chloride solution

(ii) $0.4\ ^o/_o$ sodium chloride solution

Solution:

(a) $K_f(CS_2) = 3.83\ K\ kg\ mol^{-1}$

Atomic mass of sulphur $= 32\ g\ mol^{-1}$

Mass of sulphur $= 2.56\ g$

Mass of $CS_2 = 100\ g$

$\Delta T_f = 0.383\ K$

Formula of sulphur $(S_X),\ X = ?$

$\Delta T_f = l \times K_f \times m$

$0.383 = i \times 3.83 \times \frac{2.56 \times 1000}{32 \times 100}$

$i = \frac{0.383 \times 32 \times 100}{3.83 \times 2.56 \times 1000}$

$i = \frac{1}{8}$

$\therefore\ X = 8$

Formula of sulphur $= S_8$

(b) Blood cells are isotonic with $0.9\ ^o/_o\ NaCl$ solution . If we place blood cells in -

(i) $1.2\ ^o/_o\ NaCl$ solution blood cells will shrink.

(ii) $0.4\ ^o/_o\ NaCl$ solution

blood cells will swell.

Q. 89 (a) Account for the following :

(i) $H_2\ Te$ is more acidic than $H_2S.$

(ii) PCl_5 is more covalent than $PCl_3.$

(iii) Boiling points of interhalogens are little higher as compare to pure halogens.

(b) Draw the structures of :

(i) $HClO_4$ (ii) $XeOF_4$

Solution:

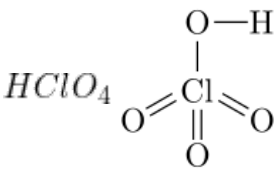
(a) (i) $H_2\ Te$ is more acidic than H_2S since $Te - H$ bond is weaker than $S - H$ bond because, Te is bigger in size than S. Hence, $H_2\ Te$ can easily gives H^+ ions .

(ii) PCl_5 is more covalent than PCl_3 because P in PCl_5 is in +5 oxidation state and more positive the oxidisation state more is the covalent character whereas P is PCl_3 is in +3 oxidisation state.

(iii) Boiling point of interhalogens are more than pure halogins because boiling point depends on polarity of the bond. Interhalogens have non-zero electronegativity which makes their bond polar whereas in the case of purehalogens because of zero electronegativity difference, bond between halogens is not polar.

(b)

(i)



(ii)

$XeOF_4$ 

Q. 90 (i) Arrange the following in the increasing order of their reducing character :

$$H_3PO_3, \quad H_3PO_4, \quad H_3PO_2$$

(ii) Out of He and Xe, which one can easily form compound and why ?

(iii) Write the conditions to Maximize the yield of ammonia in Haber's process.

(iv) Write two uses of Chlorine gas.

(v) How can you detect the presence of SO_2 gas ?

Solution:

(i) $H_3PO_4 < H_3PO_3 < H_3PO_2$

(ii) Xenon can easily form compounds because it has least ionisation energy.

(iii) Conveteons for maximum yield of NH_3 in Haber's process are low temperature and high pressure.

(iv) Two uses of chlorine gas are -

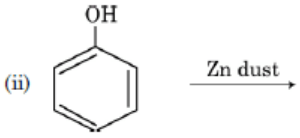
- It is a powerful bleaching agent .
- It is a strong oxidising agent. and is used in purifying drinking water.

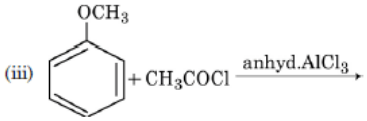
(v) SO_2 decolourises Potassium permagnate.

$$5SO_2 + 2\underset{Darkpurple}{MnO_4^-} + 2H_2O \rightarrow 5SO_4^{2-} + 4H^+ + 2\underset{nocolour}{Mn^{2+}}$$

Q. 91 (a) Write the product (s) in each of the follpowing reactions :

(i) $CH_2 = CH - CH_2OH \overset{PCC}{\rightarrow}$

(ii) 

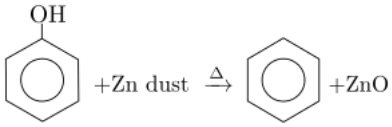
(iii) 

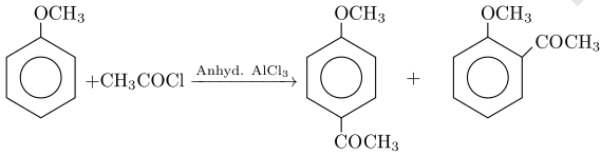
(b) Write the Mechanism of the following reaction:

$$2CH_3CH_2OH \overset{conc.H_2SO_4/413K}{\rightarrow} CH_3CH_2 - O - CH_2CH_3$$

Solution:

(a) (i) $CH_2 = CH - CH_2OH \overset{PCC}{\rightarrow} CH_2 = CH - CHO$

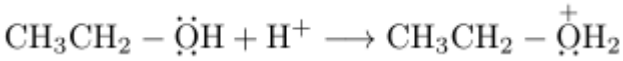
(ii) 

(iii) 

(b) Mechanism of

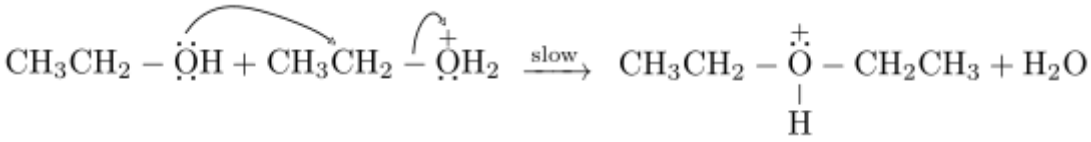
$$2CH_3CH_2OH \overset{conc.H_2SO_4/413K}{\rightarrow} CH_3CH_2 - O - CH_2CH_3$$

Step-I Protonation of alcoholes

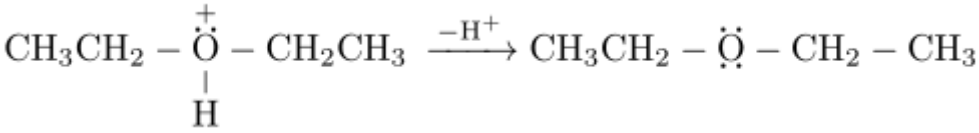


Step- II Nucleophilic attack of alcohol molecule on protonaid alcohole

(SN_2).



Step- III Deprotonation



Q. 92 (a) Write equations of the following reactions :

(i) Bromine in CS_2 with phenol

(ii) Treating phenol with chloroform in the presence of aq. $NaOH$

(iii) Anisole reacts with HI

(b) Distinguish between :

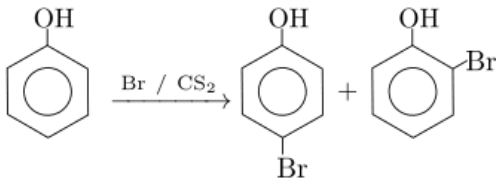
(i) Ethanol and Diethyl ether

(ii) Propanol and t-butyl alcohol

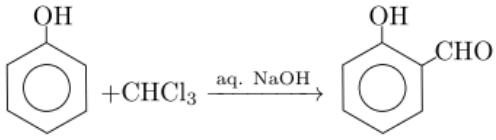
Solution:

(a)

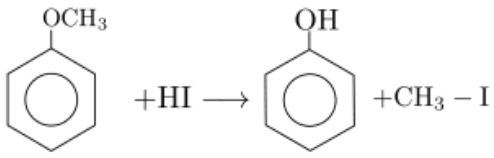
(i)



(ii)



(iii)



(b) (i) Ethanol and diethylether

Ethanol on heating with $NaOH$ and I_2 gives yellow precipitate of iodoform but diethylether does not gives this test

$$OH - OH_2 - CH_3 \overset{NaOH+I_2}{\rightarrow} CHI_3 \downarrow + CH_3COOHNa$$

ethanol yellow

(ii) Propanol and t-butylalcohol

t-butylalcohole on treatment with Luca's reagent gives white tunbidity immediately but propanol does not gives this test.

$$\underset{\text{t-butylalcohol}}{H_3C - \overset{\overset{CH_3}{|}}{\underset{\underset{OH}{|}}{C}} - CH_3} + HCl \xrightarrow{\text{anhyd. ZnCl}} \underset{\text{(White turbidity)}}{H_3C - \overset{\overset{CH_3}{|}}{\underset{\underset{CH_3}{|}}{C}} - Cl} + H_2O$$

Q. 93 On heating Zn granules with conc. HNO_3, a brown gas is evolved which undergoes dimerization on cooling. Identify the gas.

Solution:
NO_2 (Nitrogen dioxide) is evolved on heating Zn granules with conc. HNO_3.

Q. 94 (a) Account for the following:

(i) Mn shows the highest oxidation state of +7 with oxygen but with fluorine it shows the highest oxidation state of +4.

(ii) Zirconium and Hafnium exhibit similar properties.

(iii) Transition metal acts as catalysts.

(b) Complete the following equations:

(i) $2MnO_2 + 4KOH + O_2 \overset{\Delta}{\rightarrow}$

(ii) $Cr_2O_7^{2-} + 14H^+ + 6I^- \rightarrow$

Solution:
(a)

(i) Mn shows the highest oxidation state of +7 with oxygen but with flourine it shows the highest oxidation state of +4 is because of the ability of oxygen to form multiple bonds with Mn $(d\pi - p\pi)$ but fluorine cannot do so.

(ii) Zirconium and Hafnium exhibit similar properties since there is an overall decrease in atomic radii of elements in 5d because of imperfect shielding of f electrons which is unable to counter balance effect of increased nuclear charge.

(iii) Transition metals acts as catalysts due to their ability to show multiple oxidation state and due to their tendency to form complexes.

(b)

(i) $2MnO_2 + 4KOH + O_2 \xrightarrow{\Delta} 2K_2MnO_4 + 2H_2O$

(ii) $Cr_2O_7^{2-} + 14H^+ + 6I^- \rightarrow 2Cr^{3+} + 3I_2 + 7H_2O$

Q. 95 The elements of 3d transition series are given as:

Sc Ti V Cr Mn Fe Co Ni Cu Zn

Answer the following:

(i) Write the elements which is not regraded as transition element. Give reason.

(ii) Which is the element has the highest m.p.?

(iii) Write the elements which can show an oxidation state of +1.

(iv) Which element is a strong oxidizing agent +3 oxidation state and why?

Solution:
(i) Zinc (Zn) is not regarded as transition element since it does not contain partially filled d-orbital in either ground state or stable +2 oxidation state.

(ii) Vanadium (V) ,Atomic number = 23

(iii) Copper (Cu) (Atomic number = 29) can show oxidation state is +1.

(iv) Fe^{3+} is a strong oxidizing agent, as it readily accepts an electron to form Fe^{2+} as it has extra stable half filled configuration $(3d^5)$. Therefore Iron is a strong oxidizing agent in +3 oxidation state.

Q. 96 (a) The conductivity of 0.001 mol L^{-1} solution of CH_3COOH is $3.905 \times 10^{-5} Scm^{-1}$. Calculate its molar conductivity and degree of dissiciation(α).

Given $\lambda^\circ(H^+) = 349.6 Scm^2mol^{-1}$ and $\lambda^\circ(CH_3COO^-) = 40.9 Scm^2mol^{-1}$

(b) Define electrochemical cell. What happens if external potential applied becomes greater than E°_{cell} of electrochemical cell?

Solution:
(a)

$\lambda^{\circ}(H^{+}) = 349.6 Scm^{2}mol^{-1}$

$\lambda^{\circ}(CH_3COO^{-}) = 40.9 Scm^{2}mol^{-1}$

$K(CH_3COOH) = 3.905 \times 10^{-5} Scm^{-1}$

$\propto = ?, \Lambda_m = ?$

$C = 0.001 molL^{-1} = 0.001 molcm^{-3}$

$$\Lambda_m = \frac{K \times 1000}{c}$$

$$\Lambda_m = \frac{3.905 \times 10^{-5} \times 10^{3}}{0.001} = 89.05 Scm^{2}mol^{-1}$$

$$\propto = \frac{\Lambda_m}{\Lambda_m^{\circ}} = \frac{39.05}{390.5} = 0.1$$

(b) E;ectrochemical cell is a device that converts chemical energy of an indirect redox reaction into electrical energy. It is formed by two redox couples.

If external a potential applied becomes greater than E_{cell}° of electrchemical cell, the reaction gets reversed along with the flow of current.

Q. 97 (a) Calculate E_{cell}° for the following reaction at 298 K:

$2Cr(s) + 3Fe^{2+}(0.001M) \rightarrow 2Cr^{3+}(0.001) + 3Fe(s)$

Given: $E_{cell} = 0.261V$

(b) Using the E° values of A and B, predict which one is better for coating the surface of iron $\left[E^{\circ}\left(Fe^{2+}/Fe\right) = 0.44V\right]$ to prevent corrosion and why?

Given: $E^{\circ}\left(A^{2+}/A\right) = -2.37V, E^{\circ}\left(B^{2+}/B\right) = -0.14V$

Solution:
(a)

E_{cell}° = ?

T = 298 K

$E_{cell} = 0.261V$

$2Cr(s) + 3Fe^{2+}(0.001M) \rightarrow 2Cr^{3+}(0.001) + 3Fe(s)$

Cell = $Cr\left|Cr^{3+}(0.001M)\right|\left|Fe^{2+}(0.001M)\right|Fe$

Anode = $\left(Cr(s) \rightarrow Cr^{3+}(aq) + 3e^{-}\right) \times 2$

Cathode $= \left(Fe^{2+} + 2e^- \rightarrow Fe(s)\right) \times 3$

n = 6

$$E_{cell} = E^\circ_{cell} - \frac{0.0591}{n} \log \frac{[Cr^{3+}]^2}{[Fe^{2+}]^3}$$

$$E_{cell} = 0.261 - \frac{0.0591}{6} \log \frac{(0.01)^2}{(0.01)^3}$$

$$E_{cell} = 0.261 - \frac{0.0591}{6} \log 10^2$$

$$E_{cell} = 0.261 - \frac{0.0591 \times 2}{6}$$

$$E_{cell} = 0.2413V$$

(b)

$$E^\circ \left(A^{2+}/A\right) = -2.37V$$

$$E^\circ \left(B^{2+}/B\right) = -0.14V$$

$$E^\circ \left(Fe^{2+}/Fe\right) = 0.44V$$

A is better for coating the surface of iron to prevent corrosion takes place when iron is oxidised therefore to prevent it element A with higer oxidation potential will oxidise faster.

Q. 98 (a) Write the chemical reaction involved in Etard reaction.

(b) Arrange the following in the increasing order of their reactivity towards nucleophilic addition reaction:

$$CH_3 - CHO, C_6H_5COCH_3, HCHO$$

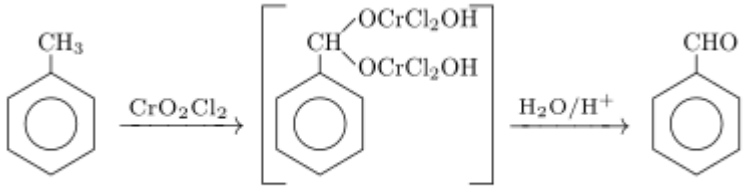
(c)Why pK_a of $Cl - CH_2 - COOH$ is lower than the pK_a of CH_3COOH ?

(d) Write the product of the following reaction.

$$CH_3CH_2CH = CH - CH_2CN \xrightarrow[2.H_2O]{1.(i-Bu)_2AlH}$$

(e) A and B are two functional isomers of compound C_3H_6O. On heating with NaOH and I_2, isomers A forms yellow precipitates of idoform whereas isomer B does not form any precipitate, Write the formulae of A and B.

Solution:
(a) Etard reaction



Brown Intermediate

(b) $C_6H_5COCH_3 < CH_3 - CHO < HCHO$

(c) pK_a of $Cl - CH_2 - COOH$ is less than the CH_3COOH because Cl being an electron withdrawing group increases the acidic strength of carboxylic acids by stabilizing the carboxylate ion due to dispersal of negative charge.

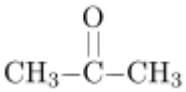
(d) $CH_3CH_2CH = CH{-}CH_2CN \xrightarrow[2.H_2O]{1.(i-Bu)_2AlH} CH_3CH_2{-}CH = CH.CH_2CHO$

(e) A and B functional isomers of C_3H_6O

$A \xrightarrow[\Delta]{NaOH+I_2} CHI_3 \downarrow \therefore$ A is a methyl ketone

yellow ppt

B does not reacts to this$\longrightarrow$ B is not a methyl ketone

A = 

$B = CH_3CH_2CHO$

Q. 99 (a) Write the structures of A,B,C and D in the following reactions:

$$CH_3CN \xrightarrow[(ii)H_2O]{(i)SnCl_2-HCl} A \overset{dil.NaOH}{\rightarrow} B \overset{heat}{\rightarrow} C$$

$$\downarrow \text{HCN}$$

D

(b) Distinguish between:

(i) $C_6H_5 - CH = CH - COCH_3$ and $C_6H_5 - CH = CH - COCH_2CH_3$

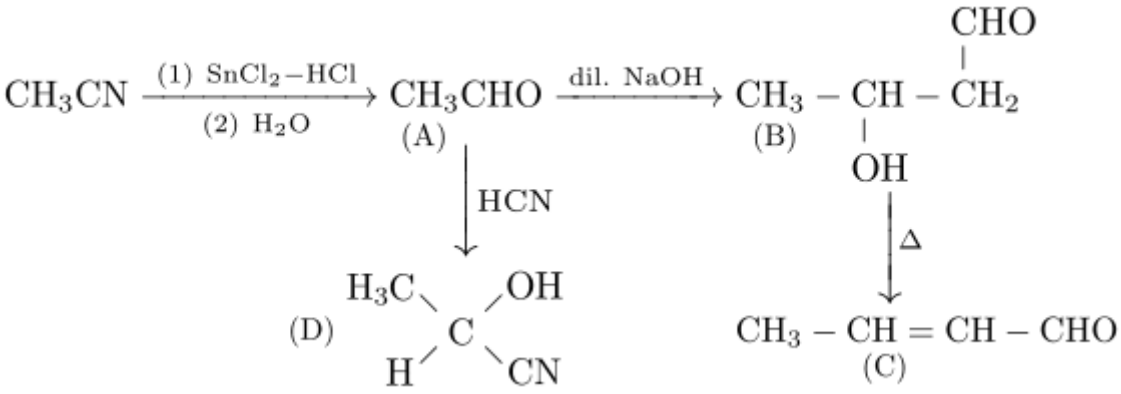
(ii) CH_3CH_2COOH and $HCOOH$

(c) Arrange the following in the increasing order of their boiling points:

$CH_3CH_2OH, CH_3COCH_3, CH_3COOH$

Solution:

(a)



(b)

(i) $C_6H_5-CH=CH-COCH_3$ and $C_6H_5-CH=CH-COCH_2CH_3$

$C_6H_5-CH=CH-COCH_3$ gives iodoform reaction as it is a methyl ketone but $C_6H_5-CH=CH-COCH_2CH_3$ does not give this test.

$$C_6H_5-CH=CH-COCH_3+NaOI\xrightarrow{\Delta}C_6H_5CH=CHCOONa^++CHI_3\downarrow$$

(ii) CH_3CH_2COOH and $HCOOH$

$HCOOH$ is the only carboxylic acid which reduces Tollen's reagent to shining sliver mirror, but CH_3CH_2COOH does not gives this test.

$$HCOOH+2\left[Ag\left(NH_3\right)_2\right]^++3OH^-\rightarrow CO_2+4NH_3+H_2O+2Ag\downarrow$$

(c)

$$CH_3COCH_3<CH_3CH_2OH<CH_3COOH$$

Q. 100 Due to basic and busy schelude, Mr. Awasthi made his life full of tensions and anxiety. He started taking sleeping pills to overcome the depression without consulting the doctor. Mr.Roy, a close friend of Mr. Awasthi advised him to stop taking the pills and suggested to change his lifestyle by doing Yoga, meditation and some physical exercise. Mr. Awasthi followed his friend's advice and after few days he started feeling better.

After reading the above passage, answer the following:

(i) What are the values (at least two) displayed by Mr. Roy?

(ii) Why it is not advisable to take sleeping pills without consulting doctor?

(iii) What are tanquilizers? Give two examples.

Solution:
(i) Value - Adaptability, Flexibility , Understanding

(ii) It is not advisable to take sleeping pills without consulting a doctor because taken in high does it is harmful and may even lead to death. These drugs also affects the nervous system.

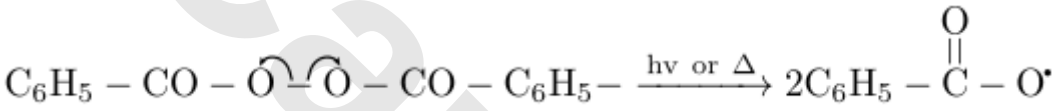
(iii) Transquilizers are chemical substance used to cure mental tension and reduce anxiety and are constituent of sleepping pills.

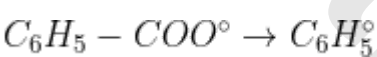
Examples: Luminal, Veronal.

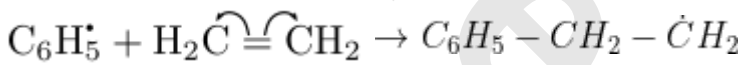
Q. 101 Write the mechanism of free radical polymerization of ethene.

Solution:
Mechanism of free radical polymerisation of ethene.

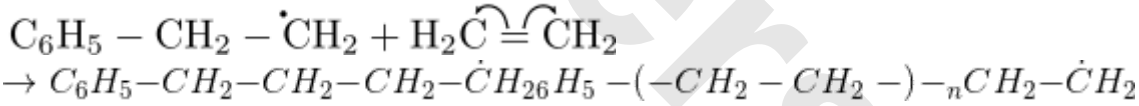
Chain initiation step



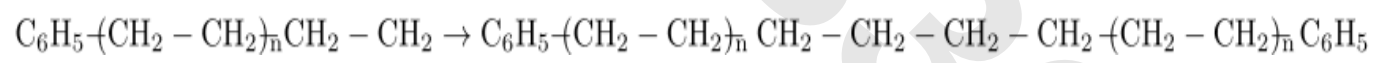




Chain Propagating step

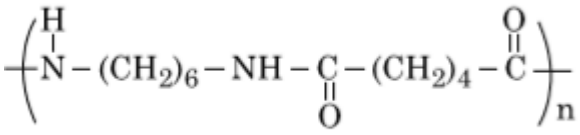


Chain termination step



Q. 102 (i) What is the role of benzoyl peroxide in the polymerization of ethene?

(ii) Identify the monomers in the follwoing polymer:



(iii) Arrange the following polymers in the incerasing order of their intermolecular forces:

Nylon -6,6 Polythene, Buna-S

Solution:
(i) Benzoyl peroxide acts as an initiator in the polymerization of ethene, it helps in formation of phenyl

free radical.

(ii) Monomers

$\mathrm{H_2N(CH_2)_6N}$ and $\mathrm{HO-\overset{O}{\overset{\|}{C}}-(CH_2)_4-\overset{O}{\overset{\|}{C}}-OH}$

(iii) Increasing order of intermolecular forces

Buna-S < Polythene < Nylon -6,6

Q. 103 The rate constant for the first order decomposition of H_2O_2 is given by the following equation:

$$\log k = 14.2 - \frac{1.0 \times 10^4}{T}$$

Calculate E_a for this reaction and rate constant k if its half - life period be 200 minutes. (Given: R = 8.314 $JK^{-1}mol^{-1}$)

Solution:

$E_a = ?, k = ?$

R = 8.314 $JK^{-1}mol^{-1}$

$t_{\frac{1}{2}} = 200min$

$$\log k = 14.2 - \frac{1.0 \times 10^4}{T}$$

order = 1

$$\log K = \log A - \frac{E_o}{2.303T}$$

$$\frac{E_a}{2.303T} = \frac{1.0 \times 10^4}{T}$$

$$E_a = 1 \times 10^4 K \times 2.303 \times R$$

$$E_a = 2.303 \times 10^4 \times 8.314$$

$$E_a = 19.147142 \times 10^4$$

$$E_a = 19147.142 Jmol^{-1}$$

$t_{\frac{1}{2}} = 200min$

$$\frac{0.693}{\quad} \quad \frac{0.693}{\quad}$$

$$K = \frac{0.693}{t_{\frac{1}{2}}} = \frac{0.693}{200} = 0.003465 min^{-1} = 0.2079 sec^{-1}$$

Q. 104 Write the structures of A, B and C in the following reactions:

(1)

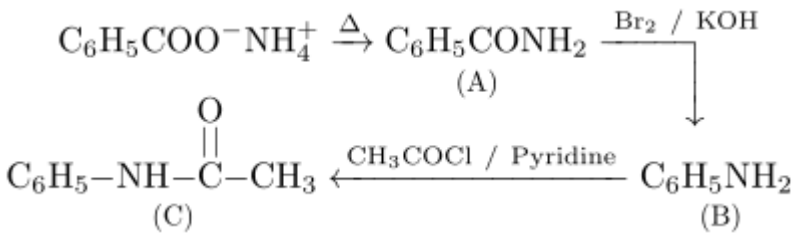
$$C_6H_5 - COO^-NH_4^+ \xrightarrow{\Delta} A \overset{Br_2/KOH}{\rightarrow} B \overset{CH_3COCl/pyridine}{\rightarrow} C$$

(2)

$$C_6H_5N_2^+BF_4^- \xrightarrow[\Delta]{NaNO_2/Cu} A \overset{Sn/HCl}{\rightarrow} B \overset{CHCl_3+alc.KOH}{\rightarrow} C$$

Solution:

(1)



(2)

$$C_6H_5N_2^+BF_4^+ \xrightarrow[\Delta]{NaNO_2/Cu} C_6H_5NO_2 \overset{Sn/HCl}{\rightarrow} C_6H_5NH_2 \xrightarrow[alc.KOH]{CHCl_3} C_6H_5NC$$

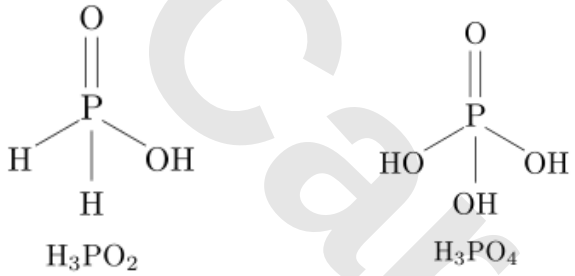
Q. 105 Assign reasons for the following

(i) H_3PO_2 is a stronger reducing agent than H_3PO_4.

(ii) Sulphur shows more tendency for catenation than oxygen .

(iii) Reducing character increases from HF to HI

Solution:
(i) H_3PO_2 is a stronger reducing agent than H_3PO_4 because in H_3PO_2,two H- atoms are bonded directly to P- atom which reducing character whereas there is none in H_3PO_4.



(ii) sulphur shows more tendency for catenation then oxygen due to big size of sulphur lone pair lone pair repulsions are less and S-S bond is stronger than O-O.

(iii) Reducing character increases from HF to HI since increase in the size of halogen, H-X Bond strength decreases which increases tendency to give H^+.

HF < HCl < HBr < HI

Q. 106 Define the following terms:

(i) O/W Emulsion

(ii) Zeta potential

(iii) Multimolecular colloids

Solution:
(i) O/W Emulsion are colloidals solutions which is both the dispersed phase and dispersion medium are liquids and in this case oil is dispersed in water.

(ii) Zeta potential or electrokinetic potential is the potential difference between the fixed layer (first layer of ions which is firmly held) and the diffused layer (second layer which is mobile) of opposite charges.

(iii) Multimolecular colloids are these in which a large number of small atoms or molecules (diameter < 1nm) aggregate together to forms colloidal particles. Example - gold sol.

Q. 107 (i) Name the method of refining which is based on the principle of adsorption.

(ii) What is the role of depressant in froth floatation process?

(iii) What is the role of limestone in the extraction of iron from its oxides?

Solution:
(i) Method of refining which is based on the principle of adsorption is chromatofraphy.

(ii) Depresiants are used to prevent one type of sulphide ore particles from forming the froth with air bubbles. Examples - NACN

(iii) Limestone $(CaCO_3)$ is mixed with oxides ores of iron, after concentration through calcination/ roasting to remove water and to decompose carbonate to oxide.

Q. 108 Calculate the boiling point of solution when 2g of Na_2SO_4 (M = 142 g mol^{-1}) was dissolved in 50g of water, assuming Na_2SO_4 undergoes complete ionization.

$(K_b for water = 0.52 K kg mol^{-1})$

Solution:

$K_b(water) = 0.52 K kg mol^{-1}$

$M(Na_2SO_4) = 142 g mol^{-1} = 0.142 K g mol^{-1}$

Mass of solute $(Na_2SO_4) = 2g = 0.002kg$

Mass of solvent $(water) = 50g = 0.05kg$

$T_b = ?$

Complete ionisation, i=3

$$\Delta T_b = T_b - T_b^\circ$$

$$\Delta T_b = i \times K_b \times m$$

$$\Delta T_b = \frac{3 \times 0.52 \times 0.002}{0.142 \times 0.05}$$

$$\Delta T_b = 0.439K$$

$$\Delta T_b = T_b - T_b^\circ$$

$$\Delta T_b = 373.15 + 0.439$$

$$\Delta T_b = 373.589K$$

Q. 109 (i) Write one reaction of D-glucose which cannot be explained by its open chain structure.

(ii) What type of linkage is present in Nuclei acids?

(iii) Give one example each for water - soluble vitamins and fat soluble vitamins?

Solution:
(i) One reaction which can't be explained by open chain structure of D-glucose is despite having aldehyde group, D-glucose does not give 2,4 DNP test.

(ii) Phosphodiester linkage is present in nuclei acids.

(iii) Water - soluble Vitamin - Vitamin -C

Fat soluble Vitamin- Vitamin A

Q. 110 Give reason for the following:

(a) Protonation of Phenols is difficult whereas ethanol easily undergoes protonation.

(b) Boiling point of ethanol is higher than that of dimethyl ether.

(c) Anisole on reaction with HI gives phenol and $CH_3 - I$ as main products and not iodobenzene and CH_3OH.

Solution:
(a) Protonation of phenols is difficult whereas ethanol easily undergoes protanation because due to reasonace oxygen atom of -OH bond becomes electron deficient in phenols but there is no such resonance in ethanol.

(b) Boiling point of ethanol is more than dimethyl because dipole - dipole attractions in dimethyl ether is weaker than intermolecular hydrogen bonding in ethanol.

(c) Anisole on reaction with HI gives phenol and CH_3I, not iodobenzene and CH_3OH because aryl - oxygen bond requires partial double bond charater due to resonance and hence does not breaks easily.

Q. 111 An element crystallizes in a f.c.c lattice with cell edge 400pm. The density of the element is $7gcm^{-3}$. How many atoms are present in 280g of the element?

Solution:
Edge (a) = 400pm

Density = $7gcm^{-3}$

Mass = 280g

No. of atoms = ?

$$Volume = (a)^3$$

$$Volume = (400pm)^3$$

$$Volume = 6.4 \times 10^{-23} cm^3$$

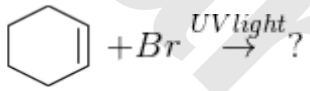
Volume of 280 g $= \frac{mass}{density} = \frac{280}{7} = 40cm^3$

No. of units cell in 40 cm^3 $= \frac{40}{6.4 \times 10^{-23}} = 6.25 \times 10^{23}$unit cell

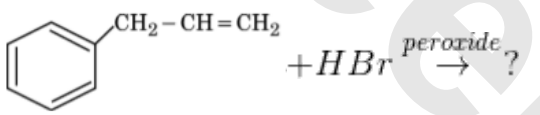
Total no. of atoms in 280g $= 4 \times 6.25 \times 10^{23} = 25 \times 10^{23} atoms$

Q. 112 Write the major monohalo product(s) in each of the following ractions::

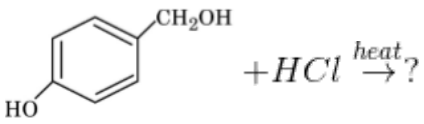
(i)



(ii)

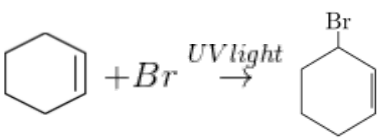


(iii)

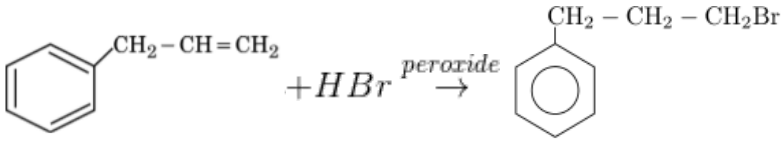


Solution:

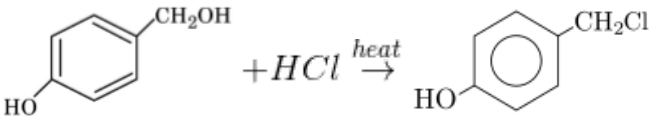
(i)



(ii)



(iii)



Q. 113 For a reaction: $2NH_3(g) \overset{Pt}{\rightarrow} N_2(g) + 3H_2(g)$

Rate =k

(i) Write the order and molecularity of this reaction.

(ii) Write the unit of k.

Solution:

$2NH_3(g) \overset{Pt}{\rightarrow} N_2(g) + 3H_2(g)$

rate = k

(i) Since rate is independent of concentration of reactants, order = zero (0)

Molecularity = Two(2)

(ii) Unit of k= $molL^{-1}s^{-1}$

Q. 114 When coordination compound $NiCl_2.6H_2O$ is mixed with $AgNo_3$, 2 moles of AgCl are precipiated per mole of the compound. Write.

(i) Structural formula of the complex

(ii) IUPAC name of the complex

Solution:

$NiCl_2.6H_2O + AgNo_3 \rightarrow 2AgCl\downarrow$

(i) Structural formula - $[Ni(H_2O)_6]\,Cl_2$

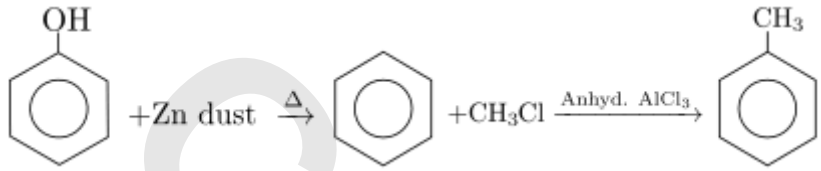
(ii) IUPAC name - Hexaaquanickel(II)chloride

Q. 115 How do you convert:

(i) Phenol to Toulene

(ii) Formaldehyde to Ethanol

Solution:
(i) Phenol to Toulene



(ii) Formaldehyde to Ethanol

$$HCHO + CH_3MgBr \rightarrow CH_3CH_2OMgBr \overset{H_2O}{\rightarrow} CH_3CH_2OH$$

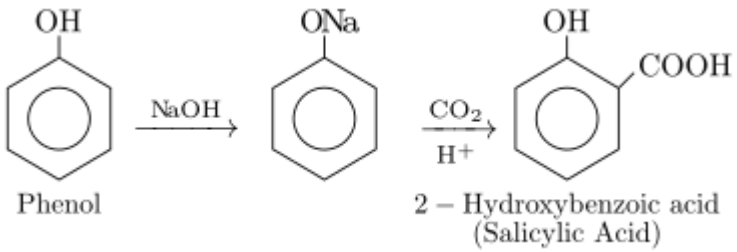
Formaldehyde Ethanol

Q. 116 Write the chemical equations involved in the following reactions:

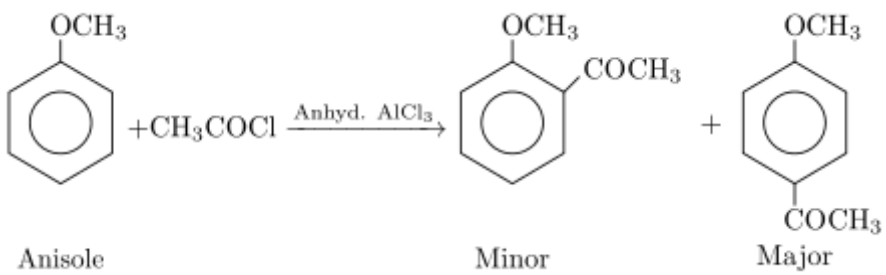
(i) Kolbe's reaction

(ii) Friedal - Crafts acetylation of anisole

Solution:
(i) Kolbe's reaction



(ii) Friedal - Crafts acetylation of anisole



Q. 117 (i) Write the colligative property which is used to find the molecular mass of marcomolecules.

(ii) In non-ideal solution, what type of deviation shows the formation of minimum boiling azeotropes?

Solution:
(i) Osmotic pressure is used to detremne the olecular mass of macromolecule.

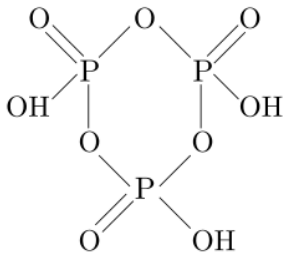
(ii) In non-ideal solutios, positive deviations show the formation of minimum boiling azeotropes

Q. 118 Write the structures of the following:

(i) $(HPO_3)_3$ (ii) XeF_4

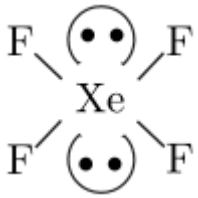
Solution:
(i)

$(HPO_3)_3$

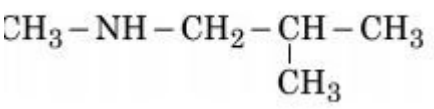


(ii)

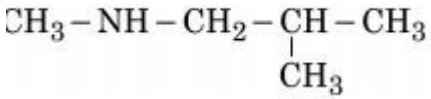
XeF_4



Q. 119 Write the IUPAC name of the given compound:



Solution:



N,2- Dimethylpropan-1-amine

Q. 120 ZnO turns yellow on heating. Why?

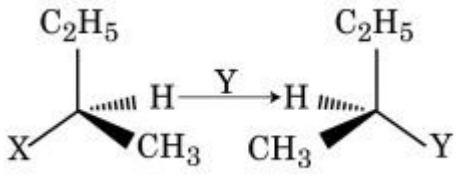
Solution:
ZnO turns yellow on heating because at high temperature, Zn^{2+} ions occupy intertitial sitess along with electrons for neutralization and crystals that show such type of defects on coloured.

Q. 121 Write the reason for the stability of colloidal sols.

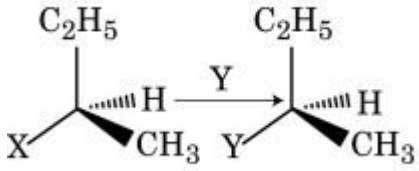
Solution:
The reason for stability of collodial sols is the presence of equal and similar charges on collodial particles, they do not combine to form large particles when they come closer to one another.

Q. 122 Which of the following two reaction is S_N2 and why?

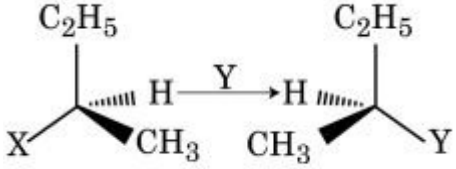
(i)



(ii)



Solution:



follow S_N2 reaction as it involves inversion of configuration

Q. 123 On heating $Pb(NO_3)_2$ a brown gas is envolved which undergoes dimerization on cooling. Identify the gas.

Solution:
NO_2 (nitrogen dioxide) is evolved on heating $Pb(NO_3)_2$.

Q. 124 (a) Calculate E°_{cell} for the following reaction at 298K:

$$2Al(s) + 3Cu^{2+}(0.001M) \rightarrow 2Al^{3+}(0.01M) + 3Cu(s)$$

Given: $E_{cell} = 1.98V$

(b) Using the E° values of A and B, predict which is better for coating the surface iron $\left[E^\circ\left(Fe^{2+}/Fe\right) = -0.44V\right]$ to prevent corrosion and why?

Given : $\left[E^\circ\left(A^{2+}/A\right) = -2.37V\right]; \left[E^\circ\left(B^{2+}/B\right) = -0.14V\right]$

Solution:
(a)

E°_{cell} = ?

$$2Al(s) + 3Cu^{2+}(0.001M) \rightarrow 2Al^{3+}(0.01M) + 3Cu(s)$$

$E_{cell} = 1.98V$

Cell $Al\left|Al^{3+}(0.01M)\right|\left|Cu^{2+}(0.01M)\right|Cu$

Anode - $\left(Al(s) \rightarrow Al^{3+}(aq) + 3e^-\right) \times 2$

Cathode - $\left(Cu^{2+}(aq) + 2e^- \rightarrow Cu(s)\right) \times 3$

n = 6

$$E_{cell} = E^\circ_{cell} - \frac{0.0591}{n}\log\frac{[Al^{3+}]^2}{[Cu^{2+}]^3}$$

$$E^\circ_{cell} = 1.98 + \frac{0.0591}{6}\log\frac{(0.01)^2}{(0.01)^3}$$

$$E^\circ_{cell} = 1.98 + \frac{0.0591}{6}\log 10^2$$

$$E^{\circ}_{cell} = 1.98 + \frac{0.0591 \times 2}{6}$$

$$E^{\circ}_{cell} = 1.9997V$$

(b)

$$E^{\circ}\left(A^{2+}/A\right) = -2.37V$$

$$E^{\circ}\left(B^{2+}/B\right) = -0.14V$$

$$E^{\circ}\left(Fe^{2+}/Fe\right) = -0.44V$$

A is better for coating the surface of iron to prevent corrosion takes place when iron is oxidised therefore to prevent it element A with higher oxidation potential will oxidise faster.

Q. 125 (a) The conductivity of 0.001 mol L^{-1} solution CH_3COOH is $3.905 \times 10^{-5} Scm^{-1}$. Calculate its molar conductivity and degree of dissociation $(\propto)$.

Given : $\lambda^{\circ}(H^+) = 349.6 Scm^2 mol^{-1}$ and $\lambda^{\circ}(CH_3COO^-) = 40.9 Scm^2 mol^{-1}$

(b) Define electrochemical cell. What happens if the external potential applied becomes greater than E°_{cell} of electrochemical cell?

Solution:
(a)

$$\lambda^{\circ}(H^+) = 349.6 Scm^2 mol^{-1}$$

$$\lambda^{\circ}(CH_3COO^-) = 40.9 Scm^2 mol^{-1}$$

$$K\,(CH_3COOH) = 3.905 \times 10^{-5} Scm^{-1}$$

$$\propto = ?$$

$$\Lambda_m = ?$$

$$c = 0.001 mol L^{-1} = 0.001 mo; cm^{-3}$$

$$\Lambda_m = \frac{K \times 1000}{c}$$

$$\Lambda_m = \frac{3.905 \times 10^{-5} \times 10^3}{0.001}$$

$$\Lambda_m = 3.905 \times 10^{-5+3-3} = 3.905 \times 10$$

$$\Lambda_m = 39.05 Scm^2 mol^{-1}$$

$$\propto = \frac{\Lambda_m}{\Lambda^{\circ}_m} = \frac{39.05}{349.6 + 40.9} = 0.1$$

(b)

Electrochemical cell is a device which converts chemical energy of an indirect redox reaction into electrical energy. It is formed by two redox couples.

If the external potential applied becomes greater than E°_{cell} of the electrochemical cell the reaction gets reversed along with the flow of currents.

Q. 126 (a) Write the chemical reaction involved in Wolff - Kishner reduction.

(b) Arrange the following in the increasing order of their reactivity towards nucleophile addition reaction:

$$C_6H_5COCH_3, CH_3-CHO, CH_3COCH_3$$

(c) Why carboxylic acid does not give reactions of carbonyl group?

(d) Write the product of the following reaction

$$CH_3CH_2CH=CH-CH_2CN \xrightarrow[2.H_2O]{1.(i-Bu)_2AlH}$$

(e) A and B are two functional isomers of compound C_3H_6O. On heating with NaOH and I_2, isomer B forms yellow precipitate. Write the formulae of A and B.

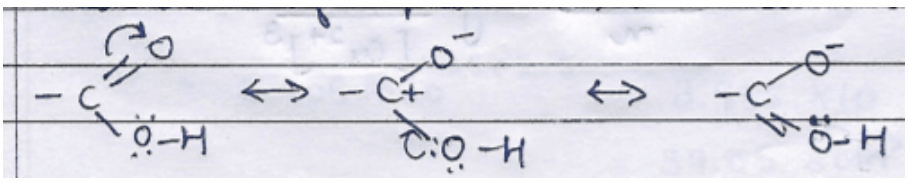
Solution:

(a) Woff - Kishner Reaction

$$CH_3CH_2CHO+H_2N-NH_2 \overset{H^+}{\rightarrow} CH_3CH_2CH+N-NH_2 \xrightarrow[\Delta,KOH]{453-473K} CH_3-CH_2-CH_3+N_2$$

(b) $C_6H_5COCH_3 < CH_3COCH_3 < CH_3-CHO$

(c) Carboxylic acid does not give the reactions of carbonyl group because carboxylic carbon is less electrophilic than carbonyl carbon because of possible resonance structures.



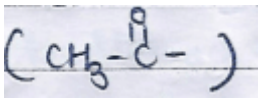
(d) $$CH_3CH_2CH=CH-CH_2CN \xrightarrow[2.H_2O]{1.(i-Bu)_2AlH} CH_3CH_2CH=CH-CH_2-CHO$$

(e) C_3H_6O

A and B are functional isomers

$$B \xrightarrow[+I_2]{\Delta,NAOH} CHI_3 \downarrow$$

$$A \xrightarrow[+I_2]{\Delta, NAOH} Noppt$$

For Iodoform reaction, B should be methylketone 

Therefore, B is $CH_3 - CO - CH_3$.

And A is functional isomer of B and does not give iodoform reaction formula of A is CH_3CH_2CHO

Q. 127 (a) Account for the following:

(i) Mn shows the highest oxidation state of +7 with oxygen but with fluorine it shows the highest oxidation state of +4.

(ii) Cr^{2+} is strong reducing agent.

(iii) Cu^{2+} salts are coloured while Zn^{2+} salts are white.

(b) Complete the following equations:

(i) $2MnO_2 + 4KOH + O_2 \xrightarrow{\Delta}$

(ii) $Cr_2O_7^{2-} + 14H^+ + 6I^- \rightarrow$

Solution:

(a)

(i) Mn shows the highest oxidation state of +7 with oxygen but with flourine it shows the highest oxidation state of +4 because of ability of oxygen to form multiple bonds with transction metals $(d\pi - p\pi)$ but fluorine cannot do so.

(ii) Cr^{2+} is a strong reducing agent because Cr^{3+} is more stable than Cr^{2+} due to extra stable half filled t_2g level in Cr^{3+}. Cr^{2+} gets oxidised easily to Cr^{3+}.

(iii) Cu^{2+} salts has unpaired electrons in its 3rd orbital hence Cu^{2+} are coloured ($3d^9$). Whereas Zn^{2+} has all paried electrons ($3d^{10}$) which is why Zn^{2+} salts are white.

(b)

(i) $2MnO_2 + 4KOH + O_2 \xrightarrow{\Delta} 2K_2MNO_4 + 2H_2O$

(ii) $Cr_2O_7^{2-} + 14H^+ + 6I^- \rightarrow 2Cr^{3+} + 3I_2 + 7H_2O$

Q. 128 The elements of 3d transition seires are given as:

Sc Ti V Cr Mn Fe Co Ni Cu Zn

Answer the following:

(i) Write the elements which shows the maximum number of oxidation states. Give reason.

(ii) Which element has highest m.p?

(iii) Which element shows only +3 oxidation state?

(iv) Which element is a strong oxidizing agent in +3 oxidation state and why?

Solution:
(i) Mn with atomic no. 25 shows maximum number of oxidation states(+2 to +7) due to its configuration $3d^5 4s^2$, it contains 5 unpaired electrons.

(ii) Vanadium (V) , Atomic no. - 25

(iii) Scandium (Sc), Atomic no. - 21

(iv) Fe^{3+} is a strong oxidising agent, as it readily accepts as electron to form Fe^{2+} as it has extra stable half filled configuration ($3d^5$)

Q. 129 For the first order thermal decomposition reaction, the following data were obtained :

$$C_2H_5Cl(g) \rightarrow C_2H_4(g) + HCl(g)$$

Time/sec	Total pressure/atm
0	0.32
300	0.50

Calculate the rate constant

(Given: log 2 = 0.301, log 3= 0.4771, log 4 = 0.6021)

Solution:
$$C_2H_5Cl(g) \rightarrow C_2H_4(g) + HCl(g)$$

K = ?

Time/sec	Total pressure/atm
0	0.32
300	0.50

$$K = \frac{2.303}{t} \log \frac{P_0}{2P_0 - P_t}$$

$$K = \frac{2.303}{300} \log \frac{0.30}{2(0.30) - 0.50}$$

$$K = \frac{2.303}{300} \log \frac{0.30}{0.10}$$

$$K = \frac{2.303}{300} \log 3$$

$$K = \frac{2.303}{300} \times 0.4771$$

$$K = 0.0036 s^{-1}$$

Q. 130 Define the following terms:

(i) Lyophilic colloid

(ii) Zeta potential

(iii) Associated colloids

Solution:
(i) Lyophilic colloid are these in which particles of dispersed phase have attraction for particles of dispersed phase have attraction for particles of dispersion medium.

Example - Salts of starch, proteins

(ii) Zeta potential or the electrokinetic potential is the potential difference between the fixed layer (first layer of ions which is firmly held) and the diffused layer of opposite charges (second layer is mobile).

(iii) Associated colloids or micelles are substances which act as electrolytes at ion concentration but at high concentration associate with each other to form particles having size in colloidal range. Example - soaps.

Q. 131 (i) Name the method of refining nickel.

(ii) What is the role of cryolite in the extraction of aluminium?

(iii) What is the role of limestone in the extraction of iron from its oxides?

Solution:
(1) Mond process is used for refining of nickel.

(2) Cryolite (Na_3AlF_6) is a solvent that decreases the melting point of alumina and increases its conductivity.

(3) Limestone ($CaCO_3$) is mixed with oxides of iron, after concentration through calcimation/roasting to remove water, to decompose carbonates and to oxidise sulphides.

Q. 132 Calculate the boiling point of solution when 4g of $MgSO_4$ (Mg = 120 g mol^{-1}) was dissolved in 100g of water, assuming $MgSO_4$ undergoes complete ionization.

(k_B for water = 0.52 K kg mol^{-1})

Solution:

k_B for water = 0.52 K kg mol^{-1}

M = 120 g mol-1

Mass of solute = $MgSO_4$ = 4g

Mass of solvent = H_2O = 100g

Complete ionization of $MgSO_4$, i=2

$T_b =$?

$\Delta T_b = T_b - T_b^\circ$

$T_b^\circ = 373.15K$

$\Delta T_b = iK_bm$

$m = \frac{4}{120} \times \frac{1000}{100} = \frac{1}{3}$

$\Delta T_b = 2 \times 0.52 \times \frac{1}{3}$

$\Delta T_b = 0.347K$

$T_b = \Delta T_b + T_b^\circ$

$T_b = 0.34 + 373.15$

$T_b = 378.49K$

Q. 133 Give reasons:

(i) SO_2 is reducing while TeO_2 is an oxidizing agent.

(ii) Nitrogen does not form pentahaldie.

(iii) ICl is more reactive than I_2

Solution:

(i) In SO_2 and TeO_2 both S and Te have +4 oxidation state but S has d orbital so it can easily expand its oxidation state but Te being a heavier element is unstable due to inert pair effect, it can only show a decrease in its oxidation state.

(ii) N doesn't form pentahalide due to absence of Valant d-orbitals, it cannot expand its octet and thus cannot show a coordination number beyond 4.

(iii) Ice is more reactive than I_2 because I- Cl bond is weaker than I-I bond due to less effective overlapping between orbitals of dissimilar atoms than those between similar atoms.

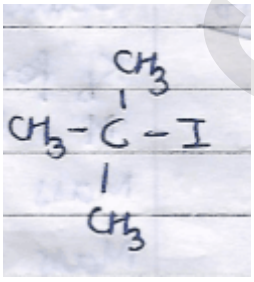
Q. 134 Write the final product (s) in each of the following reaction:

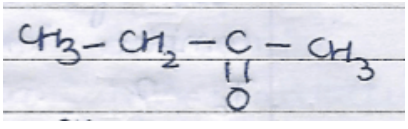
(a) $CH_3-\underset{\displaystyle CH_3}{\overset{\displaystyle CH_3}{\overset{|}{\underset{|}{C}}}}-O-CH_3+HI \rightarrow$

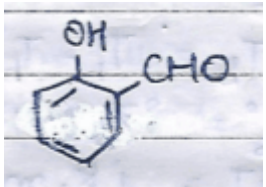
(b) $CH_3-CH_2-\underset{\displaystyle OH}{\overset{}{\underset{|}{CH}}}-CH_3 \xrightarrow{Cu/573K}$

(c) $C_6H_5OH \xrightarrow[(ii)H+]{(i)CHCl_3+aq.NaOH}$

Solution:

(a) $CH_3-\underset{\displaystyle CH_3}{\overset{\displaystyle CH_3}{\overset{|}{\underset{|}{C}}}}-O-CH_3+HI \rightarrow CH_3OH+$ 

(b) $CH_3-CH_2-\underset{\displaystyle OH}{\overset{}{\underset{|}{CH}}}-CH_3 \xrightarrow{Cu/573K}$ 

(c) $C_6H_5OH \xrightarrow[(ii)H+]{(i)CHCl_3+aq.NaOH}$ 

Q. 135 Give reasons for the following:

(i) Aniline does not undergo Friedal - Crafts reaction.

(ii) $(CH_3)_2NH$ is more basic than $(CH_3)_3N$ in an aqueous solution.

(iii) Primary amines have higher boiling point than tertiary amines.

Solution:
(i) Aniline doesn't undergo Friedal-crafts reaction due to salt formation with aluminium chloride. Due to this, N of aniline acquires positive charge and hence acts as a strong deactivating group for further reaction.

(ii) $(CH_3)_2NH$ in aqueous solution is more basic than $(CH_3)_3N$. This is based on the extent of solvation through H-bonding hence is based on the stability of conjugate acid.

(iii) 1° amine has higher boiling point than 3° amine because primary amines are associated to each other through H - bonding due to presence of 2 N - H bonds.

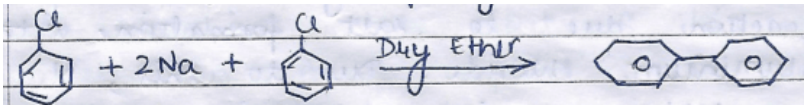
Q. 136 How do you convert:

(i) Chlorobenzene to biphenyl

(ii) Propene to 1- iodopropane

(iii) 2-bromobutane to but-2-ene

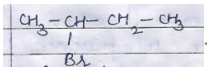
Solution:
(i) Chlorobenzene to biphenyl



(ii) Propene to 1- iodopropane

$$CH_3CH=CH_2+HBr \overset{Peroxide}{\rightarrow} CH_3CH_2CH_2Br+NaI \overset{Acetone}{\rightarrow} CH_3CH_2CH_2I+NaBr\downarrow$$

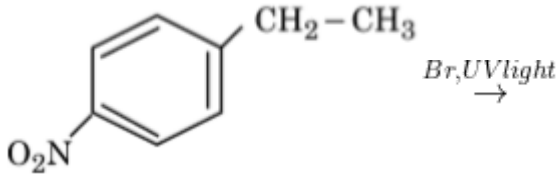
(iii) 2-bromobutane to but-2-ene

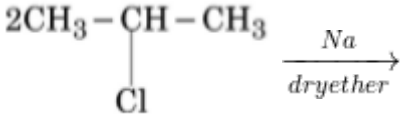


$$+KOH \overset{ethanol}{\rightarrow} CH_3-CH=CH-CH_3$$

2-Bromobutane But-2-ene

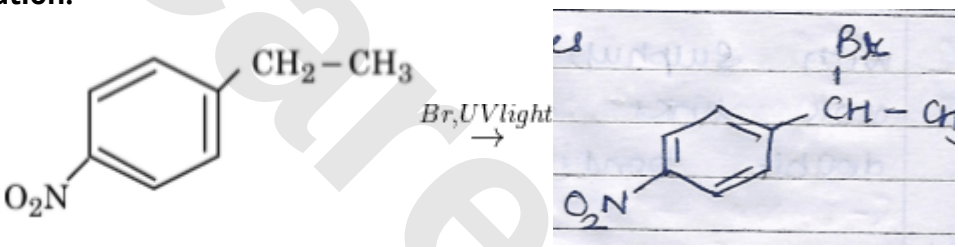
Q. 137 Write the major product(s) in the following:

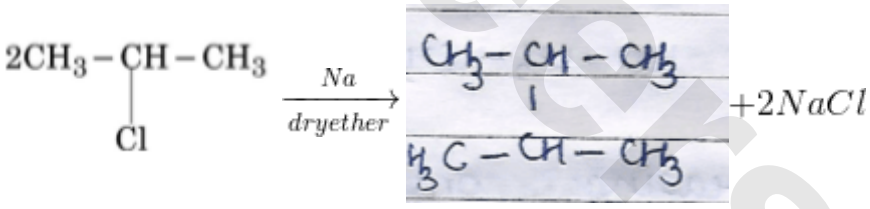
(i) 

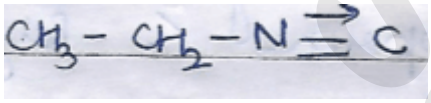
(ii) 

(iii) $CH_3 - CH_2 - Br \xrightarrow{AgCN}$

Solution:

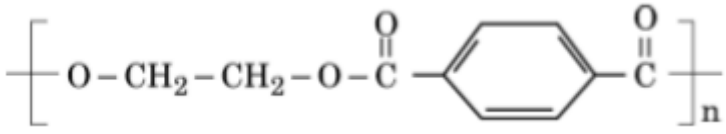
(i) 

(ii) 

(iii) $CH_3 - CH_2 - Br \xrightarrow{AgCN}$  +AgBr

Q. 138 (i) What is the role of Sulphur in the vulcanization of rubber?

(ii) Identify the monomers in the following polymer:

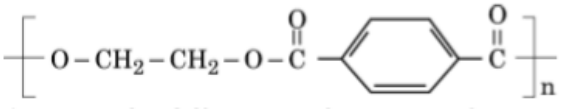


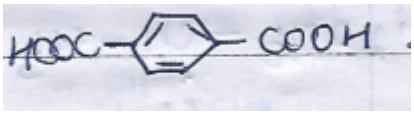
(iii) Arrange the following polymer in the increasing order of their intermolecular forces:

Terylene, Polythene, Neoprene

Solution:

(i) Vulcanization of rubber consists of heating a mixture of raw rubber with sulphur. On vulcanization, sulphur forms cross links at the reactive sites of double bonds and thus gets stiffened.

(ii) Monomer of 

are $HO-CH_2CH_2-OH$ and 

(iii) increasing order of their intermolecular forces -

Neoprene<Polythene< Terylene

Q. 139 (i) Write the structural difference between starch and cellulose.

(ii) What type of linkage is present in Nuclei acids?

(iii) Give one example each for fibrous protein and globular protein.

Solution:
(i) Starch is polysaccride which is a linear polymer of $\alpha - D - glucose$ units joined together by glycosidie linkage.

Whereas cellulose is polysaccride which is a linear polymer $\beta - D - glucose$ in which C_1 of one glucose unit and C_4 of next are linked by glucoside linkage.

(ii) Phosphodiester linkage is present in nuclei acids.

(iii) Examples:

Fibrous proteins - mysoin (in muscle)

Globular protein - insulin

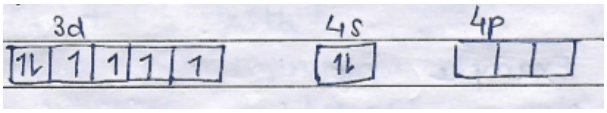
Q. 140 (a) For the complex $[Fe\,(H_2O_6)]^{3+}$, write the hybridization, magnetic character and spin of complex.(At. no. - Fe =26)

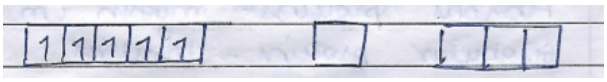
(b) Draw one of the geometrical isomers of the complex $[Pt\,(en)_2\,Cl_2]^{2+}$ which is optically inactive.

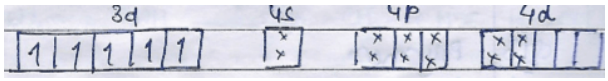
Solution:
(i) Coordination compounds

$[Fe\,(H_2O_6)]^{3+}$

At.no. Fe = 26

Fe(26) =  $3d^6 4s^2$

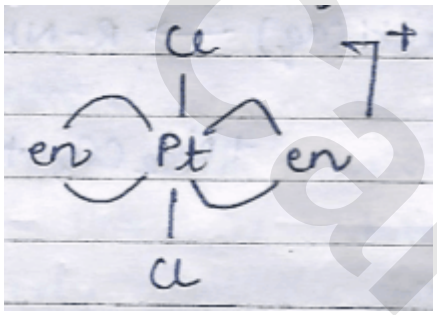
Fe(+3) =  $3d^5$

$[Fe\ (H_2O_6)]^{3+}$= 

Hybridisation - sp^3d^2

Paramagnetic, high spin

(b) $[Pt\ (en)_2\ Cl_2]^{2+}$



Trans-isomer is optically inactive.

Q. 141 For a reaction : $H_2 + Cl \overset{hv}{\rightarrow} 2HCl$

Rate = k

(i) Write the order and molecularity of this reaction.

(ii) Write the unit of k.

Solution:

$H_2 + Cl \overset{hv}{\rightarrow} 2HCl$

Rate = k

(i) Order = 0 (Rate is independent of concentration)

molecularity = 2

(ii) Unit of K = $molL^{-1}s^{-1}$

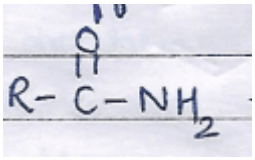
Q. 142 Write the chemical equations involved in the following reactions:

(i) Hoffmann - bromamide degradation reaction

(ii) Carbylamine reaction

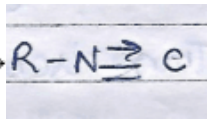
Solution:

Hoffmann- bromamide degradation reaction



$$+Br_2 + 4NaOH(aq) \rightarrow R - NH_2 + 2NaBr + Na_2CO_3 + H_2O$$

Carbylamine reaction

$$R - NH_2 + CHCl_3 + 3KOH \rightarrow$$  $$+3KCl + H_2O$$

Q. 143 Write the structures of the following:

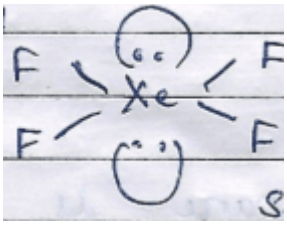
(i) BrF_3 (ii) XeF_4

Solution:

(i) BrF_3

Bent - T shaped

(ii) XeF_4



Square Planar

Q. 144 What happens when:

(i) SO_2 gas is passed through an aqueous solution Fe^{3+} salt?

(ii) XeF_4 reacts with SbF_5?

Solution:

(i) SO_2 behaves as a reducing agent, it converts Fe (III) to Fe (II).

(ii) When XeF_4 reacts with SbF_5,

$[XeF_3]^+ [SbF_6]^-$ is formed

Q. 145 (i) Gas A is more soluble in water than Gas B at the same temperature. Which one of the two gases will have higher value of K_H (Henry's constant) and why?

(ii) In non - ideal solution, what type of deviation shows the formation of maximum boiling azeotropes?

Solution:
(i) Gas B will have higher values of K_H .This is because K_H varies inversely with mole fraction which increases with solubility.

(ii) Negative deviations shows the formation of maximum boiling azeotrophs.

Q. 146 When coordination compound $CoCl_3.6NH_3$ is mixed with $AgNo_3$. 3moles of AgCl are precipiatated per mole of the compound. Write.

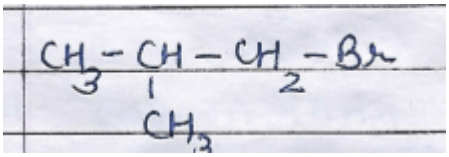
(i) Structural formula of the complex

(ii) IUPAC name of the complex.

Solution:
(i) $[Co\,(NH_3)_6]\,Cl_3$

(ii) Hexaammine cobalt (III) chloride

Q. 147 Write the structure of an isomer of compound C_4H_9Br which is most reactive towards S_N1 reaction.

Solution:


1-Bromo-2-methylpropane is the isomer of C_4H_9Br which is most reactive towards S_N1 reaction because of greater electron donating effect of $(CH_3)_2CH-group$.

Q. 148 $Pb(NO_3)_2$ on heating gives brown gas which undergoes dimerization on cooling? Identify the gas.

Solution:
NO_2 (Nitrogen dioxide)

Q. 149 Give an example each of molecular soild and ionic soild.

Solution:
Molecular soild - Diamond

Ionic soild - Sodium chloride (NaCl)

Q. 150 What is the reason for the stability of colloidal sols?

Solution:
Stability of the colloidal sols is due to the presence of equal and similar charges on colloidal particles. They do not combine to form large particles when they come closer to one another due to replusive forces between charged particles.

Q. 151 (a) Write the structures of A and B in the following reactions:

(i) $CH_3COCl \overset{H_2,Pd-BaSO_4}{\rightarrow} A \overset{H_2N-OH}{\rightarrow} B$

(ii) $CH_3MgBr \xrightarrow[2H_3O^+]{1.CO_2} A \overset{PCl_5}{\rightarrow} B$

(b) Distinguish between:

(i) $C_6H_5-COCH_3$ and C_6H_5-CHO

(ii) CH_3COOH and $HCOOH$

(c) Arrange the following in the increasing order of their boiling points:

$$CH_3CHO, CH_3COOH, CH_3CH_2OH$$

Solution:
(a)

(i) $CH_3COCl \overset{H_2,Pd-BaSO_4}{\rightarrow} CH_3CHO \overset{H_2N-OH}{\rightarrow} CH_3CH=N-OH$

(ii) $CH_3MgBr \xrightarrow[2H_3O^+]{1.CO_2} CH_3COOH \overset{PCl_5}{\rightarrow} CH_3-CO-Cl$

(b)

(i) $C_6H_5-COCH_3$ and C_6H_5-CHO

C_6H_5-CHO being an aldehyde reduces Tollen's reagent and a bright sliver mirror is produced.

$$C_6H_5-CHO+2\left[Ag(NH_3)_2\right]^+ + 3OH^- \rightarrow C_6H_5COO^- + 2Ag + 2H_2O + 4NH_3$$

But $C_6H_5-COCH_3$ being a ketone does not react with Tollen's reagent.

(ii) CH_3COOH and $HCOOH$

$HCOOH$ (formic acid) is the only carboxylic acid that reduces Tollen's reagent to shiny silver mirror but CH_3COOH (acetic acid) does not give this test.

$$HCOOH + 2\left[Ag(NH_3)_2\right]^+ + 3OH^- \rightarrow CO_2 + 2Ag + 3H_2O + 4NH_3$$

(c) Increasing order of boiling points

$$CH_3CHO < CH_3CH_2OH < CH_3COOH$$

Q. 152 What type of stoichiometric defect is shown by ZnS?

Solution:
Stoichiometric defect shown by ZnS is Fenkel defect.

Q. 153 What are emulsions ? Give one example.

Solution:
Emulsions are colloidal solutions in which both the dispersed phase and dispersion medium are liquids.

Example: milk, butter.

Q. 154 What happens when phenol is oxidized by $\mathrm{Na_2Cr_2O_7/H_2SO_4}$?

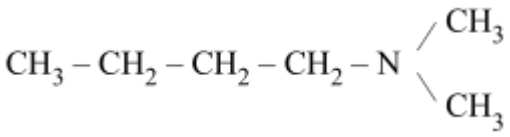
Solution:
Benzoquinone is formed when phenol is oxidized by $\mathrm{Na_2Cr_2O_7/H_2SO_4}$.

Q. 155 Write IUPAC name of the complex : $\left[\mathrm{CoCl_2(en)_2}\right]^+$

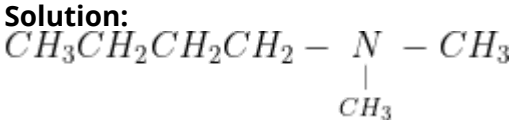
Solution:
$\left[\mathrm{CoCl_2(en)_2}\right]^+$

Docloridobis-(ethane-1,2-diene)cobalt(III)

Q. 156 Write IUPAC name of the following compound :



Solution:



N,N-Dimethylbutylamine

Q. 157 Following reactions can occur at cathode during the electrolysis of aqueous silver nitrate solution using Pt electrodes :

$$\mathrm{Ag^+_{(aq)} + e^- \longrightarrow Ag_{(s)}; E^\circ = 0.80V}$$

$$\mathrm{H^+_{(aq)} + e^- \longrightarrow \frac{1}{2}H_{2(g)}; E^\circ = 0.00V}$$

On the basis of their standard electrode potential values, which reaction is feasible at cathode and why?

Solution:

$$(I)\ \mathrm{Ag^+_{(aq)} + e^- \longrightarrow Ag_{(s)}; E^\circ = 0.80V}$$

$$(II)\ \mathrm{H^+_{(aq)} + e^- \longrightarrow \frac{1}{2}H_{2(g)}; E^\circ = 0.00V}$$

I reaction is feasible at cathode because higher the E^o value, more is the capacity to get reduced.

Q. 158 "Orthophosphoric acid (H_3PO_4) is not a reducing agent whereas hypophosphorous acid (H_3PO_2) is a strong reducing agent." Explain and justify the above statement with the help of a suitable example.

Solution:

H_3PO_4 is not a reducing agent but H_3PO_2 is a strong reducing agent as it has 2 H-atoms directly bonded to P atom which imparts reducing character whereas H_3PO_4 does not contain P-H bond.

Example:

$$4AgNO_3 + 2H_2O + H_3PO_2 \rightarrow 4Ag + H_3PO_4 + 4HNO_3$$

Q. 159 (a) Explain why H_2 and O_2 do not react at room temperature.
(b) Write the rate equation for the reaction $A_2 + 3B_2 \longrightarrow 2C$, if the overall order of the reaction is zero.

Solution:
(a) H_2 and O_2 do not react at room temperature because required activation energy is not available despite having negative ΔG.

(b) $A_2 + 3B_2 \longrightarrow 2C$

order = 0

Rate equation = $R = k[A]^0[B]^0$

$$R = k$$

Q. 160 Derive integrated rate equation for rate constant of a first order reaction.

Solution:
$R \rightarrow P$ [First order reaction]

$[R_0] = \text{initial concentrationn at t} = 0$

$[R] = \text{remaining concentrationn at t} = \text{t}$

$$\frac{-d[R]}{dt} = k[R]^1$$

$$\frac{-d[R]}{[R]} = kdt$$

Integrating, $\int \frac{-d[R]}{[R]} = \int kdt$

$$-\log_e[R] = kt + I \quad -(1)$$

At $t = 0, [R] = [R_0]$

$$-\log_e[R_0] = k(0) + I$$

$$I = -\log_e[R_0]$$

In (1), $-\log_e[R] = kt - \log_e[R_0]$

$$kt = \log_e[R_0] - \log_e[R]$$

$$k = \frac{1}{t}\log_e\frac{[R_0]}{[R]}$$

$$k = \frac{2.303}{t} \log_{10} \frac{[R_0]}{[R]}$$

Q. 161 Explain the following observations :

(i) Copper atom has completely filled d orbitals ($3d^{10}$) in its ground state, yet it is regarded as a transition element.

(ii) Cr^{2+} is a stronger reducing agent than Fe^{2+} in aqueous solutions.

Solution:

(i) Copper has $3d^{10}$ configuration in the ground state yet it is regarded as transition element since it shows +2 oxidation state in many compounds and contains unpaired electrons in +2 oxidation state ($3d^9$)

(ii) Cr^{2+} is a strong reducing agent than Fe^{2+} in aqueous solution since $E^0_{Cr^{2+}/Cr}$ is lower than $E^0_{Fe^{2+}/Fe}$, therefore Cr^{2+} is easily oxidized than Fe^{2+}.

Q. 162 How will you carry out the following conversions :

(i) 2-Bromopropane to 1-bromopropane

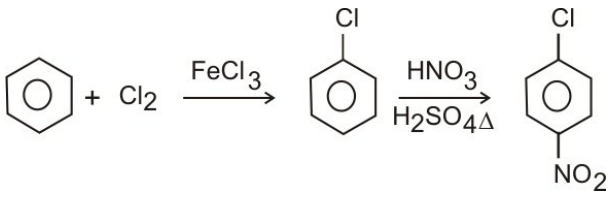
(ii) Benzene to p-chloronitrobenzene

Solution:

(i) 2-Bromopropane to 1-bromopropane

$$CH_3\underset{\underset{Br}{|}}{C}HCH_3 + alcKOH \xrightarrow{\Delta} CH_3-CH=CH_2 \xrightarrow{HBr/Peroxide} CH_3CH_2CH_2Br$$

(ii) Benzene to p-chloronitrobenzene



Q. 163 An element exists in bcc lattice with a cell edge of 288 pm. Calculate its molar mass if its density is 7.2 g/cm^3.

Solution:

Edge = 288 pm

molar mass = ?

Density = 7.2 g/cm^3

bcc, z = 2

$$M = \frac{d \times N_A \times V}{z}$$

$$V = (a)^3 = (2.88pm)^3$$

$$= (2.88 \times 10^{-10})^3$$

$$M = \frac{7.2 \times 6.022 \times 10^{23} \times (288 \times 10^{-10})^3}{2}$$

$$= 51.7869 g/mol$$

Q. 164 Calculate $\Delta_r G^o$ and $\log K_c$ for the following reaction at 298 K.

$$2Cr_{(s)} + 3Cd^{2+}_{(aq)} \rightarrow 2Cr^{3+}_{(aq)} + 3Cd_{(s)}$$

[Given: $E^o_{cell} = +0.34V, IF = 96500\ C\ mol^{-1}$]

Solution:

$$2Cr_{(s)} + 3Cd^{2+}_{(aq)} \rightarrow 2Cr^{3+}_{(aq)} + 3Cd_{(s)}$$

$$E^o_{cell} = +0.34V, IF = 96500\ C\ mol^{-1}$$

$$\Delta_r G^o = ? \quad \log K_c = ?$$

$$n = 6$$

$$\Delta_r G^o = -nFE^o_{cell}$$

$$= -6 \times 96500 \times 0.34$$

$$= -196860 J/mol$$

$$\Delta_r G^o = -2.303RT \log K_c$$

$$\log K_c = \frac{\Delta_r G^o}{-2.303RT}$$

$$= \frac{-196860}{-2.303 \times 8.314 \times 298}$$

$$= 34.501$$

Q. 165 For a first order reaction, show that time required for 99% completion is twice the time required for completion of 90% reaction.

Solution:

For a 1st order reaction

$$t = \frac{2.303}{k} \log \frac{[R]_o}{[R]_o - [R]}$$

$$t_{99\%} = \frac{2.303}{k} \log \frac{[R]_o}{[R]_o - 0.99[R]}$$

$$t_{99\%} = \frac{2.303}{k} \log 100$$

$$t_{99\%} = \frac{2.303}{k} \times 2 \log 10 \quad -(1)$$

$$t_{90\%} = \frac{2.303}{k} \log \frac{[R]_o}{[R]_o - 0.90[R]}$$

$$t_{90\%} = \frac{2.303}{k} \log 10 \quad -(2)$$

Dividing (1) by (2)

$$\frac{t_{99\%}}{t_{90\%}} = 2$$

$$t_{99\%} = 2t_{90\%}$$

Q. 166 Explain the following phenomenon giving reasons :

(i) Tyndall effect

(ii) Brownian movement

(iii) Physical adsorption decreases with an increase in temperature.

Solution:

(i) Tyndal Effect is the phenomenon in which the path of light becomes visible when it is passed through a colloidal solution. It occurs due to the scattering of light by large colloidal particles.

(ii) Brownian movement refers to the zig-zag motion of colloidal particles. It occurs due to the unbalanced bombardment of particles by molecules of the dispersion medium.

(iii) Physical adsorption decreases with an increase in temperature because kinetic energy of the molecules increases with an increase in temperature and they overcome the force of attraction by the adsorbent surface.

Q. 167

(a) Write the principle involved in the following :

(i) Zone refining of metals

(ii) Electrolytic refining

(b) Name the metal refined by each of the following processes :

(i) Mond Process

(ii) van Arkel Method

Solution:

(a) (i) Zone refining of metals is based on the principle that the impurities are more soluble in the molten state than in solid state of the metal.

(ii) Electrolytic refining is the refining of impure metals by using electricity where they are put in a suitable electrolytic bath containing soluble salt of the same metal.

(b) (i) Nickel by Mond's Process.

(ii) Zirconium and Titanium by Von Arkel Method.

Q. 168

A mixed oxide of iron and chromium is fused with sodium carbonate in free access of air to form a yellow coloured compound (A). On acidification the compound (A) forms an orange coloured compound (B), which is a strong oxidizing agent. Identify compound (A) and (B). Write chemical reactions involved.

Solution:

$$4FeCr_2O_4 + 8Na_2CO_3 + 7O_2 \rightarrow \underset{\text{(Yellow)}}{8Na_2Cr_2O_4} + 2Fe_2O_3 + 8CO_2$$

$$A = \mathrm{N_2CrO_4}$$

$$2Na_2CrO_4 + H_2SO_4 \rightarrow \underset{\text{(orange)}}{Na_2Cr_2O_7} + Na_2SO_4 + H_2O$$

$$B = \mathrm{Na_2Cr_2O_7}$$

Q. 169

(a) Give reasons for the following :

(i) Compounds of transition elements are generally coloured.

(ii) MnO is basic while Mn_2O_7 is acidic.

(b) Calculate the magnetic moment of a divalent ion in aqueous medium if its atomic number is 26.

Solution:

(a) (i) Compounds of transition metals are generally coloured due to the presence of unpaired d electrons and d-d- transition, electrons get excited to higher energy d-orbitals which gives colour to

compounds.

(ii) MnO is basic but Mn_2O_7 is acidic because MnO, oxidation state of Mn is +2 whereas, in Mn_2O_7, Mn is in +7 oxidation state. Lower oxidation state oxides being ionic produce oxide ions which in turn gives OH^- ions, but higher oxides are covalent and it can accept electrons.

(b) Mn^{2+} ion $= [Ar]^{18}3d^6$ At. no $= 26$

Magnetic moment $= \sqrt{4(4+2)} = \sqrt{24} = 4.89$ BM

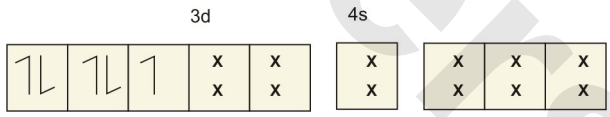
Q. 170 For the complex ion $[Fe(en)_2Cl_2]^+$ write the hybridization type and magnetic behaviour. Draw one of the geometrical isomer of the complex ion which is optically active. [Atomic No. : Fe = 26]

Solution:

$[Fe(en)_2Cl_2]^+$

$Fe(26) =$ 

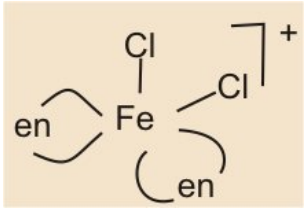
$Fe(+3) =$ 

$[Fe(en)_2Cl_2] =$ 

Hybridization d^2sp^3

paramagnetic

cis isomer is optically active



Q. 171 (a) Account for the following :

(i) Electrophilic substitution reactions in haloarenes occur slowly.

(ii) Haloalkanes, though polar, are insoluble in water.

(b) Arrange the following compounds in increasing order of reactivity towards S_N2 displacement :

2–Bromo–2–Methylbutane, 1–Bromopentane, 2–Bromopentane

Solution:

(a) (i) Electrophilic substitution reaction in haloarenes occur slowly because halogen has a negative inductive effect, it decreases the electron density on the benzene ring due to resonance.

(ii) Haloalkanes, though polar, are insoluble in water since they can neither form nor break the Hydrogen-bonds already existing in the water.

(b) 2–Bromo–2–Methylbutane < 2–Bromopentane < 1–Bromopentane

Q. 172 (a) Why phenol is more acidic than ethanol?

(b) Write the mechanism of acid dehydration of ethanol to yield ether :

$$2CH_3CH_2OH \xrightarrow[413K]{H^+} CH_3CH_2OCH_2CH_3$$

Solution:

(a) Phenol is non-acidic than ethanol because

- In phenol, due to resonance oxygen atom of OH bond becomes electron deficient which makes the release of H+ easier
- Stronger acid has a more stable conjugate base. Phenoxide ion is resonance stabilized but ethanoxide ion is not.

(b) Mechanism of acid dehydration of ethanol to yield ether

$$2CH_3CH_2OH \xrightarrow[413K]{H^+} CH_3CH_2OCH_2CH_3$$

Step I Protonation

$$CH_3CH_2 - \ddot{O}H + H^+ \rightarrow CH_3CH_2 - \overset{+}{\ddot{O}}H_2$$

Step II Nucleophilic sttack of alcohol on protonated alcohol

Step III Deprotonation

$$CH_3CH_2 - \underset{\underset{H}{|}}{\ddot{O}} - CH_2CH_3 \xrightarrow{-H^+} CH_3CH_2\ddot{O}CH_2CH_3$$

Q. 173 Identify A, B and C in the following reactions :

(i)

$$CH_3CH_2Cl \xrightarrow{KCN} A \xrightarrow{H_2Ni} B \xrightarrow{CH_3COCl/Base} C$$

(ii)

$$C_6H_5N_2^+Cl^- \xrightarrow{HBF_4} A \xrightarrow[\Delta]{NaNO_2/Cu} B \xrightarrow{Sn/HCl} C$$

Solution:

$$\underset{}{CH_3CH_2Cl} \xrightarrow{KCN} \underset{(A)}{CH_3CH_2CN} \xrightarrow{H_2Ni} \underset{(B)}{CH_3CH_2CH_2NH_2} \xrightarrow{CH_3COCl/Base} \underset{(C)}{CH_3CH_2CH_2-NH\overset{\overset{O}{\|}}{C}-CH_3}$$

$$C_6H_5N_2^+Cl^- \xrightarrow{HBF_4} \underset{(A)}{C_6H_5N_2^+BF_4^-} \xrightarrow[\Delta]{NaNO_2/Cu} \underset{(B)}{C_6H_5NO_2} \xrightarrow{Sn/HCl} \underset{(C)}{C_6H_5NH_2}$$

Q. 174 (a) Why water soluble vitamins must be supplied regularly in the diet ? Give one example of it.

(b) Differentiate between the following :

(i) Essential and non-essential amino acids.

(ii) Fibrous and globular proteins.

Solution:

(a) Water soluble vitamin must be supplied regularly in diest because they are readily excreted in urine and cannot be stored. Example: Vitamin C.

(b) (i) Essential amino acids are those which are not synthesized in our body and hence must be supplied in our diet from outside. Example: Lysine.

Non-essential an=mino acids are those which can be made in our bodies and therefore we don't require them in our diet. The human body can synthesize 10 out od 29 amino acids found in proteins. Example: Glycine

(ii) Fibrous Proteins - When the polypeptide chains run parallel and held together by H-bonds or disulphide bonds, then fibre the structure is formed. These are insoluble in water. Example: myosin.

Globular Proteins consists of polypeptide chains coiled around each other to form molecules having a nearly spherical shape. These are soluble in water. Example: Insulin.

Q. 175 (i) Name a substance which can be used as an antiseptic as well as a disinfectant.

(ii) Name an artificial sweetener whose use is limited to cold foods and drinks.

(iii) What are cationic detergents?

Solution:

(i) Phenol can be used as an antiseptic as well as a disinfectant.

(ii) Aspartic is artificial sweater whose use is limited to cold food and soft drinks

(iii) cationic detergents are a type of detergents in which the active part of the molecule is a positive ion (cation). Cationic detergents are usually quaternary ammonium salts and often also have bactericidal properties

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Q. 176

Once there was a heavy downpour for about 3 hours in the early morning. Irfan and his family were finding it difficult to carry out their daily morning chores as the sewer water was flowing back into the toilets, the road in front of their house was flooded with water and they could not move out. On this very serious problem, Irfan called a meeting of all the residents. In the meeting, Irfan discussed the problem and said that we are using too many polythene bags and other plastic items which we throw here and there. All these moves into the drains and sewer lines which get choked and do not allow the flow of water. As these are non-biodegradable, they remain as such for a long time. So to overcome this problem, we should use bags made up of cloth or jute which are biodegradable.

Answer the following questions :

(i) Name the polymer which is biodegradable. Write the structures of monomers and the repeating unit.

(ii) Write two uses of this polymer.

(iii) Write any two values shown by Irfan.

Solution:

(i) Nylon-2Nylon-6 is a polymer which is a biodegradable structure of monomers-

$\mathrm{H_2N-CH_2-COOH}$ and $\mathrm{H_2N-(CH_2)_5-COOH}$

Repeating unit-

$$-(\mathrm{NH-CH_2-\overset{\overset{O}{\|}}{C}-NH-(CH_2)_5-\overset{\overset{O}{\|}}{C}})_n-$$

(ii) Uses of this polymer-

- It can be used in ropes
- I can be used for making waterproof tents.

(iii) Values shown by Irfan are responsibility, sustainability towards environment and awareness.

Q. 177

(a) Explain why on addition of 1 mol glucose to 1 litre water the boiling point of water increases.

(b) Henry's law constant for CO_2 in water is $1.67 \times 10^8\ \mathrm{Pa}$ at 298 K. Calculate the number of moles of CO_2 in 500 ml of soda water when packed under $2.53 \times 10^5\ \mathrm{Pa}$ at the same temperature.

Solution:

(a) On addition of 1 mol glucose to 1 litre water, the boiling point of water increases because the addition of glucose decreases the vapour pressure of solution form, hence solution has to be heated to a temperature greater than the boiling point of pure solvent so as to make its vapour pressure equal to atmospheric pressure.

(b) $K_H = 1.6710^8 \text{ Pa}$

$$P_{CO_2} = 2.53 \times 10^5 Pa$$

$$P_{CO_2} = K_H X$$

$$X = \frac{2.53 \times 10^5}{1.67 \times 10^8} = 1.5149 \times 10^{-3} = 0.0015$$

$$X = \frac{n_{CO_2}}{n_{H_2O}}$$

$$n_{H_2O} = \frac{500}{18} = 27.78 \text{ mol}$$

$$0.0015 = \frac{n_{CO_2}}{27.78}$$

$$n_{CO_2} = 0.04167$$

Quantity of CO_2 in 500 ml soda water

$$0.04167 \times 44$$

$$= 1.83348\text{g}$$

Q. 178

(a) Define the following terms :

(i) Ideal solution

(ii) Osmotic pressure.

(b) Calculate the boiling point elevation for a solution prepared by adding 10 g $CaCl_2$ to 200 g of water, assuming that $CaCl_2$ is completely dissociated. (K_b for water = 0.512 K $kgmol^{-1}$; Molar mass of $CaCl_2$ = 111 g mol^{-1})

Solution:

(a) (i) Ideal Solution is a solution of two liquids if it obeys Raoult's law in solution i.e $\mathrm{P_1 = P_1^o \chi_1;\ P_2 = P_2^o \chi_2; P_T = P_1^o \chi_1 + P_2^o \chi_2; \Delta H_{mix} = 0}$, no heat is evolved or absorbed during the formation of solution.

$\mathrm{\Delta V_{mix} = 0}$, Volume remains unchanged on mixing.

(ii) Osmotic Pressure is the extra pressure which has to be applied on the solution side so as to just stop osmosis.

(b) $\mathrm{\Delta T_b = ?} \qquad \mathrm{\Delta T_b = iK_b m}$

$K_b = 0.5.12\ K\ kg\ mol^{-1}$

Molar mass of $CaCl_2$ = 111 $gmol^{-1}$

$i = 3$ (complete dissociation)

$$m = \frac{10}{111} \times \frac{1000}{200} = 0.450$$

$$\Delta T_b = 3 \times 0.512 \times 0.450 = 0.6918K$$

Q. 179 (a) When concentrated sulphuric acid was added to an unknown salt present in a test tube a brown gas (A) was evolved. This gas intensified when copper turnings were added to this test tube. On cooling the gas (A) changed into a colourless solid (B). Identify (A) and (B). Write chemical reactions involved.

(b) Draw structure of $XeOF_4$.

Solution:

(a)

$$salt + conc H_2SO_4 \rightarrow \underset{(brown)}{A\uparrow}$$

$$A \xrightarrow{cool} \underset{colourless\ solid}{B}$$

Gas A intensifies on addition on Cu.

$A = NO_2 - Nitrogen\ dioxide\ (Brown\ gas)$

$B = N_2O_4 - (colourless\ solid)$

$$NO_3^- + H_2SO_4 \rightarrow HSO_4^- + HNO_3$$

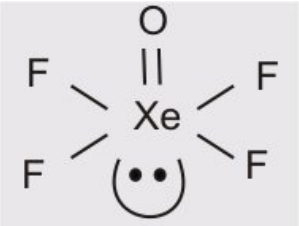
$$4HNO_3 \rightarrow NO_2\uparrow + O_2 + 2H_2O$$

$$3Cu + 8HNO_3 \rightarrow 3Cu(NO_3)_2 + 2NO\uparrow + 4H_2O$$

$$NO_2 \xrightarrow{cool} N_2O_4$$

(b)

$XeOF_4$



Q. 180 (a) Account for the following :

(i) Reducing character decreases from SO_2 to TeO_2.

(ii) $HClO_3$ is a stronger acid than HClO.

(iii) Xenon forms compound with fluorine and oxygen only.

(b) Complete the following equations :

(i) $4NaCl + MnO_2 + 4H_2SO_4 \rightarrow$

(ii) $6XeF_4 + 12H_2O \rightarrow$

Solution:

(a) (i) Reducing character decreases from SO_2 to TeO_2 since down the group with an increase in the size of the central atom there is decrease electronegativity and metallic character increase.

(ii) $HClO_3$ is a stringer acid than HClO since strength decrease with a decrease in oxidation number and the oxidation number of Cl in $HClO_3$ is +5 whereas in HClO it is +1.

(iii) Xenon forms compound only with fluorine and oxygen because of high electronegativity, fluorine and oxygen are strong oxidizing agents.

(b) (i) $4NaCl + MnO_2 + 4H_2SO_4 \rightarrow MnCl_2 + 4NaHSO_4 + 2H_2O + Cl_2$

(ii)

$$6XeF_4 + 12H_2O \rightarrow 4Xe + 2XeO_3 + 24HF + 3O_2$$

Q. 181 (a) Account for the following :

(i) Propanal is more reactive than propanone towards nucleophilic reagents.

(ii) Electrophilic substitution in benzoic acid takes place at the meta position.

(iii) Carboxylic acids do not give characteristic reactions of the carbonyl group.

(b) Give a simple chemical test to distinguish between the following pairs of compounds:

(i) Acetophenone and benzaldehyde.

(ii) Benzoic acid and ethylbenzoate.

Solution:

(a) (i) Propanal is more reactive than propanone towards nucleophile reagents because of the electron releasing effect of two alkyl groups in propanone, electrophilicity of carbonyl carbon decreases in propanone. Moreover, steric hindrance is more in propanone making nucleophile attack difficult.

(ii) Electrophilic substitution in benzoic acid takes place at m-position because -R effect there is a decrease in e^- density at o- and p- positions which deactivates the ring and directs the incoming electrophile to m-positon.

(iii) Carboxylic acid do not give the characteristic reaction of carbonyl group since in carboxylic acids due to resonance the electrophilicity of carboxyl carbon decreases.

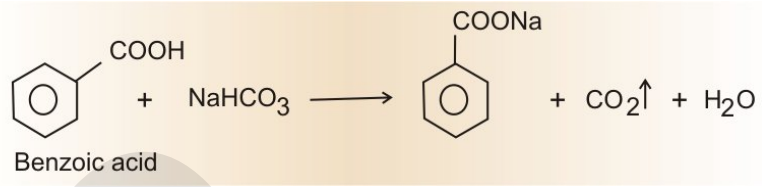
(b) (i) Acetophenone and Benzaldehyde

Benzaldehyde reduces Tollens reagent but acetophenone being a ketone does not.

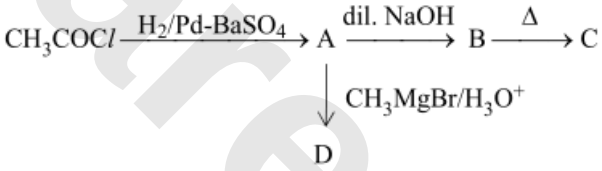
$$\underset{\text{Benzaldehyde}}{C_6H_5CHO} + 2[Ag(NH_3)_2]^+ + 3OH^- \rightarrow C_6H_5COO^- + 2Ag \downarrow + 4NH_3 + H_2O$$

(ii) Benzoic acid and ethylbenzoate

Benzoic acid reacts with $NaHCO_3$ to give effervescence of CO_2 but ethylbenzoate does not.



Q. 182 (a) Write structures of A, B, C and D in the following reaction sequence :

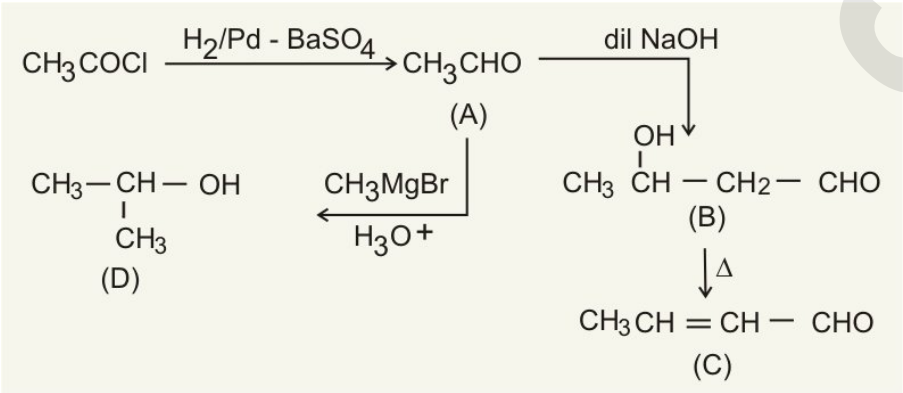


(b) Arrange the following compounds in the increasing order of their boiling points :

$$CH_3CHO, CH_3CH_2OH, CH_3OCH_3, CH_3COOH$$

Solution:

(a)



(b) Increasing order of boiling point:-

$$CH_3OCH_3 < CH_3CHO < CH_3CH_2OH < CH_3COOH$$

Q. 183 Write the dispersion medium and dispersed phase in milk.

Solution:

Both dispersed phase and dispersion medium in milk are liquid.

Q. 184 Write IUPAC name of the complex $[Co(NH_3)4Cl(NO_2)]^+$.

Solution:
$[Co(NH_3)4Cl(NO_2)]^+$

Tetraaminichloridonitro-N-cobalt(III)

Q. 185 What type of stoichiometric defect is shown by NaCl ?

Solution:
Stiochiometric defect shown by NaCl is Schottky Defect.

Q. 186 What happens when phenol is heated with zinc dust ?

Solution:
Benzene is formed when phenol is reacted with Zinc dust.

Q. 187 Explain the following observations :

(i) Silver atom has completely filled d-orbitals ($4d^{10}$) in its ground state, yet it is regarded as a transition element.

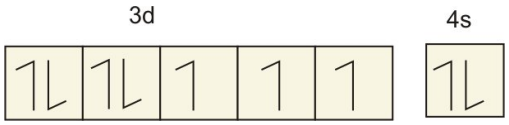
(ii) E^0 value for Mn^{3+}/Mn^{2+} couple is much more positive than Cr^{3+}/Cr^{2+} .

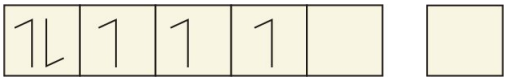
Solution:
E^0 value of Mn^{3+}/Mn^{2+} couple is much more positive than Cr^{3+}/Cr^{2+}since Mn^{2+} is more stable than Mn^{3+} because Mn^{2+} has the configuration $3d^5$ which is extra stable half filled configuration.

Q. 188 For the complex ion $[CoCl_2(en)_2]^+$ write hybridization type and spin behaviour. Draw one of the geometrical isomer of the complex ion which is optically active. [Atomic number : Co = 27]

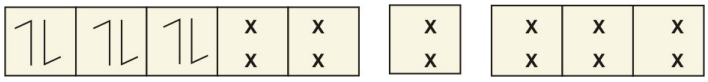
Solution:
$[CoCl_2(en)_2]^+$

Atomic number = Co = 27

Co = 

Co^{3+} = 

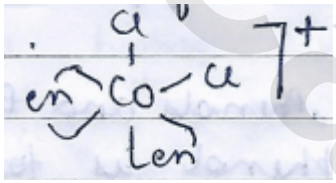
$[CoCl_2(en)_2]^+$



Hybridization = d^2sp^3

low spin complex

Cis isomer of $[CoCl_2(en)_2]^+$ is optically active.



Q. 189 Which ionic compound shows both Frenkel and Schottky defects ?

Solution:
AgBr shows both Schottky as well as Frenkel defect.

Q. 190 Write the dispersed phase and dispersion medium in butter.

Solution:
Dispersed phse in butter is liquid and dispersion medium is soild.

Q. 191 Following reactions may occur at cathode during the electrolysis of aqueous $CuCl_2$ solution using Pt electrodes :

$$Cu^{2+}(aq) + 2e^- \rightarrow Cu(s); E^\circ = +0.34V$$

$$H^+(aq) + e^- \rightarrow \frac{1}{2}H_2(g); E^\circ = 0.00V$$

On the basis of their standard electrode potential values, which reaction is feasible at cathode and why ?

Solution:

$Cu^{2+}(aq) + 2e^- \rightarrow Cu(s); E^\circ = +0.34V$

$H^+(aq) + e^- \rightarrow \frac{1}{2}H_2(g); E^\circ = 0.00V$

I reaction is more feasible at cathode because higher E° value, more is the capacity to get reduced.

Q. 192 (i) What is the order of the reaction whose rate constant has same units as the rate of reaction ?

(ii) For a reaction $A + H_2O \rightarrow B$; Rate $\alpha[A]$. What is the order of this reaction ?

Solution:
(i) Zero order reaction has same unit of rate constant as rate of reaction.

(ii) $A + H_2O \rightarrow B$

Rate $\alpha[A]$.

Order = 1st order since rate is proportional to concentration of one reactant.

Q. 193 Explain the following phenomenon giving reasons :

(i) Chemical adsorption increases with increase in temperature.

(ii) Alum is applied on a cut to stop bleeding.

(iii) Sky appears blue in colour.

Solution:
(i) chemical adsorption increases with increase in temperature since it is a chemical reaction, therefore temprature supplies activation energy to the reactants.

(ii) Alum is applied on a cut to stop bleeding because of styptic action of alum and ferric chloride solution coagulates the blood forming a clot which stops further bleeding.

(iii) Sky appears blue in colour because of dust particles along with water suspended in air scatter blue light which reaches our eyes.

Q. 194 When a coordination compound $CrCl_3.6H_2O$ is mixed with $AgNO_3$ solution, 3 moles of AgCl are precipitated per mole of the compound. Write :

(i) Structural formula of the complex

(ii) IUPAC name of the complex

(iii) Magnetic and spin behaviour of the complex

Solution:

$CrCl_3.6H_2O + AgNO_3 \rightarrow 3AgCl\downarrow$

(i) Structural formula = $[Cr(H_2O)_6]\,Cl_3$

(ii) IUPAC name

Hexaaquachromium(III) chloride

(iii) Paramagnetic, low spin complex

Q. 195 Half-life for a first order reaction is 693 s. Calculate the time required for 90% completion of this reaction.

Solution:

1st order reaction

$$t_{\frac{1}{2}} = \frac{0.693}{K}$$

$$t_{\frac{1}{2}} = 693s$$

$$k = \frac{0.693}{t_{\frac{1}{2}}} = \frac{0.693}{693} = \frac{1}{1000} = 0.001s^{-1}$$

$t_{90\%}$ =?

$$k = \frac{2.303}{t}\log\frac{[R]_o}{[R]}$$

$$t_{90} = \frac{2.303}{k}\log\frac{[R]_0}{[R]_0 - 0.90\,[R]_0}$$

$$t_{90} = \frac{2.303}{0.001}\log 10$$

$$t_{90} = \frac{2.303}{0.001} \times 1$$

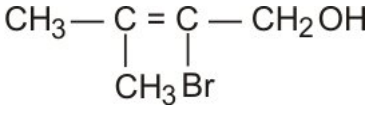
$$t_{90} = 2303s$$

Q. 196 Write the formula of the compound of phosphorus which is obtained when conc.HNO_3 oxidises P_4.

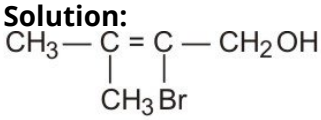
Solution:

H_3PO_4 is formed when conc.HNO_3 oxidies P_4

Q. 197 Write the IUPAC name of the following compound :



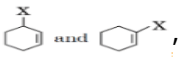
Solution:



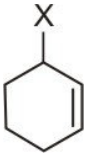
2– Bromo – 3 – methylbut - 2 en - I -ol

Q. 198 What is the effect of adding a catalyst on
(a) Activation energy (E_a), and
(b) Gibbs energy (ΔG) of a reaction ?

Solution:
(i) Addition of calalyst lowers the activation energy (E_a).
(ii) Gibbs energy ΔG of a reaction remains unchanged one addition of catalyst.

Q. 199 Out of  , which is an example of allylic halide ?

Solution:

 is an example of allylic halide.

Q. 200 What type of colloid is formed when a liquid is dispersed in a solid ? Give an example.

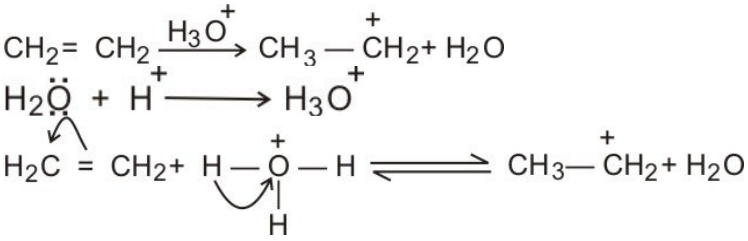
Solution:
Type of colloid formed when liquid is dispersed in solid is Gel. Example- butter

Q. 201 (a) Arrange the following compounds in the increasing order of their acid strength :
p-cresol, p-nitrophenol, phenol
(b) Write the mechanism (using curved arrow notation) of the following reaction :

$$CH_2 = CH_2 \overset{H_3O^+}{\rightarrow} CH_3 - CH_2^+ + H_2O$$

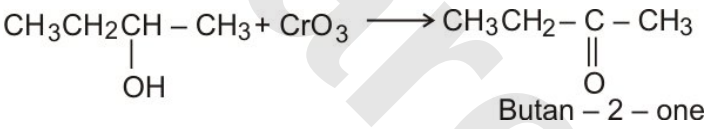
Solution:

(a) increasing order of acidic strength =
p-cresol < phenol < p- nitrophenol
(b) Mechanism of

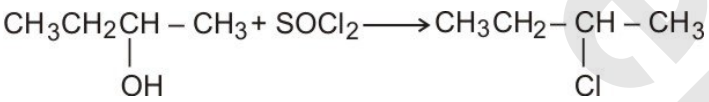


Q. 202 Write the structures of the products when Butan-2-ol reacts with the following :
(a) CrO_3
(b) $SOCl_2$

Solution:
(a)



(b)



Q. 203 Calculate the number of unit cells in 8·1 g of aluminium if it crystallizes in a face-centred cubic (f.c.c.) structure. (Atomic mass of Al = 27 g mol^{-1})

Solution:
Mass of Aluminium = 8.1 g
Atomic mass = 27 g mol^{-1}

Number of atoms $= \frac{8 \cdot 1}{27} \times 6 \cdot 022 \times 10^{23}$

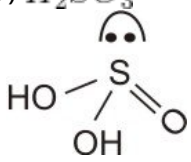
In fcc, z =4

Number of unit cells $= \frac{8 \cdot 1}{27} \times \frac{6 \cdot 022 \times 10^{23}}{4}$
$= 0 \cdot 45165 \times 10^{23}$
$= 4 \cdot 51 \times 10^{22}$ unit cells

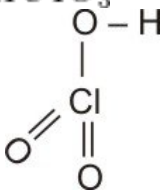
Q. 204 Draw the structures of the following :
(a) H_2SO_3
(b) $HClO_3$

Solution:

(a) H_2SO_3



(b) $HClO_3$



Q. 205 Write the name of the cell which is generally used in hearing aids. Write the reactions taking place at the anode and the cathode of this cell.

Solution:

Mercury cell is used in hearing aids Reactions occuring at

Anode:

$$Zn\,(Hg) + 2OH^- \rightarrow ZnO\,(s) + H_2O + 2e^-$$

Cathode:

$$HgO + H_2O + 2e^- \rightarrow Hg\,(s) + 2OH^-$$

Q. 206 Using IUPAC norms write the formulae for the following :

(a) Sodium dicyanidoaurate(I)

(b) Tetraamminechloridonitrito-N-platinum(IV) sulphate

Solution:

(a) Sodium dicyanidoaurate(I)

$$Na\,[Au\,(CN)_2]$$

(b) Tetraamminechloridonitrito-N-platinum(IV) sulphate

$$(PtCl\,(NO_2)\,(NH_3)_4)\,SO_4$$

Q. 207 (a) Based on the nature of intermolecular forces, classify the following solids :

Silicon carbide, Argon

(b) ZnO turns yellow on heating. Why ?

(c) What is meant by groups 12-16 compounds ? Give an example.

Solution:

(a) Silicon carbide - Covalent Solid

Argon- Non-polar molecular solids

(b) In ZnO, Zn2+ ions occupy the interstitial sites and electrons are trapped in the interstitial sites for the neutralization. Crystals that shows such type of defects are generally colored. Zinc oxide is white in color but on heating it turns into yellow because on heating it loses oxygen reversibly at high temperature.

(c) Group 12-16 compounds means
compounds formed when elements of group 12 and 16 combine together.
Example = ZnS, CdS. In these compound, bond are not perfectlly covalent and the ionic character depens on the electronegativities of two elements.

Q. 208

(a) The cell in which the following reaction occurs : $2Fe^{3+}\,(aq) + 2I^{-}\,(aq) \rightarrow 2Fe^{2+} + I_2\,(s)$ has $E^0_{cell} = 0 \cdot 236\,V\ at\ 298\,K.$
Calculate the standard Gibbs energy of the cell reaction.(Given : 1 F = 96,500 C mol^{-1})
(b) How many electrons flow through a metallic wire if a current of 0·5 A is passed for 2 hours ? (Given : 1 F = 96,500 C mol^{-1})

Solution:

(a) $2Fe^{3+}\,(aq) + 2I^{-}\,(aq) \rightarrow 2Fe^{2+} + I_2\,(s)$

$E^0_{cell} = 0 \cdot 236\,V, T = 298\,K, IF = 96500\,Cmol^{-1}$

$\Delta_r G^0 = ?$ n = 2

$\Delta_r G^0 = -nFE^0_{cell}$

$= -2 \times 96500 \times 0 \cdot 236$

$= -45548\,J\,mol^{-1}$

(b) $I = 0 \cdot 5A$

$t = 2\,hours\ = 7200\,s$

$Q = It$

$Q = 0 \cdot 5 \times 7200$

$= 3600\,c$

Number of $e^- = \dfrac{6 \cdot 023 \times 10^{23} \times 3600}{96500}$

$= 0 \cdot 22469 \times 10^{23}$

$= 2 \cdot 25 \times 10^{23}$

Q. 209

(a) What type of isomerism is shown by the complex $[Co\,(NH_3)_5\,(SCN)]^{2+}$?
(b) Why is $[NiCI_4]^{2-}$ paramagnetic while. $[Ni\,(CN)_4]^{2-}$ is diamagnetic ?
(Atomic number of Ni = 28)
(c) Why are low spin tetrahedral complexes rarely observed ?

Solution:

(a) $[Co\,(NH_3)_5\,(SCN)]^{2+}$ show linkage isomerism

(b) $[NiCI_4]^{2-}$ is paramagnetic but $[Ni\,(CN)_4]^{2-}$ is diamagnetic because CN^- is a strong ligand which cause pairing of electrons whereas CI is a weak ligand which cannot calls pairing

(c) In tetranedral , the d-element splitting is inverted and is smaller as compared to the octahedral field splitting. The orbital splitting energies are not sufficiently large for forcing pairing therefore, low spin configuration are rarely observed.

Q. 210 Write one difference in each of the following :
(a) Multimolecular colloid and Associated colloid
(b) Coagulation and Peptization
(c) Homogeneous catalysis and Heterogeneous catalysis

Solution:
(i) Multimolecular colloids an those in which large number of small atoms/molecules aggregate together to form colloidal particles. whereas in associated colloids . sustances which act as electrocytes at low concentration but at high concentration associate with each other to form particles having size in colloidal range.
(ii)Coagulation is the process of setting of colloidal particles whereas peptization is the process of converting a freshly prepared precipitate into colloidal form by addition of a small amount of electrocyte.
(iii) Homogeneous catalysis is said to occur when reactants and catalyst are in the same phase whereas in hetrogeneous catalysis, reactants and catalysts are in different phases.

Q. 211 (a) Write the dispersed phase and dispersion medium of milk.
(b) Write one similarity between physisorption and chemisorption.
(c) Write the chemical method by which $Fe(OH)_3$ sol is prepared from $FeCl_3$.

Solution:
(a) Both dispersed phase and dispression medium in milk are liquid.
(b) Both physcosorption and chemisorption are adsorption types which is the phenomenon of attracting and retaining the molecules of a substance on the surface of another
(c) Electrophoesis is the chemical method by which $Fe(OH)_3$ sel is prepared from $FeCl_3$.

Q. 212 A first order reaction takes 20 minutes for 25% decomposition. Calculate the time when 75% of the reaction will be completed. (Given : log 2 = 0·3010, log 3 = 0·4771, log 4 = 0·6021)

Solution:
Order = 1

$$k = \frac{2 \cdot 303}{t} \log \frac{a}{a - x}$$

25% decomposition , $x = 0 \cdot 25a, t = 20\,min$

$$k = \frac{2 \cdot 303}{20} \log \frac{a}{a - 0 \cdot 25a}$$

$$k = \frac{2 \cdot 303}{20} \log \frac{1}{0 \cdot 75}$$

$$k = \frac{2 \cdot 303}{20} (\log 4 - \log 3)$$

$k = 0 \cdot 01439\, min^{-1}$
75 % decomposition , t = ? , $x = 0 \cdot 75a$

$$t = \frac{2 \cdot 303}{0 \cdot 0144} \log \frac{a}{a - 0 \cdot 75a}$$

$$t = \frac{2 \cdot 303}{0 \cdot 0144} \log \frac{1}{0 \cdot 25}$$

$$t = \frac{2 \cdot 303}{0 \cdot 0144} \log 4$$

$$t = \frac{2 \cdot 303}{0 \cdot 0144} \times 0 \cdot 6021$$

$$= 96 \cdot 3\, min$$

Q. 213 The following compounds are given to you :
2-Bromopentane, 2-Bromo-2-methylbutane, 1-Bromopentane
(a) Write the compound which is most reactive towards S_N2 reaction.
(b) Write the compound which is optically active.
(c) Write the compound which is most reactive towards β-elimination reaction.

Solution:
(i) 1-Bromopentane
(ii) 2-Bromopentane
(iii) 2-Bromo-2-methylbutane

Q. 214 Write the principle of the following :
(a) Zone refining
(b) Froth floatation process
(c) Chromatography

Solution:
(a) Zone refining is based on the principle that the impurities on more soluble in molten state than in solid state of metal.

(b) Froth floatation process is based on the principle that the metallic sulphide particles of ore are preferentially wetted by oil and the gangue particles by water. Collectors attach themselves by polar groups to grains of minerals which then become water repellent and thus, pass on into the froth.

(c) Chromatography is based on the principle where molecules in mixture applied onto the surface or into the solid, and fluid stationary phase (stable phase) is separating from each other while moving with the aid of a mobile phase

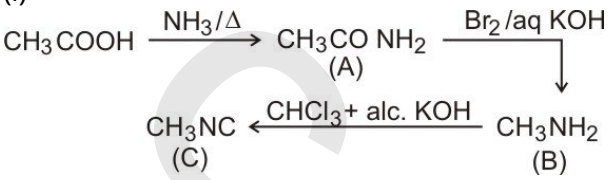
Q. 215 Write the structures of compounds A, B and C in the following reactions :

(a) $CH_3 - COOH \overset{NH_3/\Delta}{\rightarrow} A \overset{Br_2/KOH(aq)}{\rightarrow} B \overset{CHCI_3+alc\cdot KOH}{\rightarrow} C$

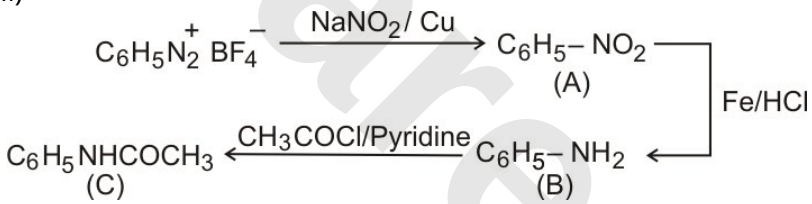
(b) $C_6H_5N_2^+BF_4^- \xrightarrow[\Delta]{NaNO_2/Cu} A \overset{Fe/HCI}{\rightarrow} B \overset{CH_3COCI/pyridine}{\rightarrow} C$

Solution:

(i)



(ii)



Q. 216 Write the structures of the monomers used for getting the following polymers :

(a) Nylon-6,6

(b) Melamine-formaldehyde polymer

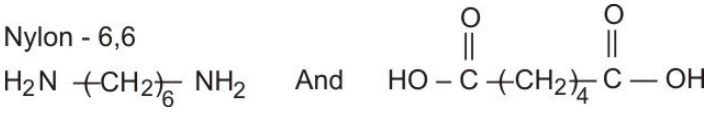
(c) Buna-S

Solution:

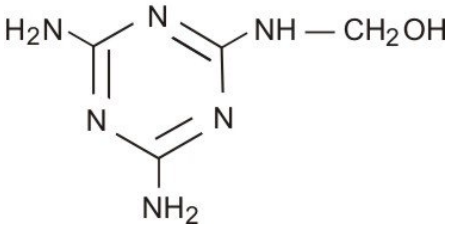
Structures of monomers of

(a)

Nylon - 6,6



(b) Melamine formaldehyde



(c) Buna -S

$CH_2 = CH - CH = CH_2 \ and \ C_6H_5 - CH = CH_2$

Q. 217 Define the following :
(a) Anionic detergents
(b) Limited spectrum antibiotics
(c) Antiseptics

Solution:
(a) Anionic detergents an sodium salts of sulphonated long chain alcohols or hydrocarbons. Alkyl hydrogensulphates formed by treating long chain alcohols with concentratred with alkali to fprm these.
(b) limited spectrum antibiotics are those antibiotics which are effective against a single organism or disease.
(c) Antisephtics are chemical substances which prevent the growth of microorganisms and may even kill them, They are safe to be applied on living tissues.

Q. 218 Give reasons for the following :
(a) Red phosphorus is less reactive than white phosphorus.
(b) Electron gain enthalpies of halogens are largely negative.
(c) N_2O_5 is more acidic than N_2O_3.

Solution:
(a) Red phosphorus is less reactive than white phosphorus because White phosphorus is made up of discrete P4 tetrahedra which are subjected to very high angular strain as the angles is 60 degrees. Red phosphorus is a polymer of P4 tetrahedra, which has much less angular strain. This high angular strain makes white phosphorus unstable and highly reactive

(b) Electron gain ethalpies of halogens an largely negative because of their small size in their respective period, they have high effective nuclear charge, ∴ They readily accept one electron to acquire noble gas configuration
(c) N_2O_5 is more acidic than N_2O_3 as N in N_2O_5 is in +5 oxidation and N in N_2O_3 is in +3 oxidation number, more is the acidity.

Q. 219 Give reasons for the following :
(a) Acetylation of aniline reduces its activation effect.
(b) CH_3NH_2 is more basic than $C_6H_5NH_2$.
(c) Although $-NH_2$ is o/p directing group, yet aniline on nitration gives a significant amount of m-nitroaniline.

Solution:
(a) Acetylation of aniline reduces its activation effect as the acelamido group formed is less activating than amino group since resonance decreses electron density on nitrogen.
(b) CH_3NH_2 is more basic due to reasonance electron density on nitrogen decreases and the anilinium ion formed is lets reasonance stabilished than $C_6H_5NH_2$.
(c) NH_2 group is o/p directing get aniline on nitration gives m-nitrioniline due acidic medium, the resulting NH_3+ group being deactivating directs elecrophille to m-position

Q. 220

(a) Account for the following :
(i) Transition metals show variable oxidation states.
(ii) Zn, Cd and Hg are soft metals.
(iii) E^0 value for the Mn^{3+}/Mn^{2+} couple is highly positive (+ 1·57 V) as compared to Cr^{3+}/Cr^{2+}
(b) Write one similarity and one difference between the chemistry of lanthanoid and actinoid elements.

Solution:

(a) (i) Transiction metals show variable oxidation state due to presence of valence electrons in two different sets of orbitals ie outer ns and (n-1)d. Both of them can get involved in bond formation due to small difference of energy between them.
(ii) Zn, Cd, Hg are soft metals as they have break metalic bonds in their lattices due to absence of unpaired d electrons.
(iii) $E^0(Mn^{3+}/Mn^{2+})$ is highly positive as compared to Cr^{3+}/Cr^{2+}, it shows that Mn^{2+} has the $3d^5$ configuration which is extra stable half filled configuration
(b) Similarity - Both lanthanoids and actinoids form coloured ions due to presence of unpaired f electrons and f-f transition
Difference - Ionisation enthalpy of lanthanoids are grater than those of actinoids because 4f orbitals are more penetrating than 5f.

Q. 221

(a) Following are the transition metal ions of 3d series :
Ti^{4+}, V^{2+},Mn^{3+}, Cr^{3+}
(Automic numbers :Ti = 22, V = 23,Mn = 25, Cr = 24)
Answer the following :
(i) Which ion is most stable in an aqueous solution and why ?
(ii) Which ion is a strong oxidising agent and why ?
(iii) Which ion is colourless and why ?
(b) Complete the following equations :
(i) $2MnO_4^- + 16H^+ + 5S^{2-} \rightarrow$
(ii) $KMnO_4 \overset{heat}{\rightarrow}$

Solution:

(a) (i) Cr^{3+} is most stable in aqeous solution. according to crystal field Theory it has $t2g^3$ and is extremely stable
(ii) Mn^{3+} is a strong oxidising because it can easily be converted to Mn^{2+} having d^s configuration which is extra stable
(iii) Ti^{4+} is colourless because it has $3d^0$ configuration and therefore no unpair electrons.
(b) (i) $2MnO_4^- + 16H^+ + 5s^{2-} \rightarrow 2Mn^{2+} + 5s + 8H_2O$
(ii) $2KMnO_4 \overset{\Delta}{\rightarrow} K_2MnO_4 + MnO_2 + O_2$

Q. 222 (a) A 10% solution (by mass) of sucrose in water has a freezing point of 269·15 K. Calculate the freezing point of 10% glucose in water if the freezing point of pure water is 273·15 K.
Given :
(Molar mass of sucrose = 342 g mol^{-1})
(Molar mass of glucose = 180 g mol^{-1})
(b) Define the following terms :
(i) Molality (m)
(ii) Abnormal molar mass

Solution:
(a) Molor mass of sucrose = 342g mol^{-1}
Molar mass of glucose = 180 g mol^{-1}
T_f = ?

$$\Delta T_f = K_f m$$
$$\Delta T_f = T_{f^0} - T_f$$
$$T_{f^0} - T_f = K_f m$$
$$273 \cdot 15 - 269 \cdot 15 = K_f \times \frac{10}{342} \times \frac{1000}{100}$$
$$K_f = \frac{4 \times 342}{10 \times 10}$$
$$= 13 \cdot 68 K mol^{-1}$$
$$273 \cdot 15 - T_f = 13 \cdot 68 \times \frac{10}{180} \times \frac{1000}{100}$$
$$273 \cdot 15 - 7 \cdot 6 = T_f$$
$$T_f = 273 \cdot 15 - 7 \cdot 6 = 265 \cdot 55 K$$

(b) (i) Molality (m) as the number of moles of solute present per kg of solvent unit of m is mol kg^{-1} or molal
(ii) Abnormal molar mass - If the molar mass of the solute calculated by using the colligative properly is formed to be different than its normal molar mass than the solute is said to exhibit/possess abnormal molar mass.

Q. 223 (a) 30 g of urea (M = 60 g mol^{-1}) is dissolved in 846 g of water. Calculate the vapour pressure of water for this solution if vapour pressure of pure water at 298 K is 23·8 mm Hg.
(b) Write two differences between ideal solutions and non-ideal solutions.

Solution:
(a) W_{urea} = 30 g (W_B) B = urea
M_{urae} = 60 g/mol

$$\text{Nurea} = \frac{W}{M} = \frac{30}{60} = 0 \cdot 5$$

W_{water} = 846 g (W_A) A = water
M_{water} = 18 g/mol
n_{water} = 47

$$\frac{p_A^0 - ps}{p_A^0} = \frac{n_B}{n_A + n_B}$$
$$\frac{23 \cdot 8 - ps}{23 \cdot 8} = \frac{0 \cdot 5}{47 + 0 \cdot 5}$$

p_s = 23.55 mm hg

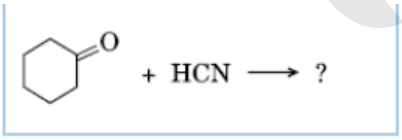
(b)

Ideal solution	Non-Ideal solution
(1) Each component of a ideal solution obey Raoult's law in solution	component of non-ideal solution dose not obey Rabcilt's law.
(2)$\Delta H_{mix} = 0,$ i.e no heat is evolved or absorbed during formation of solution	$\Delta H_{mix} \neq 0,$ i.e heat is either evolved or absorbed during the formation of solution

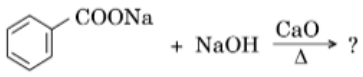
Q. 224

(a) Write the product(s) in the following reactions :

(i)



(ii)



(ii)

$$CH_3 - CH = CH - CN \xrightarrow[(b)H_2O]{(a)DIBAL-H} ?$$

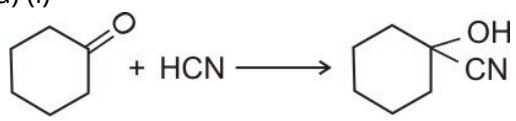
(b) Give simple chemical tests to distinguish between the following pairs of compounds :

(i) Butanal and Butan-2-one

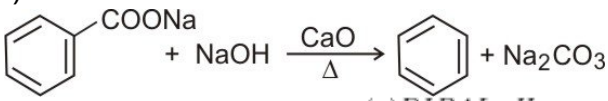
(ii) Benzoic acid and Phenol

Solution:

(a) (i)



(ii)



(iii) $CH_3CH = CHCN \xrightarrow[(b)H_2O]{(a)DIBAL-H} CH_3 = CHCHO$

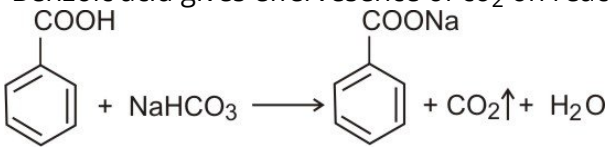
(b) (i) Butanal and Butan-2-one

Butan-2-one on heating with NaOH and I_2 gives yellow precipitate of iodoform but Butanal does not gives this test

$$CH_3COCH_2 + NaOH + I_2 \xrightarrow{\Delta} \underset{\text{yellow}}{CHI_3} + CH_3CH_2COONa$$

(ii) Benzoic acid and phenol

Benzoic acid gives effervesence of co_2 on reaction with $NaHCO_3$ but phenol doesnot gives this test.



Q. 225

(a) Write the reactions involved in the following :

(i) Etard reaction

(ii) Stephen reduction

(b) How will you convert the following in not more than two steps :

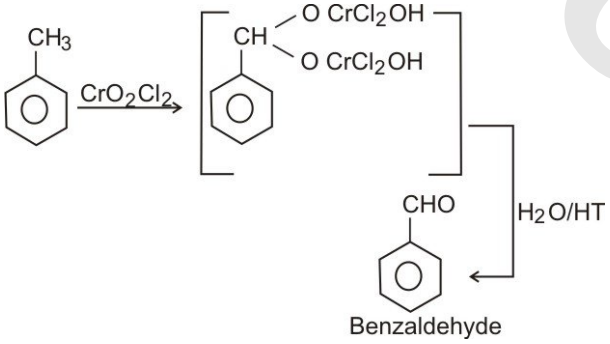
(i) Benzoic acid to Benzaldehyde

(ii) Acetophenone to Benzoic acid

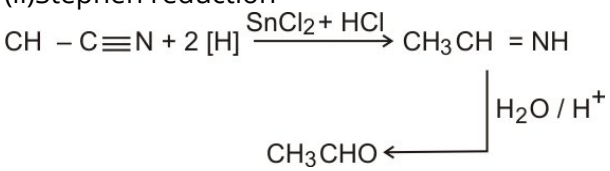
(iii) Ethanoic acid to 2-Hydroxyethanoic acid

Solution:

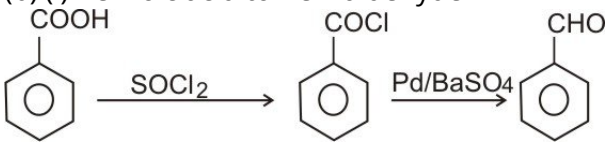
(a) (i) Etard reaction



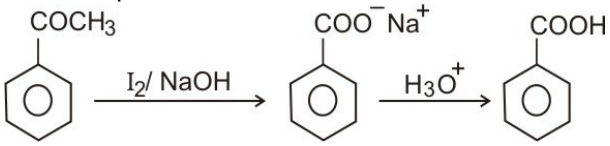
(ii)Stephen reduction



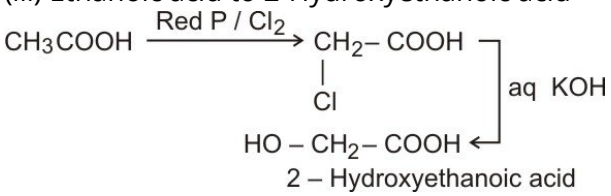
(b) (i) Benzoic acid to Benzaldehyde



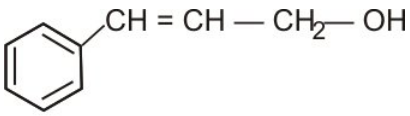
(ii) Acetophenone to Benzoic acid



(iii) Ethanoic acid to 2-Hydroxyethanoic acid

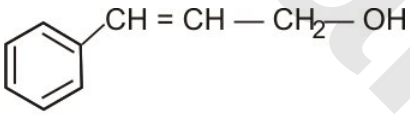


Q. 226 Write the IUPAC name of the following compound :



3-Phenyl prop -2-en-1-ol

Solution:

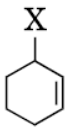


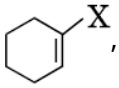
3-Phenyl prop -2-en-1-ol

Q. 227 Write the formula of the compound of sulphur which is obtained when conc. HNO_3 oxidises S_8.

Solution:

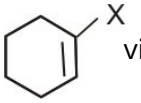
H_2SO_4 is formed when conc. HNO_3 reacts with S_8.

Q. 228 Out of 

and 

, which is an example of vinylic halide ?

Solution:



vinillic halide.

Q. 229 Using IUPAC norms write the formulae for the following :

(a) Tris(ethane-1,2-diamine)chromium(III) chloride

(b) Potassium tetrahydroxozincate(II)

Solution:

(i) Tris (ethane-1,2-diamine) chromium (III) chloride

$$[Cr(NH_2CH_2CH_2NH_2)_3]Cl_3$$

(ii) Potassium tetrahydroxyzincate (II).

$$K_2[Zn(OH)_4]$$

Q. 230 Draw the structures of the following :

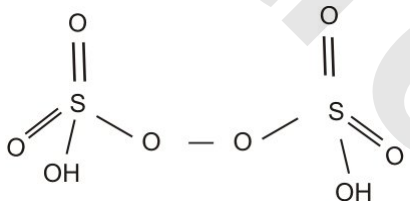
(a) $H_2S_2O_8$

(b) ClF_3

Solution:

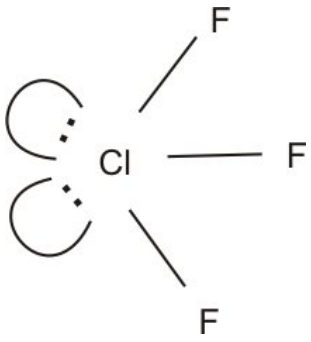
(i)

$H_2S_2O_8$



(ii)

ClF_3



Q. 231 Write the name of the cell which is generally used in inverters. Write the reactions taking place at the anode and the cathode of this cell.

Solution:

Lead storage battery which is a secondary cell is used in inverters. Reactions at -

Anode -

$$Pb(s) + SO_4^{2-}(aq) \rightarrow PbSO_4(s) + 2e^-$$

Cathode-

$$PbO_2(s) + SO_4^{2-}(aq) + 4H^+ + 2e^-$$

$$\downarrow$$

$$PbSO_4(s) + 2H_2O(Cl)$$

Q. 232 (a) Write the principle of vapour phase refining.

(b) Write the role of dilute NaCN in the extraction of silver.

(c) What is the role of collectors in the froth floatation process ? Give an example of a collector.

Solution:
(a) Principle of vapour phase refining is that metal form a volatile compound with a suitable reagent which is easily dicomposable.

(b) Dilute $NaOH$ helps to selectively dissolve the silver orc without dissolvo=ing the impurities.

(c) In froth floatation process, collectors enhance non-wettability or mineral particles.

Example- Fatty acids.

Q. 233 Define the following :

(a) Anionic detergents

(b) Narrow spectrum antibiotics

(c) Antacids

Solution:
(a) Anionic detergents are sodium salts of sulphonaud long chain alcohols or hydrocarbons.Alkyl hydrogensulphates formed by treating long chain alcohols with conc. H_2SO_4 are neutralised with alkali to form these.

(b) Narrow spectrum antibiotics are those which are specific for certain dieseases. Example - Penicillium G

(c) Antacids are substances which remove the excess acid and raise the pH to appropriate lever in stomach.

Example - $Mg(OH)_2$

Q. 234 Write the structures of the monomers used for getting the following polymers :

(a) Polyvinyl chloride (PVC)

(b) Melamine-formaldehyde polymer

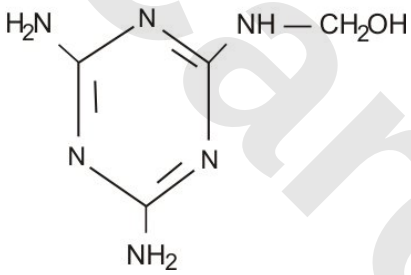
(c) Buna-N

Solution:

(1) Polyvinyl chloride (PVC) - $CH_2 = CH - Cl$

(vinyl chloride)

(2) Melamine formaldehyde polymers -



(3) Buna -N-

$CH_2 = CH - CH = CH_2$ and $CH_2 = CH - CN$

Q. 235 (a) Based on the nature of intermolecular forces, classify the following solids : Benzene, Silver

(b) $AgCl$ shows Frenkel defect while $NaCl$ does not. Give reason.

(c) What type of semiconductor is formed when Ge is doped with Al ?

Solution:

(a) Benzene - Molecular solid

silver - metallic solid

(b) $AgCl$ shows Frenkel defect whereas $NaCl$ does not because Ag^+ is smaller in size than Na^+ and hence has large difference in the size of ions (i.e, between Ag^+ and Cl^{-1}.)

(c) $\rho - type$ semiconductor is formed when Ge is doped with Al.

Q. 236 After watching a programme on TV about the presence of carcinogens (cancer causing agents) Potassium bromate and Potassium iodate in bread and other bakery products, Rupali a Class XII student decided to make others aware about the adverse effects of these carcinogens in foods. She consulted the school principal and requested him to instruct the canteen contractor to stop selling sandwiches, pizzas, burgers and other bakery products to the students. The principal took an immediate action and instructed the canteen contractor to replace the bakery products with some protein and vitamin rich food like fruits, salads, sprouts, etc. The decision was welcomed by the parents and the students.

After reading the above passage, answer the following questions :

(a) What are the values (at least two) displayed by Rupali ?

(b) Which polysaccharide component of carbohydrates is commonly present in bread ?

(c) Write the two types of secondary structures of proteins.

(d) Give two examples of water soluble vitamins.

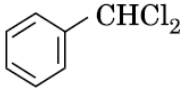
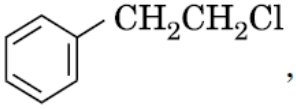
Solution:
(a) Values displayed by Rupali are awareness, intelligent and a good observer.

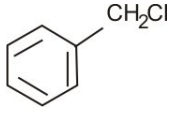
(b) Starch is present in bread.

(c) $\alpha - helix$ structure and $\beta - pleated$ shut structure are secondary structures of proteins.

(d) Nater soluble vitamins-

- Vitamin C
- Vitamin B group

Q. 237 Out of  and  , which is an example of a benzylic halide ?

Solution:
 is an example of benzylic halide.

Q. 238 Write the formula of the compound of iodine which is obtained when conc. HNO_3 oxidises I_2.

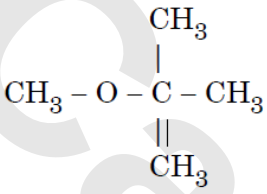
Solution:
HIO_3 is obtained when conc. HNO_3 oxidises iodine.

Q. 239 What type of colloid is formed when a gas is dispersed in a liquid ? Give an example.

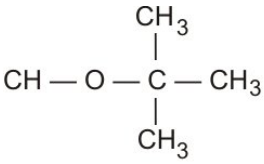
Solution:
Foam is the type colloid when gas is dispersed in liquid medium.

Example- froth

Q. 240 Write the IUPAC name of the following compound :



Solution:



2-Methoxy-2-methylpropane

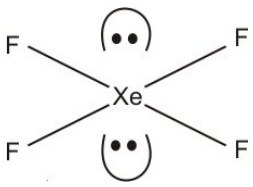
Q. 241 Draw the structures of the following :

(a) XeF_4

(b) BrF_5

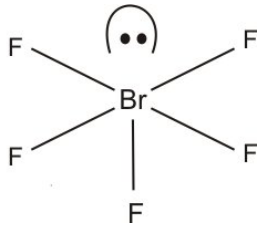
Solution:
(i)

XeF_4



(ii)

BrF_5



Q. 242 Write the name of the cell which is generally used in transistors. Write the reactions taking place at the anode and the cathode of this cell.

Solution:
Dry cell also known as Leclanch cell, which is a primary battery is used in transistor.

Reactions at -

Anode :-

$$Zn(s) \rightarrow Zn^{2+} + 2e^{-}$$

Cathode :-

$$MnO_2 + NH_4^+ + e^{-} \rightarrow MnO(H) + NH_3$$

Q. 243 Using IUPAC norms write the formulae for the following :

(a) Potassium trioxalatoaluminate(III)

(b) Dichloridobis(ethane-1,2-diamine)cobalt(III)

Solution:
(a) Potassium trioxalato aluminate (III)

$$K_3\left[Al(C_2O_4)_3\right]$$

(b) Diechloridobis (ethane-1,2-diamine) cobalt (III)

$$\left[CoCl_2(NH_2CH_2CH_2NH_2)_2\right]^H$$

Q. 244 (a) Based on the nature of intermolecular forces, classify the following solids :
Sodium sulphate, Hydrogen

(b) What happens when $CdCl_2$ is doped with $AgCl$?

(c) Why do ferrimagnetic substances show better magnetism than antiferromagnetic substances ?

Solution:
(a) Sodium sulphate - Ionic solid

Hydrogen - Non polar molecular solid.

(b) When $CdCl_2$ id doped with $AgCl$, impurity defect is created, there are cationic vacancies produced as one ion takes the place of other and other site remains vacant.

(c) Ferromagnetic substances show better magnetism than anti-ferromagnetic substances because in anti-ferromagnetism, their domains are oppositely oriented and cancel out each iothers magnetic moment whereas in ferromagnetic all domains are oriented in the direction of magnetic field.

Q. 245 (a) Write the principle of electrolytic refining.

(b) Why does copper obtained in the extraction from copper pyrites have a blistered appearance ?

(c) What is the role of depressants in the froth floatation process ?

Solution:
(a) Electrolytic refining is the process of refining impure metals by using elevtricity where they are put in a suitable electrolytic bath containing soluble salt of same metal.

(b) Copper obtained in extraction from copper pyride have a blistered appearance due to evolution of SO_2.

(c) Depressants are used to prevent one type of sulphide are particles from forming are froth with air bubbles.

Example - $NaCN$

Q. 246 Define the following :

(a) Cationic detergents

(b) Broad spectrum antibiotics

(c) Tranquilizers

Solution:
(a) Vationic detergents are quationary ammonium salts containing are or more long chain alkyl groups.

(b) Broad spectrum Antibiotics are these which inhibit or kill wide range of microorganisms.

Example - Chloramphonied

(c) Tranquilizers are chemical substances used to cure mental diseases and reduce anxiety or cuping pills.

Q. 247 Write the structures of the monomers used for getting the following polymers :

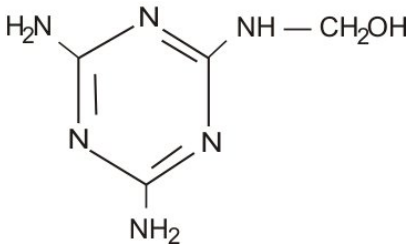
(a) Teflon

(b) Melamine-formaldehyde polymer

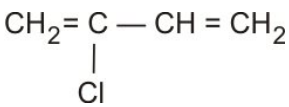
(c) Neoprene

Solution:
(1) Teflon - $CF_2 = CF_2$

(2) Melamine formaldehyde polymer



(3) Neoprene -



Q. 248 For the reaction A $\rightarrow$ B, the rate of reaction becomes three times when the concentration of A is increased by nine times. What is the order of reaction?

Solution:

$\mathrm{A} \rightarrow \mathrm{B}$

Rate $\propto [\mathrm{A}]^{\mathrm{n}} \Rightarrow \mathrm{R} = \mathrm{k}[\mathrm{A}]^{\mathrm{n}}$

$3R - k(9A)^n$

$n = \frac{1}{2}$

Half order

Q. 249 Why is adsorption always exothermic ?

Solution:
Adsorption is always endothermic because it results in restricting the freedom of gas molecules.
$\therefore \Delta S = \text{negative}$ for a process to be spontaneous $\Delta G = \Delta H - T\Delta S$. Therefore, in order to be spontaneous for adsorption ΔH must be negative

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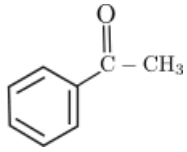
Q. 250 Write the coordination isomer of $[\mathrm{Cu}(\mathrm{NH_3})_4][\mathrm{PtCl_4}]$.

Solution:
Coordination isomer of $[\mathrm{Cu}(\mathrm{NH_3})_4][\mathrm{PtCl_4}]$ is $[\mathrm{CuCl_4}][\mathrm{Pt}(\mathrm{NH_3})_4]$.

Q. 251 An aromatic organic compound 'A' with molecular formula $\mathrm{C_8H_8O}$ gives positive DNP and iodoform tests. It neither reduces Tollens' reagent nor does it decolorize bromine water. Write the structure of 'A'.

Solution:
$A = \mathrm{C_8H_8O}$ = aromatic organic compound positive DNP$\rightarrow$ contains carbonyl group.

Positive Iodoform and negative Tollens shows it is not -CHO but $CH_3 - \overset{O}{\overset{\|}{C}} -$

A = 

Q. 252 Predict the major product formed when sodium ethoxide reacts with tert. Butyl chloride.

Solution:
$CH_3 - \overset{CH_3}{\overset{|}{C}} = CH_2$ will be the major product formed.

Q. 253 Why a mixture of Carbon disulphide and acetone shows positive deviation from Raoult's law ? What type of azeotrope is formed by this mixture ?

Solution:
A mixture of carbon disulphate and acetone shows positive derivations from Raoult's Law because attractions between CS_2 and acetone are weaker than the attractions in the pure state.

Minimum boiling azeotropes is formed by this mixture.

Q. 254 Which one of the following compounds is more reactive towards S N 2 reaction and why?

$CH_3CH(Cl)CH_2CH_3$ **or** $CH_3CH_2CH_2Cl$

Solution:
$CH_3CH_2CH_2Cl$ will be more reactive towards SN_2 because of the less static hindrance attack of nucleophile will easier.

Q. 255 A current of 1.50 A was passed through an electrolytic cell containing $AgNO_3$ solution with inert electrodes. The weight of the silver deposited was 1.50 g. How long did the current flow? (Molar mass of Ag = 108 g mol^{-1} , 1F = 96500 C mol^{-1}).

Solution:
$\mathrm{I} = 1.50\mathrm{A} \qquad t = ?$

For 108 g of Ag IF = 96500C

$$1g = \frac{196500}{108}$$

$$1.5g = \frac{196500 \times 1.5}{108} = 1340.278C$$

$$Q = It$$

$$t = \frac{Q}{I} = \frac{1340.278}{1.5} = 893.518s$$

Q. 256 The conductivity of a 0.01 M solution of acetic acid at 298 K is $1.65 \times 10^{-4} Scm^{-1}$. Calculate molar conductivity ($\wedge_m$) of the solution.

Solution:
$\wedge_m = ?$

$$K = 1.65 \times 10^{-4} S/cm$$

$$C = 0.01M$$

$$\wedge_m = \frac{K \times 1000}{C}$$

$$= \frac{1.65 \times 10^{-4} \times 1000}{1 \times 10^{-2}}$$

$$= 1.65 \times 10$$

$$= 16.5\Omega^{-1}mol^{-1}cm^2$$

Q. 257 Draw the structures of the following :

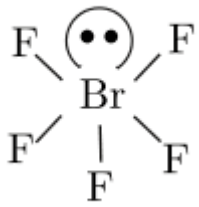
(i) XeF_2

(ii) BrF_5

Solution:

(i) XeF_2

(ii) BrF_5



Q. 258 Identify the following :

(i) Transition metal of 3d series that exhibits the maximum number of oxidation states.

(ii) An alloy consisting of approximately 95% lanthanoid metal used to produce bullet, shell and lighter flint.

Solution:

(i) Manganese Atomic No. = 25

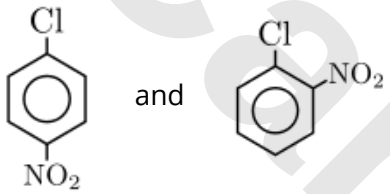
(ii) Misch Metal

Q. 259 Write the product(s) formed when
(i) 2-Bromopropane undergoes dehydrohalogenation reaction.
(ii) Chlorobenzene undergoes nitration reaction.
(iii) Methylbromide is treated with KCN.

Solution:
(i)

$CH_3CH = CH_2$ Propene

(ii)



(iii)

CH_3CN Methylcyanide

Q. 260 Calculate the freezing point of an aqueous solution containing 10.5 g of Magnesium bromide in 200 g of water, assuming complete dissociation of Magnesium bromide.

(Molar mass of Magnesium bromide = 184 g mol $^{-1}$, K_f for water = 1.86 K kg mol $^{-1}$).

Solution:

$T_f = ?$

$MgBr_2 \rightarrow Mg^{2+} + 2Br^-$

$i = 3$

$\Delta T_f = i \times K_f \times m$

$$= \frac{3 \times 1.86 \times 10.5 \times 1000}{184 \times 200}$$

$$= 1.59$$

$\Delta T_f = T_f^o - T_f$

$1.59 = 173.15 - T_f$

$T_f = 173.15 - 1.59$

$= 271.56K$

Q. 261 (i) Complete the following reaction and suggest a suitable mechanism for the reaction :

$$CH_3CH_2OH \xrightarrow{H^+, 443K}$$

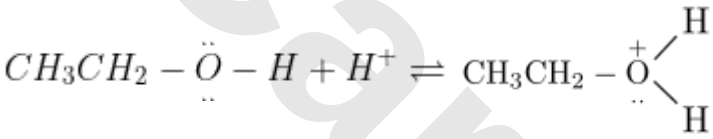
(ii) Why ortho-Nitrophenol is steam volatile while para-Nitrophenol is less volatile ?

Solution:

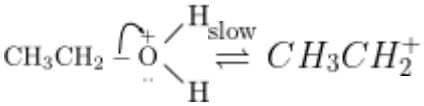
(i)

$$CH_3CH_2OH \xrightarrow{H^+, 443K} CH_2 = CH_2 + H_2O$$

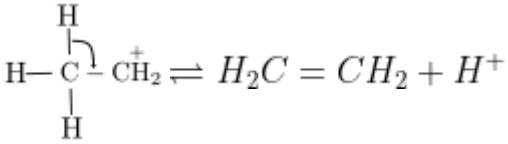
Mechanism: Step 1 - Protonation



Step2 - Loss of water



Step 3 - Deprotonation



(ii) o-nitrophenol is steam volatile while p-nitrophenol is less volatile because o-nitrophenol exists as discrete molecules due to the formation of intramolecular H-bonding between -OH and NO_2 groups but in p-nitrophenol molecules are associated through intermolecular h-bonding.

Q. 262 A reaction is first order in A and second order in B
(i) Write the differential rate equation.
(ii) How is the rate affected on increasing the concentration of B three times ?
(iii) How is the rate affected when the concentration of both A and B are doubled ?

Solution:

(i) differential rate equation

$$\text{Rate} = [A]^1[B]^2$$

(ii) $R_1 = k(a)(3b)^2 = 9kab^2$

Therefore, Rate will be 9 times.

(iii) $R_2 = k(2a)(2b)^2 = 8kab^2$

Rate will be 8 times.

Q. 263 Consider the following reaction :

$$Cu(s) + 2Ag^+(aq) \rightarrow 2Ag(s) + Cu^{2+}(aq)$$

(i) Depict the galvanic cell in which the given reaction takes place.
(ii) Give the direction of flow of current.
(iii) Write the half-cell reactions taking place at cathode and anode.

Solution:

$Cu(s) + 2Ag^+(aq) \rightarrow 2Ag(s) + Cu^{2+}(aq)$

(i) Galvanic Cell:

$$Cu(s)|Cu^{2+}||Ag^+(aq)|Ag(s)$$

(ii) Direction of flow of current is cathode to anode.

(iii) Cathode - $Ag^+ + e^- \rightarrow Ag(s)$

Anode - $Cu(s) \rightarrow Cu^{2+} + 2e^-$

Q. 264 Give reason for the following observations :
(i) When Silver nitrate solution is added to Potassium iodide solution, a negatively charged colloidal solution is formed.
(ii) Finely divided substance is more effective as an adsorbent.
(iii) Lyophilic colloids are also called reversible sols.

Solution:

(i) When silver nitrate solution is added to KI solution, a negatively charged sol is formed. It is due to the preferential adsorption of I^- ions and AgI sol formed is negatively charged.

(ii) The finely divided substance is more effective as an absorbent because more the surface area, more is the extent of adsorption.

(iii) Luophillie colloidal are also called reversible sols because once separated these can be reformed by simple mixing.

Q. 265 (a) Write the cell reaction and calculate the e.m.f. of the following cell at 298 K :

$$Sn(s)|Sn^{2+}(0.004M)||H^{+}(0.020M)|H_2(g)(1bar)|Pt(s)$$

(Given : $E^{\circ}_{Sn^{2+}/Sn} = -0.14V$)

(b) Give reasons :

(i) On the basis of E° values, O_2 gas should be liberated at anode but it is Cl_2 gas which is liberated in the electrolysis of aqueous NaCl.

(ii) Conductivity of CH_3COOH decreases on dilution.

Solution:

(a)

$$Sn(s)|Sn^{2+}(0.004M)||H^{+}(0.020M)|H_2(g)(1bar)|Pt(s)$$

$$E^{\circ}_{Sn^{2+}/Sn} = -0.14V$$

$$Sn(s) \rightarrow Sn^{2+}(aq) + 2e^{-}$$

$$2H^{+} + 2e^{-} \rightarrow H_2$$

$$Sn(s) + 2H^{+}(aq) \rightarrow Sn^{2+}(aq) + H_2(g)$$

$$E^{\circ}_{cell} = 0 - (-0.14V)$$

$$E^{\circ}_{cell} = 0.14V$$

$$E_{cell} = E^{\circ}_{cell} - \frac{0.0591}{n} \log \frac{[Sn^{2+}]}{[H^{+}]^2}$$

$$E_{cell} = 0.14 - \frac{0.0591}{2} \log \frac{(4 \times 10^{3-})}{(2 \times 10^{2})^2}$$

$$E_{cell} = 0.14 - \frac{0.0591}{2} \log 10$$

$$E_{cell} = 0.14 - 0.0295$$

$$E_{cell} = 0.1105V$$

(b)

(i) On the basis of E° values, O_2 gas should be liberated at anode but it is Cl_2 gas which is liberated in the electrolysis of aqueous NaCl. This is because higher voltage is required to liberate oxygen gas which is greater than calculated from standard potential.

(ii) Conductivity of CH_3COOH decreases on dilution since with dilution, concentartion decreases with decreases the number of ions / volume.

Q. 266 Do as directed :

(i) Arrange the following compounds in the increasing order of their basic strength in aqueous solution :

$$CH_3NH_2, (CH_3)_3N, (CH_3)_2NH$$

(ii) Identify 'A' and 'B' :

$$C_6H_5NH_2 \xrightarrow{NaNO_2/HCl:273K} A \xrightarrow{H_2O/H^+} B$$

(iii) Write equation of carbylamine reaction.

Solution:

(a) Increasing basic strength

$$(CH_3)_3N < CH_3NH_2 < (CH_3)_2NH$$

(b)

$$C_6H_5NH_2 \xrightarrow{NaNO_2/HCl:273K} \underset{(A)}{C_6H_5 - N_2^+Cl^-} \xrightarrow{H_2O/H^+} \underset{(B)}{C_6H_5 - OH}$$

(c) Carbylamine Reaction

$$\underset{\text{Methylamine}}{CH_3NH_2} + CHCl_3 + 3KOH(alc) \rightarrow \underset{\text{Methylisocyanide}}{CH_3NC} + 3KCl + 3H_2O$$

Q. 267 (a) Give reasons :

(i) H_3PO_3 undergoes disproportionation reaction but H_3PO_4 does not.

(ii) When Cl_2 reacts with excess of f_2, ClF_3 is formed and not FCl_3.

(iii) Dioxygen is a gas while Sulphur is a solid at room temperature.

(b) Draw the structures of the following :

(i) XeF_4

(ii) $HClO_3$

Solution:

(a)

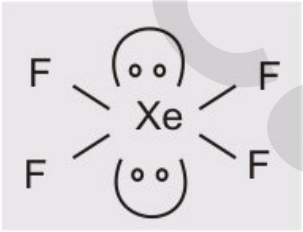
(i) H_3PO_3 undergoes disproportionation reaction but H_3PO_4 does not. In H_3PO_4, the oxidation state of P is +5 therefore it can only get reduced but in H_3PO_3, it is +3 it can both get oxidized as well as reduced.

(ii) When Cl_2 reacts with excess of f_2, ClF_3 is formed and not FCl_3 as chlorine has vaccant d-orbitals and can show oxidation state of +3 and due to high electronegativity and absence of d - orbitals in F, it cannot show oxidation state other than -1. Along with the bigger size, Cl can accomodate three F atoms.

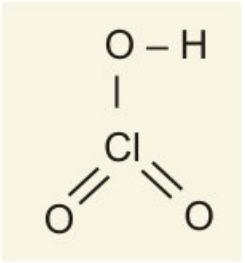
(iii) Dioxygen is a gas while Sulphur is a solid at room temperature due to small size, 2p orbitals of oxygen can overlap effectively to form $p\pi - p\pi$ multiple bonds. It exists as a gas due to weak Vander-Waals forces of attraction whereas sulphur have stronger Van-der waals forces exists as a Solid.

(b)

(i) XeF_4



(ii)$HClO_3$



Q. 268 (a) Why is bithional added to soap ?

(b) What is tincture of iodine ? Write its one use.

(c) Among the following, which one acts as a food preservative ?

Aspartame, Aspirin, Sodium Benzoate, Paracetamol

Solution:
(a) Bithinol, a sulphur containing aromatic compound is added to soaps to improve its antispectic action and to reduce bad odour.

(b) 2-3% solution of iodine in alcohol - water mixture is know as tincture of idoine.

Use-

It is applied on wounds to disinfect the area.

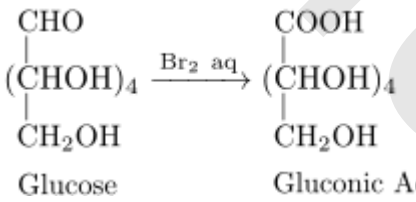
(c) Sodium benzoate is a food preservative.

Q. 269 Explain the following :
(i) Amino acids behave like salts rather than simple amines or carboxylic acids.
(ii) The two strands of DNA are complementary to each other.
(iii) Reaction of glucose that indicates that the carbonyl group is present as an aldehydic group in the open structure of glucose.

Solution:
(i) Amino acids behave like salts rather than simple amines or carboxylic acids due to the presence of both acidic (-COOH) and basic (-NH_2) groups. In solution, -COOH group can lose a proton and an amine group can accept a proton, giving rise to a dipolar ion called zwitter ion.

(ii) Two strands of DNA are complementary to each other because adenine forms H-binds with thymine and cytosine forms h-bond with guanine, due to unique specificity of base pairing the sequence of the basis on one strand automatically determines that of other.

(iii) Reaction that indicates the presence of the aldehydic group in the open structure of glucose-

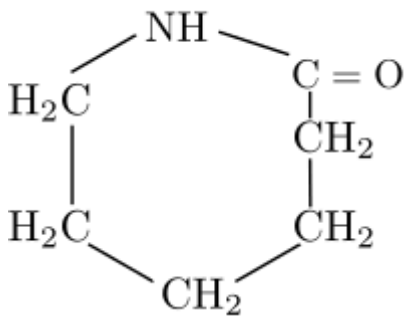


Q. 270 Give the formula of monomers involved in the formation of the following polymers :
(i) Buna-N
(ii) Nylon-6
(iii) Dacron

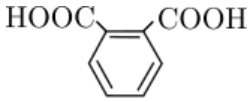
Solution:
(i) Buna-N

$$CH_2 = CH - CH = CH_2 \text{ and } CH_2 = CH - CN$$

(ii) Nylon-6



(iii) Dacron

$OH - CH_2 - CH_2 - OH$ and 

Q. 271 Write the role of
(i) NaCN in the extraction of gold from its ore.
(ii) Cryolite in the extraction of aluminium from pure alumina.
(iii) CO in the purification of Nickel.

Solution:
(i) Dilute NaCN is added as a reagent which selectively dissolves the gold on but not the impurities.

(ii) Cryolite (Na_3AlF_6) decreases the melting point and increases conductivity.

(iii) CO helps to convert nickel to a volatile complex which is collected elsewhere and thin decomposed to give pure metal.

Q. 272 Write IUPAC name for each of the following complexes :

(i) $[\mathrm{Ni}\,(\mathrm{NH_3})_6]\,\mathrm{Cl_2}$

(ii) $\mathrm{K_3}\,[\mathrm{Fe(CN)_6}]$

(iii) $[\mathrm{Co(en)_3}]^{3+}$

Solution:
(i) $[\mathrm{Ni}\,(\mathrm{NH_3})_6]\,\mathrm{Cl_2}$

Hexaaminenickel(II) chloride

(ii) $\mathrm{K_3}\,[\mathrm{Fe(CN)_6}]$

Potassium hexacyanoferrate(III)

(iii) $[\mathrm{Co(en)_3}]^{3+}$

Tris(ethane-1,2-diamine)cobalt(III)

Q. 273 (i) Complete the following equations :

(a) $2MnO_4^- + 5SO_3^{2-} + 6H^+ \rightarrow$

(b) $Cr_2O_7^{2-} + 6Fe^{2+} + 14H^+ \rightarrow$

(ii) Based on the data, arrange Fe^{2+} , Mn^{2+} and Cr^{2+} in the increasing order of stability of +2 oxidation state.

$E^o_{Cr^{3+}/Cr^{2+}} = -0.4V$

$E^o_{Mn^{3+}/Mn^{2+}} = +1.5V$

$E^o_{Fe^{3+}/Fe^{2+}} = +0.8V$

Solution:

(i) (a) $2MnO_4^- + 5SO_3^{2-} + 6H^+ \rightarrow 2Mn^{2+} + 5SO_4^{2-} + 3H_2O$

(b) $Cr_2O_7^{2-} + 6Fe^{2+} + 14H^+ \rightarrow 2Cr^{3+} + 6Fe^{3+} + 7H_2O$

(ii) Increasing order of stability of +2 oxidation state is

$Cr^{2+} < Fe^{2+} < Mn^{2+}$

Q. 274 Write the preparation of following :

(i) $KMnO_4$ from K_2MnO_4

(ii) Na_2CrO_4 from $FeCr_2O_4$

(iii) $Cr_2O_7^{2-}$ from CrO_4^{2-}

Solution:

(i)

$KMnO_4$ from K_2MnO_4

$3K_2MnO_4 + 4H^+ \rightarrow 2KMnO_4 + MnO_2 + 2H_2O$

(ii)

Na_2CrO_4 from $FeCr_2O_4$

$4FeCr_2O_4 + 8Na_2CO_3 + 7O_2 \rightarrow 8Na_2CrO_4 + 2Fe_2O_3 + 8CO_2$

(iii)

$Cr_2O_7^{2-}$ from CrO_4^{2-}

$$2CrO_4^{2-} + 2H^+ \rightarrow Cr_2O_7^{2-} + H_2O$$

Q. 275 Mathew works in a multinational company where the working conditions are tough. He started taking sleeping pills without consulting a doctor. When his friend Amit came to know about it he was disturbed and advised Mathew not to do so. He suggested that Mathew should instead practice yoga to be stress free. Mathew is now relaxed and happy after practicing yoga.
After reading the above passage, answer the following questions :
(a) Name the class of chemical compounds used in sleeping pills.
(b) Why is it advisable not to take the dose of sleeping pill without consulting a doctor ?
(c) Pick out the odd chemical compound on the basis of its different medicinal property : Luminal, Seconal, Phenacetin and Equanil.
(d) List at least two qualities of Amit that helped Mathew to be happy.

Solution:
(a) Tranquilizers are an important constituent of sleeping pills.

(b) It is not advisable to take sleeping pills without consulting a doctor because taken in high doses it is harmful and may even lead to death.

(c) Phenacetin.

(d) Qualities of Amit - helpful, sympathetic and understanding.

Q. 276 (i) What happens when
(a) chlorine gas reacts with cold and dilute solution of NaOH?
(b) XeF_2 undergoes hydrolysis?

(ii) Assign suitable reasons for the following :
(a) SF_6 is inert towards hydrolysis.
(b) H_3PO_3 is diprotic.
(c) Out of noble gases only Xenon is known to form established chemical compounds.

Solution:
(i) (a) When chlorine gas reacts with cold and dilute solution of NaOH, NaOCl is formed.

$$2NaOH + Cl_2 \rightarrow NaCl + NaOCl + H_2O$$

(b) XeF_2 undergoes hydrolysis

$$2XeF_2(s) + 2H_2O(l) \rightarrow 2Xe(g) + 4HF(aq) + O_2(g)$$

(ii) (a) Sulphur is sterically protected by 6F-atoms and hence does not allow H_2O molecules to attack S-atom. Therefore SF_6 is inert to hydrolysis.

(b) H_3PO_3 is diprotic as 2 H-atoms are joined through oxygen atoms and are insoluble whereas the third H-atoms is linked to phosphorous directly and is non-ionisable.

(c) Only Xenon is known to form chemical compounds as it has least ionisation energy among noble gases and hence forms compounds easily.

Q. 277 (i) Considering the parameters such as bond dissociation enthalpy, electron gain enthalpy and hydration enthalpy, compare the oxidizing power of F 2 and Cl 2 .
(ii) Complete the following reactions :

(a) $\mathrm{Cu + HNO_3(dilute) \rightarrow}$

(b) $\mathrm{Fe^{3+} + SO_2 + H_2O \rightarrow}$

(c) $\mathrm{XeF_4 + O_2F_2 \rightarrow}$

Solution:
(i) Although e^- gain enthalpy of Fluorine is less negative than Chlorine but bond dissociation enthalpy of F-F is much lower than Cl-Cl and hydration enthalpy of F^- is much higher than Cl^-. These two factors more than compensate the less negative e^- gain enthalpy of F. Hence F_2 has higher electron potential than Cl_2 and hence is stronger oxidizing agent.

(ii) (a) $\mathrm{3Cu + 8HNO_3(dilute) \rightarrow 3Cu(NO_3)_2 + 2NO + 4H_2O}$

(b) $\mathrm{Fe^{3+} + SO_2 + H_2O \rightarrow 2F^{2+} + SO_4^{2-} + 4H^+}$

(c) $\mathrm{XeF_4 + O_2F_2 \rightarrow XeF_6 + O_2}$

Q. 278 (i) Give reasons :
(a) HCHO is more reactive than CH_3 -CHO towards addition of HCN.
(b) pKa of O_2 N–CH_2 –COOH is lower than that of CH_3 –COOH.
(c) Alpha hydrogen of aldehydes & ketones is acidic in nature.

(ii) Give simple chemical tests to distinguish between the following pairs of compounds :
(a) Ethanal and Propanal
(b) Pentan-2-one and Pentan-3-one

Solution:
(i) (a) HCHO is more reactive towards additions of HCN than CH_3CHO because of the electron releasing effect of CH_3 in CH_3CHO, electrophilicity of carbonyl carbon decreases.

(b) pKa of CH3COOH is more than NO20CH2COOh because CH3 is an electron releasing group, it decreases the acidic strength of carboxylate ion due to the increase of negative charge.

(c) α—Hydrogen of aldehyde and ketone is acidic in nature due to e^- withdrawing effect of -CO- group and resonance stabilization of releasing carbanion.

(ii) (a) Ethanal to Propanal

Ethanal on heating with NaOI gives yellow precipitate of iodoform.

$$CH_3CHO + NaOI \xrightarrow{\Delta} \underset{\text{Yellow}}{CHI_3} \downarrow + HCOONa$$

(b) Pentan-2-one and Pentan-3-one

Pentan-2-one is methyl ketone. Therefore on reaction with sodium hypoiodite gives yellow ppt of CHI_3.

$$CH_3CH_2CH_2\overset{\overset{O}{\|}}{C}CH_3 + NaOI \xrightarrow{\Delta} \underset{\text{Yellow}}{CHI_3} \downarrow + CH_3CH_2CH_2COONa$$

Q. 279 (i) Write the structure of the product(s) formed :

(a) $CH_3 - CH_2 - COOH \xrightarrow{Cl_2 \text{red phosphorus}}$

(b) $C_6H_5COCl \xrightarrow{H_2, Pd-BaSO_4}$

(c) $2HCHO \xrightarrow{\text{Conc.KOH}}$

(ii) How will you bring the following conversions in not more than two steps :
(a) Propanone to propene
(b) Benzyl chloride to phenyl ethanoic acid

Solution:

(i) (a) $CH_3 - CH_2 - COOH \xrightarrow{Cl_2 \text{red phosphorus}} CH_3\underset{Cl}{\underset{|}{C}}H - COOH$

(b)

$$C_6H_5COCl \xrightarrow{H_2, Pd-BaSO_4} C_6H_5 - CHO + HCl$$

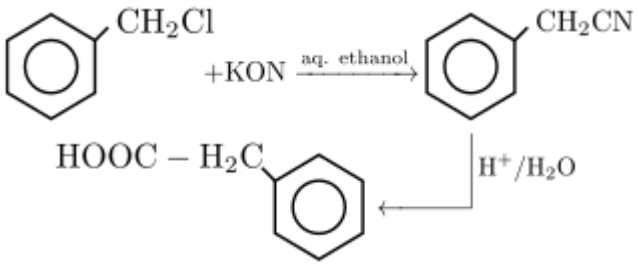
(c)

$$2HCHO \xrightarrow{\text{Conc.KOH}} HCOO^-Na^+ + CH_3 - OH$$

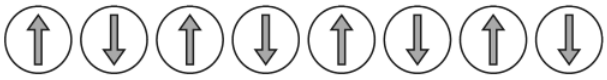
(ii) (a) Propanone to propene

$$CH_3COCH_3 + NaBH_4 \rightarrow CH_3\underset{Cl}{\underset{|}{C}}H - CH_3 \xrightarrow{conc.H_2SO_4,\ \Delta} CH_3CH = CH_2$$

(b) Benzyl chloride to phenyl ethanoic acid



Q. 280 (i) (a) Following is the schematic alignment of magnetic moments :



What type of magnetism is shown by this substance?

(b) What type of stoichiometric defect is shown by (i) KCl (ii) AgCl?

(ii) An element with density 11.2 g cm^{-3} forms a fcc lattice with edge length of $4 \times 10^{-8} cm$. Calculate the atomic mass of the element. ($N_A = 6.02 \times 10^{23} mol^{-1}$)

Solution:

(i) (a) Antiferromagnetism is shown by this substance

(b) (i) KCl - Schottky Effect

(ii) AgCl - Frenkel Effect

(ii) Edge $= 4 \times 10^{-8}$ cm

Volume $= (4 \times 10^{-8})^3$ cm^3

Density $= 11.2 g/cm^3$

$M = ?$

$$d = \frac{Z \times M}{z \times N_A}$$

In fcc, z = 4

$$M = \frac{11.2 \times (4 \times 10^{-8})^3 \times 6.02 \times 10^{23}}{4}$$

$$= 1078.78 \times 10^{-1}$$

$$= 107.878 g/mol$$

Q. 281 Silver metal crystallises with a face centred cubic lattice. The length of the unit cell is found to be $3.0 \times 10^{-8} cm$. Calculate atomic radius and density of silver.

(molar mass of Ag = 108 g mol^{-1}, $N_A = 6.02 \times 10^{23} \text{mol}^{-1}$)

Solution:

Edge $= 3 \times 10^{-8}$ cm

in fcc , z = 4

Atomic radius = ?

Density = ?

M of Ag = 108 g/mol

$$r = \frac{a\sqrt{2}}{4}$$

$$= \frac{3 \times 10^{-8\times}\sqrt{2}}{4}$$

$$= 1.06 \times 10^{-6}\ cm$$

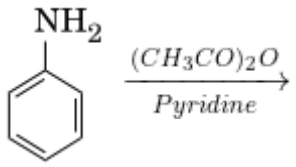
$$d = \frac{z \times M}{a^3 \times N_A}$$

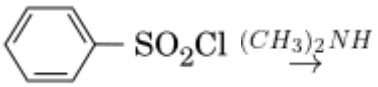
$$= \frac{4 \times 108}{(3 \times 10^{-8})^3 \times 6.02 \times 10^{23}}$$

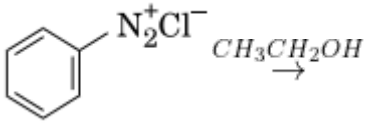
$$= 2.66 \times 10\ g/cm^3$$

$$= 26.6\ g/cm^3$$

Q. 282 (a) Write the structures of the main products of the following reactions :

(i) 

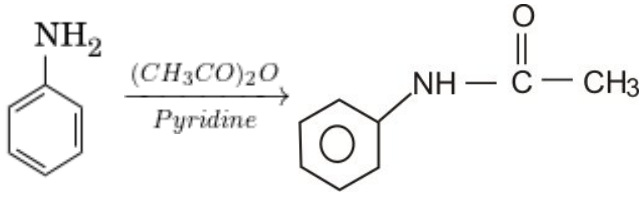
(ii) 

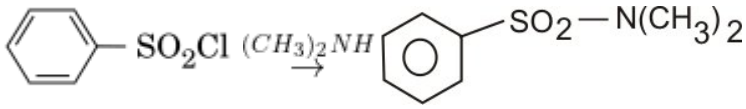
(iii) 

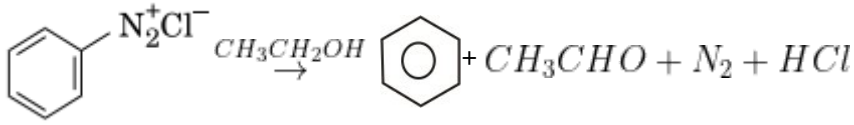
(b) Give a simple chemical test to distinguish between Aniline and N,N-dimethylaniline.

(c) Arrange the following in the increasing order of their pK_b values :
$C_6H_5NH_2, C_2H_5NH_2, C_6H_5NHCH_3$

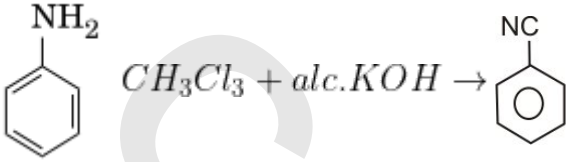
Solution:

(i) 

(ii) 

(iii) 

(b) Aniline and N-N dimethylaniline Aniline on reaction with choloform and alc. KOH gives bad smelling pheylisocyanide but N,N - dimethylaniline does not give this test.



(c) Increasing order of their pK_b values

$$C_2H_5NH_2 < C_6H_5NHCH_3 < C_6H_5NH_2$$

Q. 283 (a) Write the reactions involved in the following :

(i) Hofmann bromamide degradation reaction

(ii) Diazotisation

(iii) Gabriel phthalimide synthesis

(b) Give reasons :

(i) $(CH_3)_2NH$ is more basic than $(CH_3)_3N$ in an aqueous solution.

(ii) Aromatic diazonium salts are more stable than aliphatic diazonium salts.

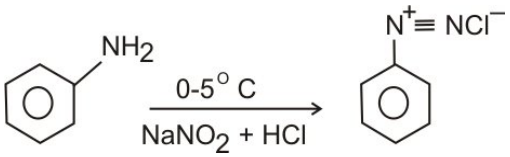
Solution:

(a)

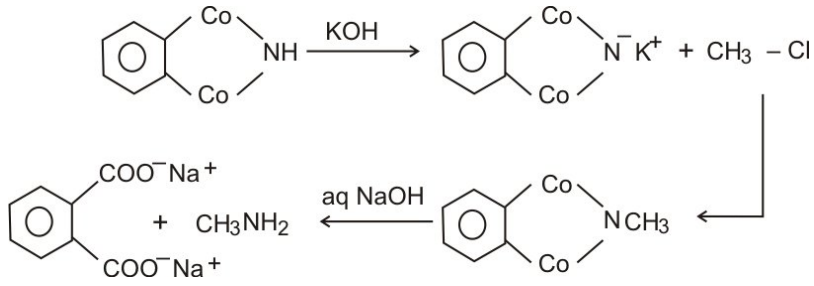
(i) Hofmann bromamide degradation reaction

$$CH_3CONH_2 + Br_2 + 4NaOH \rightarrow CH_3NH_2 + Na_2CO_3 + 2NaBr + 2H_2O$$

(ii) Diazotisation



(iii) Gabriel phthalimide synthesis



(b)

(i) $(CH_3)_2NH$ is more basic than $(CH_3)_3N$ in an aqueous solution because of N-H bond in $(CH_3)_2NH$ is forms hydrogen bonds in aqueous solution.

(ii) Aromatic diazonium salts are more stable than aliphatic diazonium salts because aromatic diazonium salts are resonance stabilized.

Q. 284 (a) For the reaction

$2AgCl(s) + H_2(g)(1atm) \rightarrow 2Ag(s) + 2H^+(0.1M) + 2Cl^-(0.1M)$, $\Delta G^\circ = -43600J$ at $25^\circ C$.

Calculate the e.m.f. of the cell.

$\left[\log 10^{-n} = -n\right]$

(b) Define fuel cell and write its two advantages.

Solution:

(a) $2AgCl(s) + H_2(g)(1atm) \rightarrow 2Ag(s) + 2H^+(0.1M) + 2Cl^-(0.1M)$, $\Delta G^\circ = -43600J$ at $25^\circ C$

emf = ?

n=2

$$\Delta G^\circ = -nFE^\circ_{cell}$$

$$E^\circ_{cell} = \frac{\Delta G^\circ}{nF} = \frac{-(-43600)}{2 \times 96487} = 0.2259V$$

$$E_{cell} = E^\circ_{cell} - \frac{0.0591}{n} \log \frac{[H^+]^2[Cl^-]^2}{pH_2}$$

$$E_{cell} = 0.2259 - \frac{0.0591}{2} \log \frac{(0.1)^2(0.1)^2}{1}$$

$$E_{cell} = 0.2259 - 0.02955 \log(10^{-4})$$

$$E_{cell} = 0.2259 - 0.02955 \log(-4)$$

$$E_{cell} = 0.3441V$$

(b) Fuel cell is an electrochemical cell which converts the chemical energy produced due to combustion of a fuel like hydrogen, methane etc. into electrical energy.

Advantages:-

- It has high efficiency (nearly 70%)
- It can cause continous generation of electricity.

Q. 285 (a) When concentrated sulphuric acid was added to an unknown salt present in a test tube a brown gas (A) was evolved. This gas intensified when copper turnings were added to this test tube. On cooling, the gas (A) changed into a colourless solid (B).

(i) Identify (A) and (B).

(ii) Write the structures of (A) and (B).

(iii) Why does gas (A) change to solid on cooling ?

(b) Arrange the following in the decreasing order of their reducing character :

HF, HCl, HBr, HI

(c) Complete the following reaction :

$$XeF_4 + SbF_5 \rightarrow$$

Solution:

(a) $Salt + conc.H_2SO_4 \rightarrow A\uparrow$

(brown)

$A \overset{cod}{\rightarrow} B$ (colourless soild)

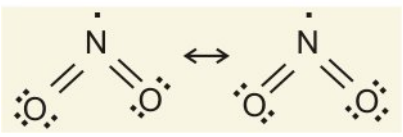
Gas A intensifies on addition of Cu.

(i) A = Nitrogen dioxide (NO_2)

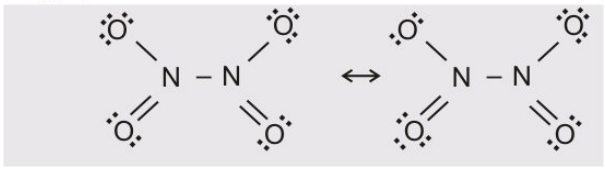
B= Dinitrogen dioxide (N_2O_4)

(ii) Structures

(NO_2)



(N_2O_4)



(iii) NO_2 change to solid on cooling as it changes to N_2O_4 which crystallizes as white soild.

(b)

Decreasing reducing character :

$$HCl, HI > HBr < HCl < HF$$

(c)

$$XeF_4 + SbF_5 \rightarrow [XeF_3]^+ [SbF_6]^-$$

Q. 286 Shyam went to a grocery shop to purchase some food items. The shopkeeper packed all the items in polythene bags and gave them to Shyam. But Shyam refused to accept the polythene bags and asked the shopkeeper to pack the items in paper bags. He informed the shopkeeper about the heavy penalty imposed by the government for using polythene bags. The shopkeeper promised that he would use paper bags in future in place of polythene bags.

Answer the following :

(a) Write the values (at least two) shown by Shyam.

(b) Write one structural difference between low-density polythene and high-density polythene.

(c) Why did Shyam refuse to accept the items in polythene bags ?

(d) What is a biodegradable polymer ? Give an example.

Solution:

(a) Values shown are preserverance (for nature), responsibility and compassion.

(b) High density polythene is a linear polymer which consist of long chains of polymer molecules. Whereas low density polythene is a branch chain polymer which contains branches along the main chain.

(c) Shyam refused to accept polythene bags because it is non-biodegrable substance which do not degrade in soil and cause pollution.

(d) Biodegradable polymers are those which degrade enzymatically These polymers contain functinal groups similar to those present in biopolymers.

Ex - Nylon-2-Nylon-6

Q. 287 (a) Write the formula of the following coordination compound :

Iron(III) hexacyanoferrate(II)

(b) What type of isomerism is exhibited by the complex $[Co(NH_3)5Cl]SO_4$?

(c) Write the hybridisation and number of unpaired electrons in the complex $[CoF_6]^{3-}$. (Atomic No. of Co = 27)

Solution:

(a)

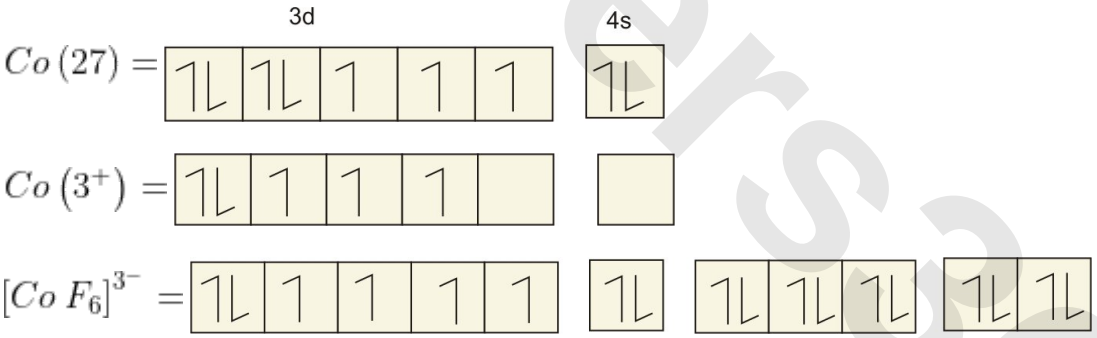
$Fe_4\,[Fe(CN)_6]_3$

(b)

Ionization isomerism is shown by $[Co(NH_3)5Cl]SO_4$.

(c)

$[CoF_6]^{3-}$



Hybridization sp^3d^2

Number of unpaired electrons = 4

Q. 288 (a) Write the product when D-glucose reacts with conc. HNO_3.

(b) Amino acids show amphoteric behaviour. Why ?

(c) Write one difference between α-helix and β-pleated structures of proteins.

Solution:

(a) D- Glucaric acid is formed when D-Glucose reacts with conc. HNO_3.

(b) Amino acids show amphoteric behaviour in zwitter ionic form i.e. when thet contain both positive and negative charges and hence react with both acids and bases.

(c) In α-helix form of proteins a polypeptide chain forms all possible H-bonds by twisting into a right handed screw with -NH group of each amino acid residue H-bonded to -CO- group of adjacent turn of helix.

Whereas in β-pleated structure, all peptide chains are stretched out of nearly maximum extension and then laid side - by -side which are held together by intermolecular H-bonds which resembles the pleated folds of drapery.

Q. 289 Define the following with an example of each :

(a) Polysaccharides

(b) Denatured protein

(c) Essential amino acids

Solution:
(a) Polysaccharides are carbohydrates which yield many molecules of monosacchrides on hydrolysis.

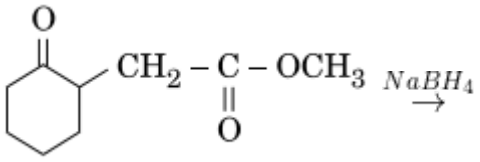
Example- Starch, cellulose

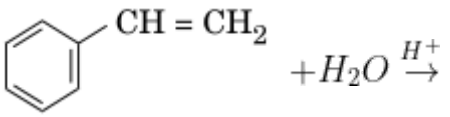
(b) Denatured protein is the one which is subjected to physical change like change in temperature or chemical cahnge like change in pH, the hydrogen bonds are disturbed due to which globules unfold and helix get uncoiled and protein loses its biological activity.

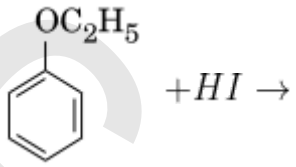
(c) Essential amino acids are those which are not synthesized in our body and hence must be supplied in our diet from outside.

Example - Valine

Q. 290 Write the structures of the main products in the following reactions:

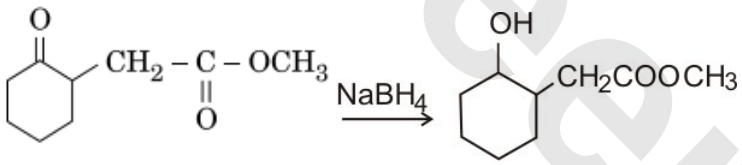
(i) 

(ii) 

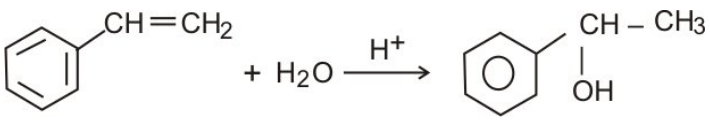
(iii) 

Solution:

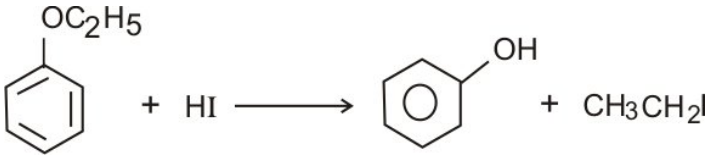
(i)



(ii)



(iii)



Q. 291 (A), (B) and (C) are three non-cyclic functional isomers of a carbonyl compound with molecular formula C_4H_8O. Isomers (A) and (C) give positive Tollens' test whereas isomer (B) does not give Tollens' test but gives positive Iodoform test. Isomers (A) and (B) on reduction with Zn(Hg)/conc. HCl give the same product (D).

(a) Write the structures of (A), (B), (C) and (D).

(b) Out of (A), (B) and (C) isomers, which one is least reactive towards addition of HCN ?

Solution:

- A,B , C = non-cyclic functional isomers of carbonyl compound C_4H_8O.
- Since A and C gives Tollen's reagent

$\therefore$ A and C = Aldehydes or formic acid

(have $-\overset{\overset{O}{\|}}{C}-$ bond (terminal))

- B gives Iodoform test

$\therefore$ B= methyl ketone $\left(CH_3-\overset{\overset{O}{\|}}{C}-\right)$

- A and B undergoes reduction to give D $\therefore$ A = aldehyde

(a) A = $CH_3CH_2CH_2CHO$

$B = CH_3COCH_2CH_3$

$C = HCOOH$

$D = CH_3CH_2CH_2CH_3$

(b) C which is HCOOH is least reactive towards addition of HCN.

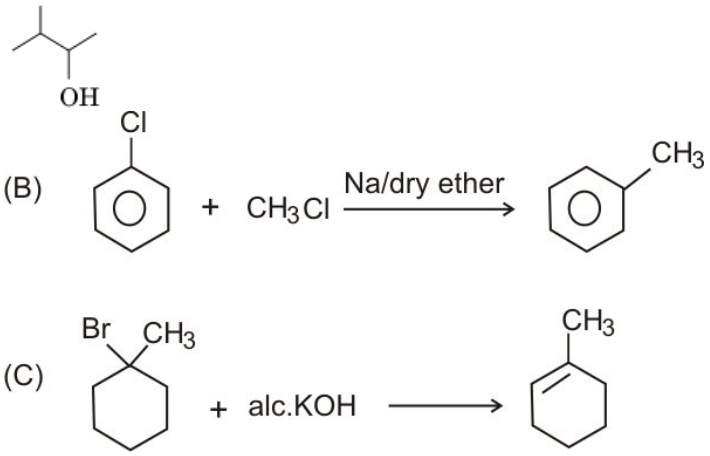
Q. 292 (a) Identify the chiral molecule in the following pair :

(i) (ii)

(b) Write the structure of the product when chlorobenzene is treated with methyl chloride in the presence of sodium metal and dry ether.

(c) Write the structure of the alkene formed by dehydrohalogenation of 1-bromo-1-methylcyclohexane with alcoholic KOH

Solution:
(a) Chiral molecule



Q. 293 Give reasons :

(a) E° value for Mn^{3+}/Mn^{2+} couple is much more positive than that for Fe^{3+}/Fe^{2+}.

(b) Iron has higher enthalpy of atomization than that of copper.

(c) Sc^{3+} is colourless in aqueous solution whereas Ti^{3+} is coloured.

Solution:
(a) E° value for Mn^{3+}/Mn^{2+} couple is much more positive than that for Fe^{3+}/Fe^{2+} because Mn^{2+} is more stable than Mn^{3+} as it has $3d^5$ configuartion which is extra stable half filled donfiguration.

(b) Iron has higher enthalpy of atomization than that of copper because number of unpaired electrons is more in Fe than Cu therefore having weak metallic bonds.

(c) Sc^{3+} is colourless in aqueous solution whereas Ti^{3+} is coloured because Sc^{3+} does not have unpaired electron but Ti^{3+} has i unpaired electron.

Q. 294 What happens when

(a) a freshly prepared precipitate of $Fe(OH)_3$ is shaken with a small amount of $FeCl_3$ solution ?

(b) persistent dialysis of a colloidal solution is carried out ?

(c) an emulsion is centrifuged ?

Solution:
(a) When freshly precipitate $FeCl_3$ is added to freshly prepared $Fe(OH)_3$ solution peptization occurs and common ion which is Fe^{3+} is adsorbed and precipitates get change.

(b) When presisent dialysis of colloidal solution is carried out, it becomes unstable and ultimaltely congulate.

(c) When emulsion is centrifuged, it gets seprated into constituent liquids.

Q. 295 A first order reaction is 50% completed in 40 minutes at 300 K and in 20 minutes at 320 K. Calculate the activation energy of the reaction. (Given : log 2 = 0·3010, log 4 = 0·6021, R = 8·314 JK^{-1} mol^{-1})

Solution:

$$k_{50} = 40min \Rightarrow 40 = \frac{0.693}{k_1}$$

at T = 300K

$k_{50} = 20min$ at 320K$\Rightarrow \frac{0.693}{k_2}$

R = 8·314 JK^{-1} mol^{-1}

$$E_a = ?$$

1st order reaction

$$\frac{k_2}{k_1} = \frac{\frac{0.693}{20}}{\frac{0.693}{40}} = \frac{40}{20} = 2$$

$$\log \frac{k_2}{k_1} = \frac{E_a}{2.303R}\left(\frac{T_2 - T_1}{T_1 T_2}\right)$$

$$\log 2 = \frac{E_a}{2.303 \times 8.314}\left(\frac{320 - 300}{320 \times 300}\right)$$

$$E_a = \frac{0.3010 \times 2.303 \times 8.314 \times 320 \times 300}{20}$$

$$E_a = 27764J$$

Q. 296 An element 'X' (At. mass = 40 g mol^{-1}) having f.c.c. structure, has unit cell edge length of 400 pm. Calculate the density of 'X' and the number of unit cells in 4 g of 'X'.
$(N_A = 6.022 \times 10^{23} mol^{-1})$

Solution:

At mass 40g mol^{-1}

fcc structure , z =4

edge = 400pm,

$$N_A = 6.022 \times 10^{23} mol^{-1}$$

density = ?

no. of unit cells = ?

Mass = 4g

Volume = $(400pm)^3$

$= (400 \times 10^{-10} cm)^3$

$= 64 \times 10^{-24} cm^3$

Mass of atom of 4g $= \frac{40}{6.022 \times 10^{23}} \times 4$

$= 26.569 \times 10^{-23}$

Density = $= \frac{26.567 \times 10^{-23}}{64 \times 10^{24}} = 4.15 gcm^3$

No. of unit cells $= \frac{4}{26.567 \times 10^{-23}} = 1.5 \times 10^{-22}$

Q. 297 Give reasons for the following :

(a) Measurement of osmotic pressure method is preferred for the determination of molar masses of macromolecules such as proteins and polymers.

(b) Aquatic animals are more comfortable in cold water than in warm water.

(c) Elevation of boiling point of 1 M KCl solution is nearly double than that of 1 M sugar solution

Solution:

(a) Measurement of osmotic pressure method is preferred for the determination of molar masses of macromolecules such as proteins and polymers because the magnitude of osmotic pressure is large even for very dilute solution and it can be measured at room temperature.

(b) Aquatic animals are more comfortable in cold water than warm water since availability of dissolved air is more as increase in temperature decreases solubility.

(c) Elevation of boiling point of 1M KCl solution is nearly double than 1M sugar solution, this is because KCl dissociates in solution as $K^+ and Cl^-$.

Q. 298 Complete and balance the following chemical equations :

(a) $Fe^{2+} + MnO_4^- + H^+ \rightarrow$

(b) $MnO_4^- + H_2O + I^- \rightarrow$

Solution:
(a)

$$5Fe^{2+} + MnO_4^- + H^+ \rightarrow Mn^{2+} + 5Fe^{3+} + 4H_2O$$

(b)

$$2MnO_4^- + H_2O + I^- \rightarrow MnO_2 + IO^{3-} + 2OH^-$$

Q. 299 Account for the following :

(a) Aromatic carboxylic acids do not undergo Friedel-Crafts reaction.

(b) pK_a value of 4-nitrobenzoic acid is lower than that of benzoic acid.

Solution:
(a) Aromatic carboxylic acid do not undergo Friedel Crafts reaction because of deactivating nature of -COOH group and the catalyst $AlCl_3$ gets bonded to -COOH.

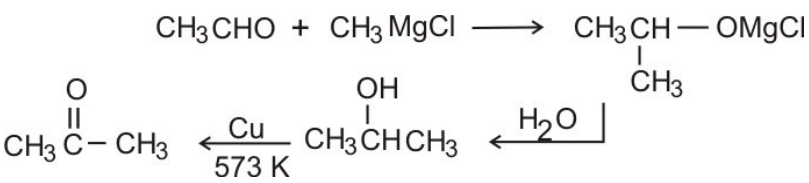
(b) pK_a value of 4-nitrobenzoic acid is lower than that of benzoic acid because $-NO_2$ is an electron withdrawing group, it increases the acidic strength of carboxylic acids by stabilizing the carboxylate ion due to dispersal of negative charge.

Q. 300 How do you convert the following ?

(a) Ethanal to Propanone

(b) Toluene to Benzoic acid

Solution:
(a) Ethanal to Propanone



(b) Toluene to Benzoic acid

$$C_6H_5-CH_3+KMnO_4\xrightarrow[\Delta]{KOH}C_6H_5-COO^-K^+\xrightarrow[H_2O]{H^+}C_6H_5-COOH$$

Q. 301 Among the hydrides of Group-15 elements, which have the

(a) lowest boiling point ?

(b) maximum basic character ?

(c) highest bond angle ?

(d) maximum reducing character ?

Solution:
(a) lowest boiling point = PH_3

(b) maximum basic character = NH_3

(c) highest bond angle = NH_3

(d) maximum reducing character = BiH_3

Q. 302 For the reaction $2N_2O_5(g)\rightarrow 4NO_2(g)+O_2(g)$),

the rate of formation of $NO_2(g)$ is $2.8\times10^{-3}Ms^{-1}$. Calculate the rate of disappearance of $N_2O_5(g)$

Solution:
$2N_2O_5(g)\rightarrow 4NO_2(g)+O_2(g)$),

the rate of formation of $NO_2(g)$ = $2.8\times10^{-3}Ms^{-1}$

rate of disappearance of $N_2O_5(g)$ =?

Rate = $\frac{1}{4}\left(\frac{\Delta[NO_2]}{\Delta t}\right)=2.8Ms^{-1}$

$=\frac{1}{2}\left(\frac{\Delta[N_2O_5]}{\Delta t}\right)=\frac{1}{4}\left(\frac{\Delta[NO_2]}{\Delta t}\right)$

$=\left(\frac{\Delta[N_2O_5]}{\Delta t}\right)=\frac{1}{4}\times2.8\times10^{-3}\times2=0.0014=1.4\times10^{-3}Ms^{-1}$

Q. 303 Calculate the freezing point of a solution containing 60 g of glucose (Molar mass = 180 g mol^{-1}) in 250 g of water. (K_f of water = 1·86 K kg mol^{-1})

Solution:

$T_f = ?$

Weight of glucose = 60g

Weight of water = 250g

K_f of water = 1·86 K kg mol^{-1}

Molar mass = 180 g mol^{-1}

$$\Delta T_f = K_f \times m$$

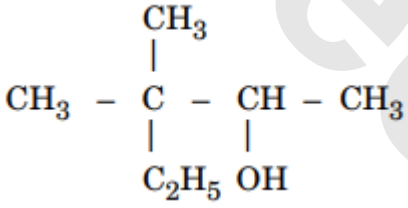
$$\Delta T_f = 1.86 \times \frac{60}{180} \times \frac{1000}{250} = 2.48K$$

$$\Delta T_f = T_f^\circ - T_f$$

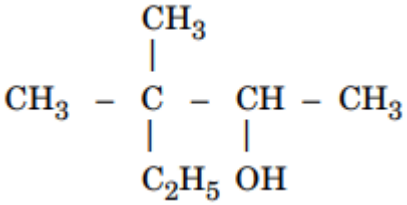
$$T_f = T_f^\circ - \Delta T_f$$

$$T_f = 273.15 - 2.48 = 270.67K$$

Q. 304 Write the IUPAC name of the following:



Solution:



3-Dimethylpentan-2-ol

Q. 305 Out of chlorobenzene and benzyl chloride, which one gets easily hydrolysed by aqueous NaOH and why ?

Solution:

Benzyne chloride will be easily hydrolized by NaOH because benzyl carbocation is resonance stabilised and there develops a partial double bond in chlorobenzene due to which substitution of chlorine becomes difficult.

Q. 306 Write the coordination number and oxidation state of Platinum in the complex $[Pt(en)_2Cl_2]$.

Solution:
$[Pt(en)_2Cl_2]$

Coordination number = 6

Oxidation number = +2

Q. 307 CO (g) and H_2 (g) react to give different products in the presence of different catalysts. Which ability of the catalyst is shown by these reactions ?

Solution:
CO (g) and H_2 (g) react to give different products in the presence of different catalysts, this shows selectivity of catalysts.

Q. 308 Analysis shows that FeO has a non-stoichiometric composition with formula $Fe_{0.95}O$. Give reason.

Solution:
FeO has a non-stoichiometric composition with formula $Fe_{0.95}O$ because of metal deficiency defect some Fe^{2+} cations are missing and loss of positive charge is made up by the presence of Fe^{3+} ions.

Q. 309 Write the chemical reactions involved in the process of extraction of Gold. Explain the role of dilute NaCN and Zn in this process.

Solution:
Reactions involved in extraction of gold
$4Au+8CN^-+2H_2O+O_2 \rightarrow 4\left[Au(CN)_2\right]^-+4OH^-2\left[Au\left(CN\right)_2\right]^-+Zn \rightarrow \left[Zn(CN)_4\right]^{2-}+2Au$

Dilute NaCN is added as a reagent which is selectively dissolves the ore but not the impurities and zinc is added to obtain metal by reducation.

Q. 310 Out of $NaCl$ and $AgCl$, which one shows Frenkel defect and why?

Solution:
$AgCl$ shows Frenkel defect because of the small size of Ag^+ ion, it can easily fit in the interstitial sites while Na^+ can not as it is bigger in size.

Q. 311 Arrange the following in increasing order of boiling points :

$(CH_3)_3N, C_2H_5OH, C_2H_5NH_2$

Solution:
$(CH_3)_3N < C_2H_5NH_2 < C_2H_5OH$

Alcohols have a higher boiling point as compared to that of amines because oxygen, being more electronegative, forms stronger hydrogen bond as compared to that of nitrogen.

In tertiary amines, there is no hydrogen to form hydrogen bond and hence, has the lowest boiling point.

Q. 312 Why are medicines more effective in colloidal state?

Solution:
Medicines are more effective in colloidal sate because colloids have a larger surface area. Thus, they get easily assimilated, absorbed and digested by the body.

Q. 313 What is difference between an emulsion and a gel?

Option 1:

Option 2:

Option 3:

Option 4:

Solution:
A colloidal solution in which both the dispersed phase and dispersion medium are liquid is called an emulsion eg Milk, Hair Cream, while gel is a kind of colloid in which the dispersed phase is liquid and dispersion medium is solid, eg Cheese, Butter, Jellies etc.

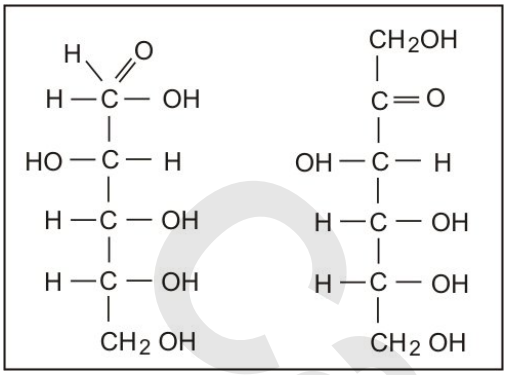
Q. 314 Define ambidient nucleophile with an example.

Solution:
The nucleophiles ie electron rich species with two nucleophilic centres are called ambident nucleophiles.

For eg, Cynide $[C \equiv N :]$. There are two nucleophile centres at carbon and nitrogen

Q. 315 What is the basic structural difference between glucose and fructose?

Solution:
Both glucose and fructose are hexose sugars. Glucose is an aldohexose containing $-CHO$ group, while Fructose is a ketohexose, containing ketone ($-C=O$) group.



Q. 316 Write the products obtained after hydrolysis of lactose.

Solution:
On hydrolysis, lactose yields an equimolar mixture of D-Glucose and D-Galactose

Q. 317 Write balanced chemical equations for the following processes :

1. XeF_2 undergoes hydrolysis.
2. MnO_2 is heated with conc. HCl.

Solution:
1. $2XeF_{2(s)} + 2H_2O_{(l)} \rightarrow 2Xe_{(g)} + 4HF_{(aq)} + O_{2(g)}$
2. $MnO_2 + 4HCl \rightarrow MnCl_2 + 2H_2O + Cl_2$

Q. 318 Arrange the following in order of property indicated for each set :

1. H_2O, H_2S, H_2Se, H_2Te – increasing acidic character
2. HF, HCl, HBr, HI – decreasing bond enthalpy

Solution:
1. $H_2O < H_2S < H_2Se < H_2Te$ [Acidic Character]
2. $HF > HCl > HBr > HI$ [Bond Enthalpy]

Q. 319 State Raoult's law for a solution containing volatile components. Write two characteristics of the solution which obeys Raoult's law at all concentrations.

Solution:

In a solution, the vapour presence of a compound at a given temperature is equal to the mole fraction of that compound in the solution multiplied by the vapour pressure of that component in the pure state.

Let's consider a mixture of two volatile liquids A & B, having mole fraction x_A & x_B and partial vapour pressure p_A & p_B, and p_A^o, p_B^o be their vapour pressure in the pure state respectively.

$$p_A = x_A p_A^o \qquad p_B = x_B p_B^o$$

$$p = p_A + p_B$$

$$= x_A p_A^o + x_B p_B^o$$

$$= (1 - x_B) p_A^o + x_B p_B^o$$

$$p = (p_B^o - p_A^o) x_B + p_A^o$$

The two characteristics of the solution which obeys Rault's law at all concentrations are as:

1. $\Delta H_{mix} = 0$, ie the enthalpy of mixing of pure components to form the solution should be zero.
2. $\Delta V_{mix} = 0$, the volume of mixing pure components should be zero.

Q. 320 For a reaction

$$2H_2O_2 \xrightarrow[\text{alkaline medium}]{I^-} 2H_2O + O_2$$

the proposed mechanism is as given below :

1. $H_2O_2 + I^- \rightarrow H_2O + I^-O \ (slow)$
2. $H_2O_2 + I^O- \rightarrow H_2O + I^+O_2 \ (fast)$

(i) Write rate law for the reaction

(ii) Write the overall order of reaction.

(iii) Out of steps a and 2, which one rate determining step?

Solution:

(i) Rate law:

$$\text{Rate} = -\frac{1}{2}\frac{d[H_2O_2]}{dt} = k[H_2O_2][I^-]$$

(ii) Order w.r.t $H_2O_2 = 1$

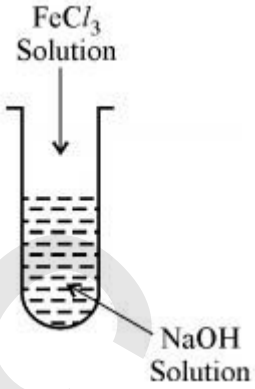
Order w.r.t $[I^-] = 1$

Overall order = 2

(iii) Step 1 is the rate determining step as it is the slowest step.

Q. 321 (i) What is the role of activated charcoal in gas mask?

(ii) A colloidal sol is prepared by the given method in the figure.What is the charge on hydrated ferric oxide collodial particles formed in the test tube? How is the sol represented?



(iii) How does chemisorption vary with temperature?

Solution:

(i) Activated charcoal in gas mask adsorbs poisonous gases.

(ii) Negative charge ; $Fe_2O_3.xH_2O/OH^-$

(iii) Chemisorption initally increases then decreases as the temperature increases.It is due to the fact that heat supplied intially acts as activation energy.The decrease afterwards is due to the exothermic nature of adfsorption equilibrium.

Q. 322 An element crystallizes in fcc lattice with cell edge of 300 pm. The density of element is $10.8gcm^{-3}$. Calculate the number of atoms in 108g of the element.

Solution:

Given:

FCC lattice, $Z = 4$

$\rho = 10.8gcm^{-3}$

$a = 300pm = 300 \times 10^{-10}cm$

$$\rho = \frac{z \times M}{a^3 \times N_A}$$

$$M = \frac{\rho \times a^{3 \times N_A}}{z}$$

$$= \frac{10.8 \times (300 \times 10^{-10}) \times 6.022 \times 10^{23}}{4} = 175.6g$$

$$n = \frac{108}{175.6} = 0.615mol$$

1 mol contains → n_A atoms

0.615 mol → $0.615 \times N_A = 14.81 \times 10^{23} atoms$

Q. 323 (a) Name the method of refining which is

(i) used to obtain semiconductor of high purity

(ii) used to obtain low boiling point

(b) Write chemical reactions taking place in the extraction of copper from Cu_2S.

Solution:

(a) (i) Zone refining

(ii) Distillation

(b) The steps involved in the exttraction of copper from Cu_2S are:

$$Cu_2S(s) + 3O_2(g) \rightarrow 2Cu_2O(s) + 2SO_2(g)$$

$$2Cu_2O(s) + Cu_2S(s) \rightarrow 6Cu(s) + SO_2(g)$$

This process is known as autareduction.

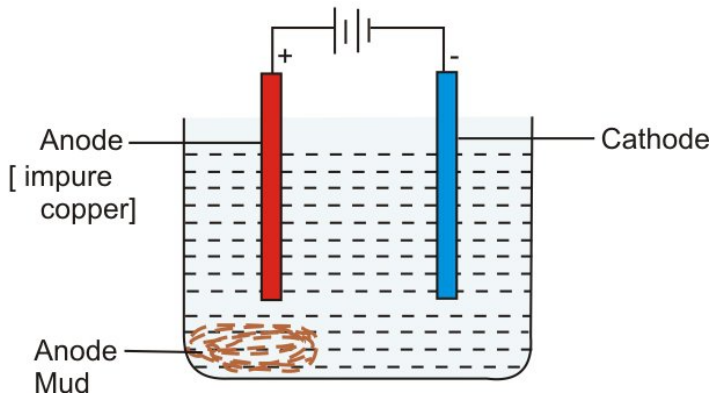
The copper obtained here is impure.It is refined by electrolytic refining.

At cathode:

$$Cu^{2+}(aq) + 2e^- \rightarrow Cu(s)$$

At anode:

$$Cu(s) \rightarrow Cu^{2+} + 2e^-$$



Q. 324 Give reasons for the following:

(i) Transition elements and their compounds act as catalysts.

(ii) E° value for $\left(Mn^{2+}/Mn\right)$ is negative whereas for $\left(Cu^{2+}/Cu\right)$ is positive.

(iii) Actinoids shows irregularities in their electronic confriguration.

Solution:

(i) The different reasons as to why transition elements act as catalysts are given as follows:

(a) Due to the presence of unpaired electrons in their incomplete d - orbitals and hence possess the capacity to absorbs and re - emit wide range of energies. This makes the required energy of activation available.

(b) In number of cases the transition metal provides a suitable large surface area with free valencies on which the reactants are absorbed.

(ii) E° value for Mn^{2+}/Mn is negative due to extra stability of half filled 3d- orbitals of $Mn^{2+}(3d^5)$ whereas E° value for Cu^{2+}/Cu is positive because the high energy to transform $\left[Cu \rightarrow Cu^{2+}\right]$ is not balanced by low hydration energy.

(iii) The irregularities in the electronic configuration of the actinoids is due to the extra stability of the $f^{\circ}, f^{5} and f^{10}$ in 5-f orbitals.

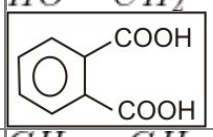
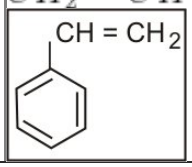
Q. 325 Write the structures of monomers used for getting the following polymers:

(i) Nylon - 6,6

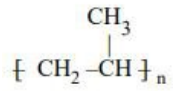
(ii) Glyptal

(iii) Buna - S

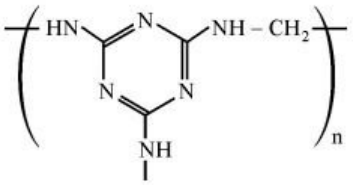
Solution:

Polymers	Monomers	Structure
Nylon 6,6	Hexamethylene diamineAND Acipic acid	$NH_2-(CH_2)_6-NH_2 and HOOC-(CH_2)_4-COOH$
Glyptal	Ethylene Glycol and Phtalic acid	$HO-CH_2-CH_2-OH$ and 
Buna- S	1,3 - Butadiene and Styrene	$CH_2=CH-CH=CH_2$ and 

Q. 326

(i) Is  a homopolymer or copolymer?Give reasons.

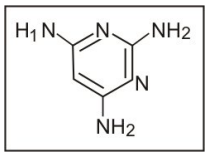
(ii) Write monomers of the following polymers:

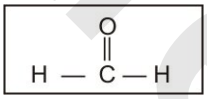


(iii) What is the role of Sulphur in vulcanization of rubber?

Solution:
(i) Homopolymer as it contains only one type of monomer unit.

(ii) Melamine and Formaldehyde





(iii) During vulcanization, Sulphur is added to the rubber as it forms cross - links between polymers chains thereby imparting more tensile strength, elasiticity and resistance to abration.

Q. 327

(i) What type of drug is used in sleeping pills?

(ii) What type of detergents are used in toothpaste?

(iii) Why the use of alitame as artificial sweetner is not recommended?

Solution:
(i) Tranquillisers

(ii) Anionic detergents

(iii) Altane is not recommendable as it is high potent artificial sweetner, its sweetness is difficult to control.

Q. 328

Define the following terms with a suitable example in each:

(i) Broad - spectrum antibiotics

(ii) Disinfectants

(iii) Cationic detergents

Solution:

(i) Antibiotics that are effective aganist a wide-range of gram - positive and gram - negative bacteria are known as broad - spectrum antibiotics, for eg. Chloramphenicol.

(ii) Disinfectants are chemical substances which kill micro - organisms but are not safe to be applied to the living tissues. Fir eg. Boric acid, Bithional, savlon, Dettol, etc.

(iii) Cationic Detergents: The detergents in which cations are major part of their molecules and are involved in the cleansing action. These are quartenary ammonium salts of amines with acetates , chlorides or bromides. for eg. Cetyltrimethylammonium bromide.

Q. 329

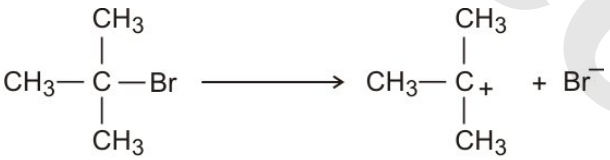
(i) Out of $(CH_3)_3C-Br$ and $(CH_3)_3C-I$, which one is more reactive towards S_N1 and why?

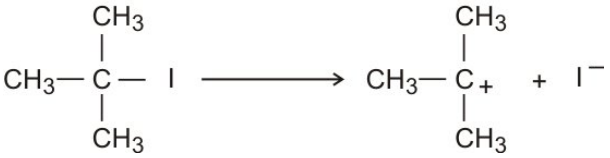
(ii) Write the product formed when p-nitrochlorobenzene is heated with aqueous NaOH at 443K followed by acidification?

(iii) Why *dextro* and *laevo* - rotatory isomers of butan - 2-ol are difficult to seprate by fractional distillation?

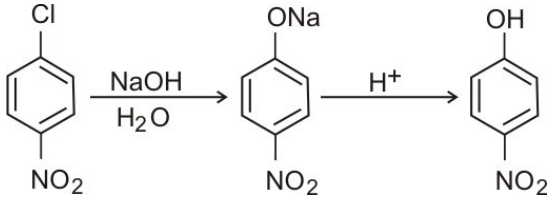
Solution:

(i) $(CH_3)_3I$, beacuse I^- is a better leaving group than Br^-.





(ii)



(iii) Dextro and Laevo- rotatory isomers of butan-2-ol are difficult to seprate by fractional distillation due to their identical boiling points.

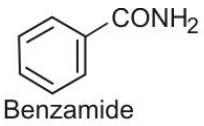
Q. 330

An aromatic compound 'A' on heating with Br_2 and KOH forms compound 'B' of molecular formula C_6H_7N which on reacting with $CHCl_3$ and alcoholic KOH produces a foul smelling compound 'C'. Write the structures and IUPAC names of compound A,B and C.

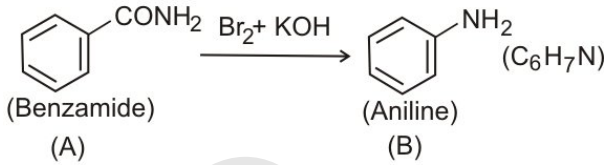
Solution:

The reagents Br_2 with KOH is used in HOffmann reaction.

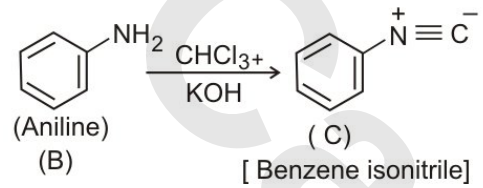
'A' should be amine $C_6H_7N + CO \rightarrow C_7H_7NO$



Benzamide

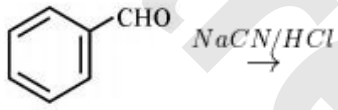


(Benzamide) (A) (Aniline) (B)

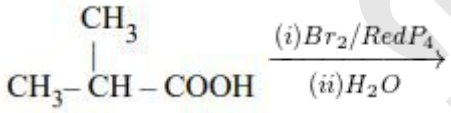


(Aniline) (B) (C) [Benzene isonitrile]

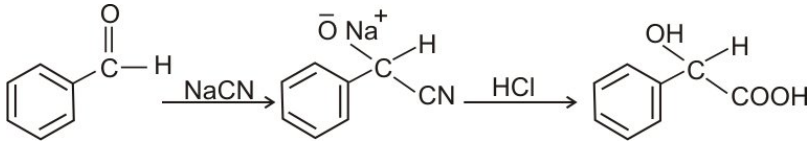
Q. 331

(i) 

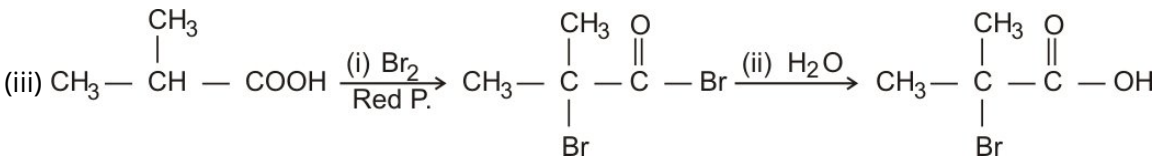
(ii) $(C_6H_5CH_2)_2\,Cd + 2CH_3COCl \rightarrow$

(iii) 

Solution:

(i) 

(ii) $(C_6H_5CH_2)_2\,Cd + 2CH_3COCl \rightarrow 2C_6H_5CH_2COCH_3 + CdCl_2$

(iii) 

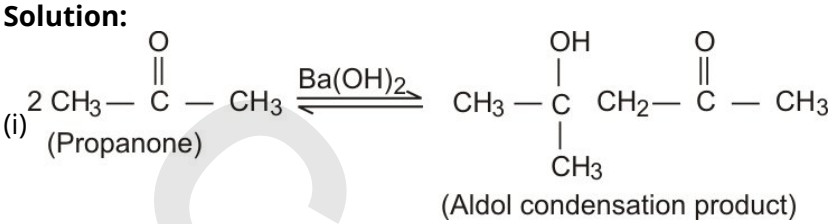
Q. 332 Write chemical equations for the following reactions:

(i) Propane is treated with dilute $Ba(OH)_2$.

(ii) Acetophenone is treated with $Zn(Hg)/Conc.HCl$.

(iii) Benzoyl chloride is hydrogenated in presence of $Pd/BaSO_4$.

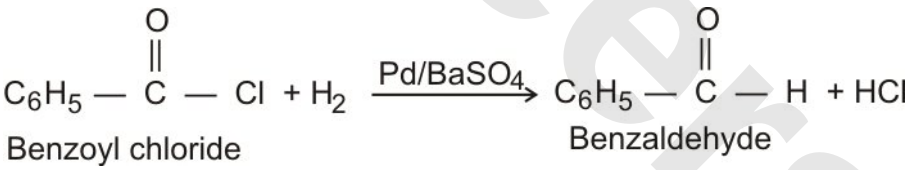
Solution:

(i) 

(ii) Clemmenser reaction

$$C_6H_5COCH_3 + 4[H] \xrightarrow[\Delta]{Zn-Hg+Conc,HCl} C_6H_5CH_2CH_3 + H_2O$$

(iii) Rosenmund reaction



Q. 333 Differentiate between the following:

(i) Amylose and Amylopectin

(ii) Peptide linkage and Glycosidic linkage

(iii) Fibrous proteins and Globular proteins

Solution:

(i) Amylose consists of 200 -1000 D - glucopyramose units connected in $\alpha-$ linkage between C1 of one unit and C4 of the next water insoluble amylopectin has similar structure to that of amylose except that the chains are branched.

(ii) The bond connecting the amino acids in a protein is commonly called a peptide linkage or peptide bond. It is an amide bond formed between -COOH and $-NH_2$.

(iii)

Fibrous proteins	Globular proteins

(i) Consists of linear thread like molecules which tend to lie side by side to form fiber like structure.	(i) Polypeptide chain is folded, around itself forming almost spheroidal shape.
(ii) Insoluble in water.	(ii) Soluble in water.
(iii) eg. Keratin in hair	(iii) eg. Albumin in eggs, insulin.

Q. 334 Write chemical reactions to show that open structure D-glucose contains the following:

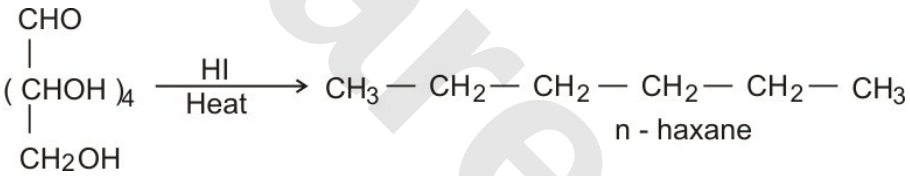
(i) Straight chain

(ii) Five alcohol groups

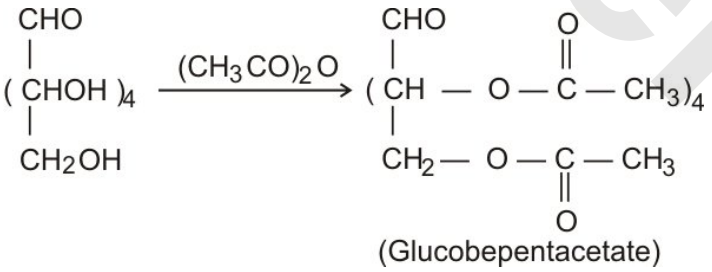
(iii) Aldehyde as carbonyl group

Solution:

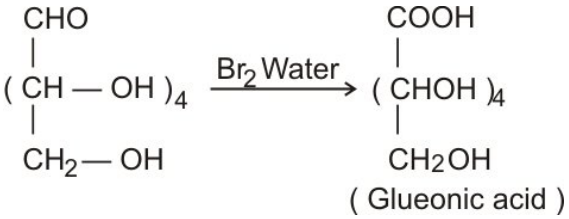
(i) Glucose reacts with HI to form n - hexane indicating that the six carbons are linked in straight chain.



(ii) Glucose gives pentacetate derivative on acetylation with acetic anhydride. This confirms the presence of five -OH groups.



(iii)



This indicates that the carbonyl group is present as an aldehyde group.

Q. 335 E°_{cell} for the given redox reaction is 2.71 V.

$$Mg(s) + Cu^{2+}_{(0.01M)} \rightarrow Mg^{2+}_{(0.001M)} + Cu(s)$$

Calculate E_{cell} for the reaction. Write the direction of flow of current when external opposite potential is applied us:

(i) less than 2.71V

(ii) greater than 2.71V

Solution:
According to Nernst equation

$$E_{cell} = E^{\circ}_{cell} - \frac{2.303RT}{nF}\log\frac{C_2}{C_1}$$

$$E_{cell} = 2.71 - \frac{2.303 \times 8.314 \times 298}{2 \times 96500}\log\frac{0.001}{0.01}$$

$$E_{cell} = 2.74V$$

(i) When an external opposite potential is applied less than 2.71V, the direction of flow of current would remain same.

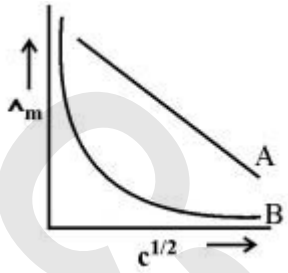
(ii) When an external opposite potenial is applied more than 2.71V, the direction of flow of current would be reversed.

Q. 336

(a) Steady current of 2 amperes was passed through two electrolytic cells X and Y connected in series containing electrolytes $FeSO_4$ and $ZnSO_4$ untill 2.8g of Fe deposited at the cathode of cell X. How long did the current flow? Calculate the mass Zn deposited at the cathode of cell Y.

(molar mass : Fe = 56 g mol^{-1}, Zn = 65.3 g mol^{-1}, 1F = 96500C mol^{-1})

(b) In the plot of molar conductivity$(\wedge_m)$ vs square root concentration $(c^{\frac{1}{2}})$, following curves are obtained for two electrolytes A and B:



Answer the following:

(i) Predict the nature of electrolyte A and B.

(ii) What happens on extrapolation of $\wedge_m$ to concentration approaching zero for electrolytes A and B?

Solution:

(a) According to faraday's first law

$$2.8 = \frac{56 \times 2 \times t}{2 \times 96500} = 48253 = 80mins41secs$$

weight of Zn deposited = $\frac{65.3}{2 \times 96500} \times 2 \times 4825 = 3.265g$

(b) (i) 'A' represents the strong electrolyte whereas 'B' represents the weak electrolyte.

(ii) For strong electrolyte A, as the concentration approaches zero value, the molar conductance approahces a limiting value called molar conductance at infinite diution.

For weak electrolyte B, it is rectangular hyerbola and does not intercept Y-axis, the value cannot be calculated.

Q. 337 (a) How do you convert the following:

(i) Phenol to anisole

(ii)Ethanol to Propan-2-ol

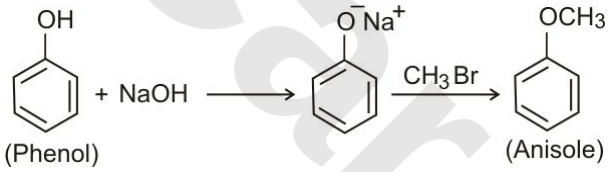
(b)write the mechanism of the following reacion:

$$C_2H_2OH \xrightarrow[443K]{H_2SO_4} CH_2 = CH_2 + H_2O$$

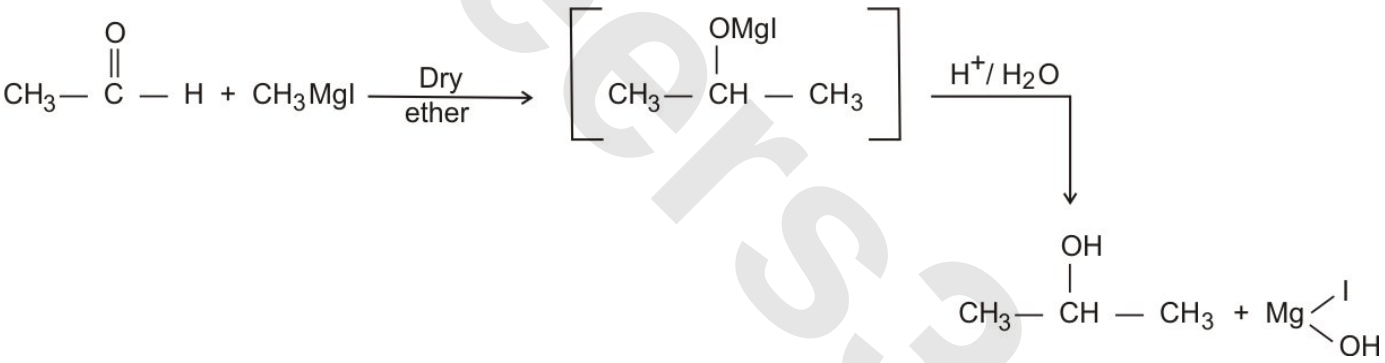
(c)Why phenol undergoes electrophilic substitution reaction more easly than benzene?

Solution:

(a)(i)



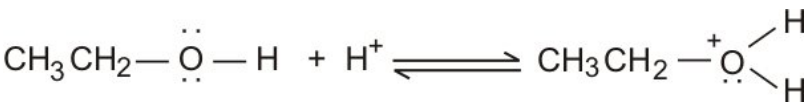
(ii)



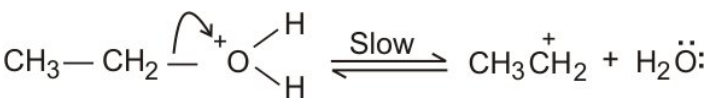
(b) $C_2H_2OH \xrightarrow[443K]{H_2SO_4} CH_2 = CH_2 + H_2O$

Mechanism:

Step 1: Formation of protonated alcohol.



Step 2: Formation of carbocation:



Steo 3: Elimination of a proton to form ethene.

$$H - CH_2 - CH_2 \rightleftharpoons CH_2 = CH_2 + H^+$$

(c) Phenols undergoes electrophilic substitution reactions due to the strong activating effect of -OH group aatached to benzene ring.

Q. 338 (a) Account for the following:

(i) o-nitophenol is more steam volatile than p-nitrophenol.

(ii) t-butyl chloride on heating eith sodium methoxide gives 2-methylpropene instead of t-butylmethylether.

(b) Write the reaction involved in the following:

(i) Reimer - Tiemann Reaction

(ii) Friedal - Crafts Alkylation Of Phenol

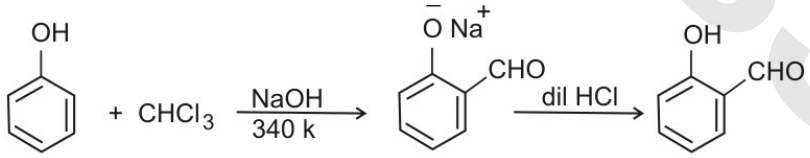
(c) Give simple test to distinguish between Ethanol and Phenol.

Solution:

(a) (i) o-Nitophenol is the more volatile isomer because its hydrogen bonding is inteamolecular.p-Nitrophenol is is less volatile because intermolecular hydrogen bonding causes association among its molecules. Thus, o-nitrophenol passes over with the steam , and p-nitrophenol remains in the distillation flask.

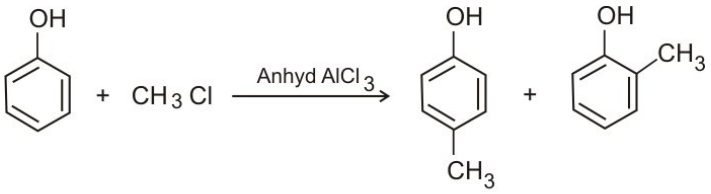
(ii) t-Butyl chloride on heating with sodium methoxide gives 2-methylpropene because E1 favored over S_N1.E1 reactions are favored with substrates that can form stable carbocation (i.e, tertiary halides)and by the use of poor nucleophiles.

(b) (i)



Riemmer - Tiemam Reaction

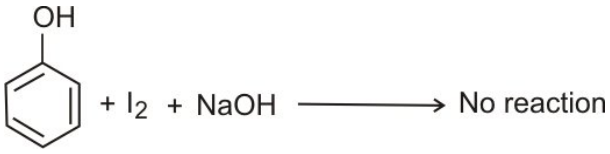
(ii)



(P) (O)

(c) Ethanol and Phenol can be distinguished by iodoform test.

$$CH_3CH_2OH + 4I_2 + 6NaOH \rightarrow CHI_3 + HCOONa + 5NaI + 5H_2O$$



Q. 339 (a) Given reasons for the following:

(i) Sulphur in vapour state shows paramagnetic behaviour.

(ii) N-N bond is weaker than P-P bond.

(iii) Ozone iss thermodynamically less stable than oxygen.

(b) Write the names of gas relased when CU is added to

(i) dilute HNO_3 and

(ii) conc. HNO_3

Solution:
(a) (i) In vapour state, sulphur partly exists as S_2 molecule, which like O_2 has two upaired electrons in the antibonding π^* orbitals and hence exhibits paramagnetic.

(ii) The single N-N bond is weaker than P-P bond because of high interelectronic repluion of the non-bonding electrons, owing to the small bond length.

(iii) O_3 is the thermodynamically unstable and decomposes to O_2. The decomposition is exothermic.

(b) (i) $3Cu + 8HNO_3 \overset{colddil.}{\rightarrow} 2NO + Cu(NO_3)_2 + 4H_2O$

(ii) $Cu + 3HNO_3 \xrightarrow[acid]{stong} NO_2 + Cu(NO_3)_2 + H_2O$

Q. 340 When MnO_2 is fused with KOH in the presence of KNO_3 as an oxidizing agent, it gives a dark green compound (A). Compound (A) disproportionates in an acidic solution to give a purple compound (B). An alkaline solution of compound (B) oxidizes KI to compound (C) whereas an acidified solution of compound (B) oxidizes KI to (D). Identify (A), (B), (C), and (D).

Solution:

$$2MnO_2 + 4KOH + O_2 \rightarrow \underset{\substack{A \\ (green) \\ \text{Potassium manganate}}}{2K_2MnO_4} + 2H_2O$$

$$\underset{A}{2MnO_4^{2-}} + 4H^+ \rightarrow \underset{\substack{B \\ (purple)}}{2MnO_4^-} + 2MnO_2 + 2H_2O$$

$$\underset{B}{2MnO_4^-} + H_2O + KI \rightarrow 2MnO_2 + 2KOH + \underset{\text{Potassium iodate}}{\underset{C}{KIO_3}}$$

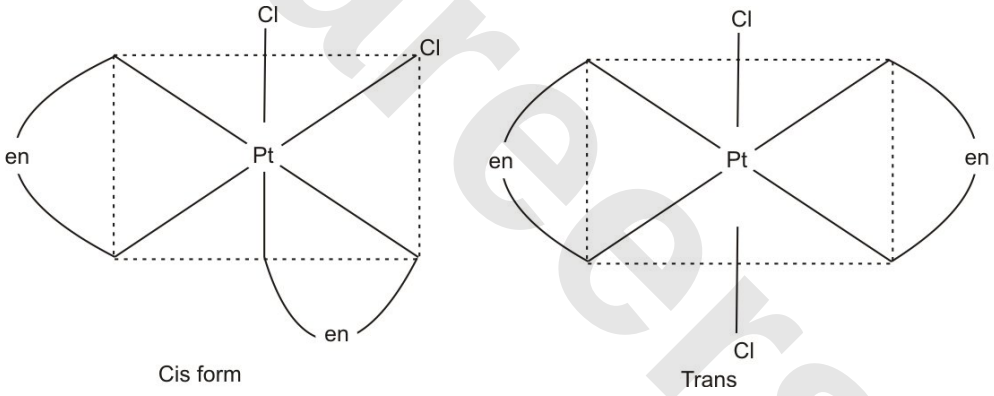
$$\underset{B}{2MnO_4^-} + 16H^+ + 10I^- \rightarrow 2Mn^{2+} + 8H_2O + \underset{D}{5I_2}$$

Q. 341 Write the IUPAC name of the complex $[Pt(en)_2Cl_2]$. Draw structures of geometrical isomers for this complex.

Solution:
$[Pt(en)_2Cl_2]$

IUPAC Name: Dichlorido(ethane-1,2-diamine)platinum(II)

Geometrical Isomers:



Q. 342 Using IUPAC norms write the formulae for the following :

1. Hexaamminecobalt(III) sulphate
2. Potassium trioxalatochromate(III)

Solution:
1. $[Co(NH_3)_6]_2(SO_4)_3$
2. $K_3[Cr(C_2O_4)_3]$

Q. 343 Out of $[CoF_6]^{3-}$ and $[Co(en)_3]^{3+}$, which one complex is

1. paramagnetic
2. more stable
3. inner orbital complex and
4. high spin complex

(Atomic no. of Co = 27)

Solution:

1. $[CoF_6]^{3-}$ is paramagnetic.
2. $[Co(en)_3]^{3+}$is more stable due to chelation.
3. $[Co(en)_3]^{3+}$ is inner orbital complex.
4. $[CoF_6]^{3-}$ is high spin complex.

Q. 344 (a) (i) Write the disproportionation reaction of H_3PO_3.

(ii) Draw the structure of XeF_4

(b) Account for the following:

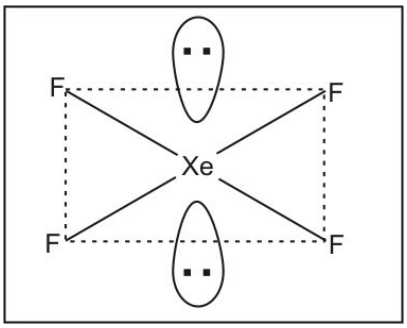
(i) Although Fluorine has less negative electtron gain enthalpy yet F_2 is styrong oxidizing agent.

(ii) Acidic character decreases from N_2O_3 to Bi_2O_3 in group 15.

(c) Write a chemical reaction to test sulphur dioxide gas. Write chemical eqaution involved.

Solution:
(a) (i) $4H_3PO_3 \rightarrow 3H_3PO_4 + PH_3$

(ii)



(b) (i) Fluorine is the strongest oxidising agent because of:

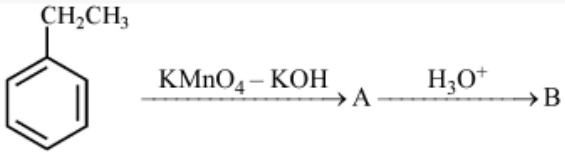
- F_2 has low enthalpy of dissociatiation.
- F_2 has high free energy of hydration.

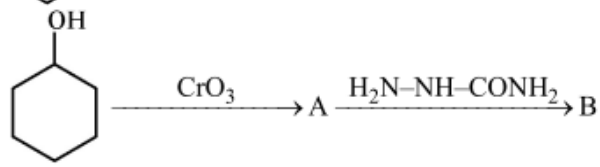
(ii) The oxides E_2O_3 of N and P are acidic. As amphoteric and those of Bi basic beacuse the metallic character of the element and hence the basicity of its oxide increases with increasing atomic number.

(c) $K_2Cr_2O_7 + 3SO_2 + H_2SO_4 \rightarrow Cr_2(SO_4)_3 + K_2SO_4 + H_2O$

SO_2 turns a filter paper moistened with acidified potassium dichromate solution green, due to the formation of Cr^{3+} and acts as a reducing agent.

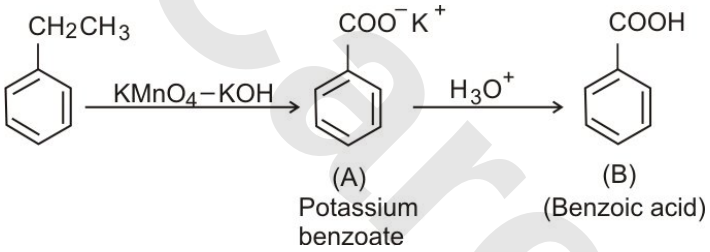
Q. 345 Write structures of compounds A and B in each of the following reactions :

1. 

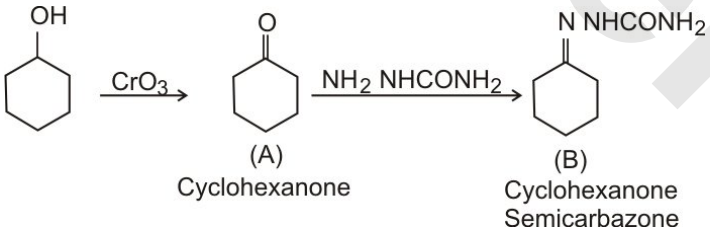
2. 

Solution:

(I)



(ii)



Q. 346 The decomposition of NH 3 on a platinum surface is zero order reaction. If rate constant (k) is $4 \times 10^{-3} Ms^{-1}$, how long will it take to reduce the initial concentration of NH 3 from 0.1 M to 0.064 M.

Solution:

For a zero-order reaction,

$$k = \frac{A_o - A}{t}$$

$$\Rightarrow t = \frac{A_o - A}{k} = \frac{0.1 - 0.064}{4 \times 10^{-3}} = \frac{0.036}{4 \times 10^{-3}} = 0.009 \times 10^3 s = 9 \text{ secs}$$

Q. 347 A 4% solution (w/w) of sucrose (M = 342 g mol^{-1}) in water has freezing point of 271.15K. Calculate the freezing point of 5% glucose (M = $180gmol^{-1}$) in water.

(Given: Frezzing point of water = 273.15K)

Solution:

$$\Delta T_f = K_f \times m$$

$$= 16.41 \times \frac{5}{180} \times \frac{1000}{45} = 4.8K$$

$$\Delta T_f = T_f^\circ - T_f$$

$$4.8 = 273.15 - T_f$$

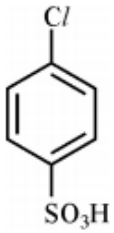
$$T_f - 268.35K$$

Q. 348 Why conductivity of silicon increases on doping with phosphorus ?

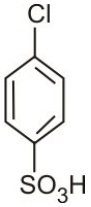
Solution:

There is an increase in conductivity when silicon is doped with Phosphorous because Si doped with P becomes N-type semiconductor. In that, four valance electrons will be used for bonding with Si and fifth electron serves to conduct electricity.

Q. 349 Write IUPAC name of the given compound :



Solution:



$4-Chlorobenzenesulphonic\ acid$

Q. 350 Write two differences between an ideal solution and a non-ideal solution.

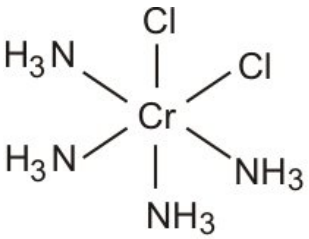
Solution:

Ideal Solutions	Non-ideal solutions
1) The interaction between the components are similar to those in the pure components 2) there is no volume charge and enthalpy change on mixing the components. $(\Delta V = 0, \Delta H = 0)$	1) the interaction between the components are different from those of the pure components. 2) $\Delta V \neq 0, \Delta H \neq 0$ on mixing the components.

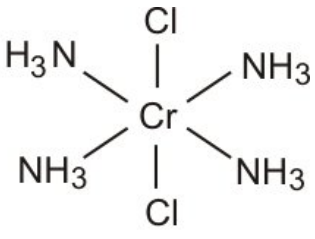
Q. 351 Write IUPAC name of the complex $[Cr(NH_3)_4Cl_2]^+$. Draw structures of geometrical isomers for this complex.

Solution:
Tetraamminedichlorido chronium(iii) ion.

Geometrical isomers of $[Cr(NH_3)_4Cl_2]^+$



Cis-form



Trans-form

Q. 352 Using IUPAC norms write the formulae for the following :

(i) Pentaamminenitrito-O-cobalt (III) chloride

(ii) Potassium tetracyanidonickelate (II)

Solution:
(i) $[CO(NH_3)_5(ONO)]\,Cl_2$

(ii) $K\,[Ni(CN)_4]$

Q. 353 (i) Write the role of 'CO' in the purification of nickel.

(ii) What is the role of silica in the extraction of copper ?

(iii) What type of metals are generally extracted by electrolytic method ?

Solution:
(i) CO forms a volatile complex Nickel tetracarbonyl,$Ni(CO)_4$ leaving behind impurities. The nickel tetracarbonyl complex is heated to a higher temperature, decomposes to give pure metal.

$$Ni + 4CO \overset{360K}{\rightarrow} Ni(CO)_4$$

$$Ni(CO)_4 \overset{470K}{\rightarrow} \underset{pure}{Ni} + 4CO$$

(ii) Silica $[SiO_2]$ acts as a flux, added before roasting to combine with

FeO [impurity] and form $FeSiO_3$ [slag]

$$FeO + SiO_2 \rightarrow FeSiO_3$$

(iii) Very highly reactive metals like sodium, Potassium,calcium etc are generally extracted by electrolytic method.

Q. 354 Give reasons for the following :

(i) Transition metals form alloys.

(ii) Mn_2O_3 is basic whereas Mn_2O_7 is acidic.

(iii) Eu^{2+} is a strong reducing agent.

Solution:
(i) The size of transition metals are similar size, Therefore, they get easily settled in the crystal lattice of another metal, hence, they form alloys.

(ii) Mn_2O_3 is bnasic because Mn is $+3$ and exist in d^+ electronic configuration.

Mn can lose 4 more electron to achieve $+7$ oxidation state of d° state.

Mn_2O_7 is acidic, because, it already exist in highest horrible oxidn state i.e, $+7$ and has no more electrons left to lose. therefore, Mn_2O_7 is acidic

(iii) Eu^{2+} get easily oxidised to Eu^{3+},as Eu^{3+} is more stable, hence Eu^{2+} acts as strong reducing agent.

Q. 355 (i) Why bithional is added in soap ?

(ii) Why magnesium hydroxide is a better antacid than sodium bicarbonate ?

(iii) Why soaps are biodegradable whereas detergents are non-biodegradable ?

Solution:
(i) Bithinol is added to soap to reduce the odour produced by bacterial decomposition of organic matter on the skin.

(ii) $Mg(OH)_2$ is a better antacid than sodium bicarbonate because, it is insolute and does not increase the P^H above neutrality.

(iii) Soaps are biodegradable whereas detergents are non bio-degradable, because detergents have generally highly branched hydrocarbon chains. the side chain stops bacteria from attacking breaking the chains, hence, they are non- biodegradable while in soaps, it is not the case.

Q. 356 Define the following terms with a suitable example in each :

(i) Antibiotics

(ii) Artificial sweeteners

(iii) Analgesics

Solution:
(i) Antibiotics :- Chemical substances, which in low concentration either kill or inhibit the growth of micro organisms by intervening in their metabolic processes.

For eg, Penicillin, Chloramphenical etc.

(ii) Artificial sweetners :- The chemicals that are added tp load to add sweetnerss, controlling the calorie intake at the same time are known as artificial sweetners.

For eg. Saccharin, aspertame,sucrolose etc -

(iii) Analgesics :- Neurologically active drugs which reduce or abolish pain without causing impairment of conscioiusness, mental confusion,inco- ordination or paralysis or some other disorder of the nervous systems are called analgesics.

For eg; Aspirin, Paracetamol, Ibuprofen etc.

Q. 357 What type of stoichiometric defect is shown by ZnS and why?

Solution:
ZnS shows Frenkel defect due to small size of Zn^{2+} ion.

Q. 358 Write one stereochemical difference between S_N1 and S_N2 reactions.

Solution:
In S_N1 mechanism, racemisation is observed while in $S_N2$mechanism, complete inversion of configuration occurs.

Q. 359 State Henry's law and write its two application

Solution:
Henry's law: The mass of gas dissolved in a given volume of the liquid at constants temperature is directly proportional to the pressure of the gas present in equilibrium with the liquid.

Two application are as follows:

(i) In the production of carbonated beverages.

(ii) In the deep sea diving

Q. 360 Write the hybridization and magnetic character of the following complexes:

(i) $[Fe(H_2O)_6]^{2+}$

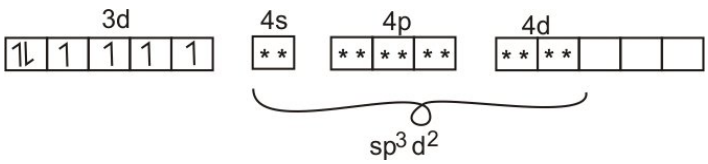
(ii) $[Fe(CO)_5]$

(Atomic number of Fe = 26)

Solution:
(i) $[Fe(H_2O)_6]^{2+}$

$_{26}Fe = 4s^2 3d^6$

$Fe^{2+} = 4s^0 3d^6$

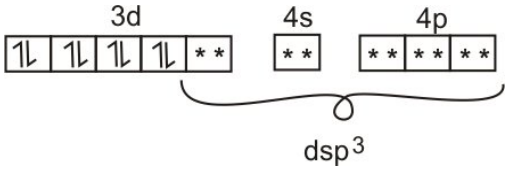


Hybrization $\rightarrow sp^3d^2$

Paramagnetic, as it contains an unpaired electrons.

(ii) $[Fe(CO)_5]$

$_{26}Fe = 4s^2 3d^6$

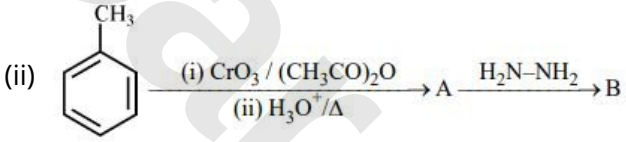


Hybridiastion $\rightarrow dsp^3$

Diamagnetic, as it does not contain any unpaired electron.

Q. 361 Write the structures of main componds A and B in each of the following reactions:

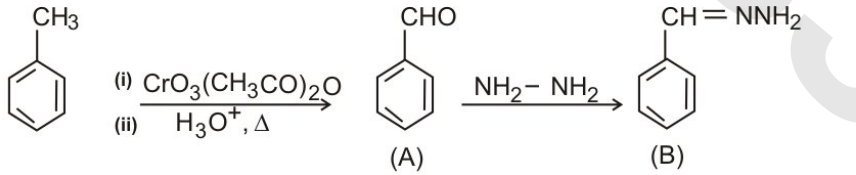
(i) $CH_3CH_2CN \xrightarrow{CH_3MgBr/H_3O^+} A \xrightarrow{LiA/H_4} B$

(ii) 

Solution:

(i) $CH_3CH_2CN \xrightarrow{CH_3MgBr} CH_3CH_2\overset{\overset{O}{\|}}{C}CH_3 \xrightarrow{LiAlH_4} CH_3CH_2\overset{\overset{OH}{|}}{C}HCH_3$

(A) Butan-2-One (B) Butan-2-ol

(ii) 

(A) Benzaldehyde (B) Benzaldehyde dehydrazone

Q. 362 How will you convert the following:

(i) Impure Nickel to pure Nickel

(ii) Zinc blende to Zinc metal

(iii) $[Ag(CN)_2]^-$ to Ag

Solution:

(i) $Ni + 4CO \overset{360K}{\rightarrow} Ni(CO)_4$

$Ni(CO)_4 \overset{470K}{\rightarrow} Ni + 4CO$

(ii)

- ZnS is concentrated by froath floation process.
- Roasting: $ZnS + 3O_2 \xrightarrow{\Delta} 2ZnO + 2SO_2$
- REduction: $ZnO + C \overset{1673K}{\rightarrow} Zn + CO$
- Impure zinc obtained is purified by distillation or electrolytic refining.

(iii) Zn reduces $[Ag(CN)_2]^-$ to Ag

$$[Ag(CN)_2]^- (aq) + Zn(s) \rightarrow 2Ag(s) + [Zn(CN)_4]^{2-} (aq)$$

Ag refined by electrolytic refining.

Q. 363 Given reasons for the following:

(i) The transition metals generally form coloured compounds.

(ii) E° value for $\left(Mn^{3+}/Mn^{2+}\right)$ is highly positive than that for $\left(Cr^{3+}/Cr^{2+}\right)$ couple.

(iii) The chemistry of actinoids elements is not so smooth as that of the lanthanoids.

Solution:
(i) Colour is due to the presence of incomplete d- subshell. During these transtions, they emit raditions corresponding to some wavelength in the visible region spectrum.

(ii) It is so because the third ionisation energy of Mn is very high $\left(d^5 to d^4\right)$

(iii) This is due to the much smaller energy difference between 5f,6d and 7s subshells of actinoids than 4f, 5d and 6s subshells of lanthanoids.

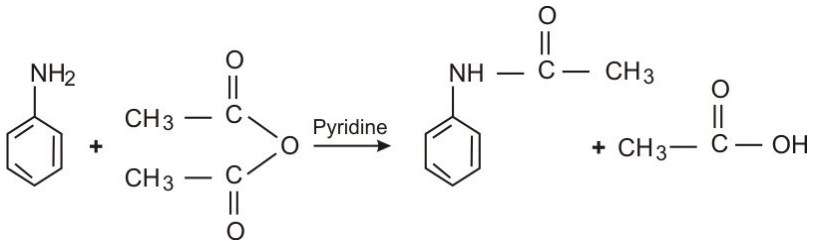
Q. 364 Write equations to the following reactions:

(i) Acetylation of aniline

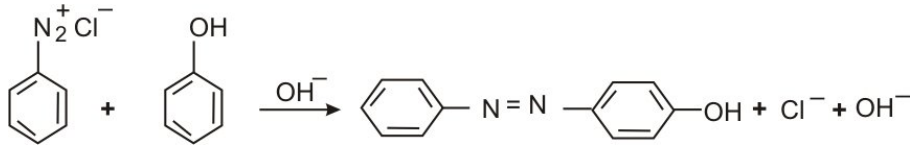
(ii) Coupling reaction

(iii) Carbyl amine reaction

Solution:
(i) Acetylation of anilline:



(ii) Coupling reaction:



(iii) Carbylamine reaction:

$$R-NH_2+CHCl_3+3KOH(alc)) \xrightarrow{\Delta} R-NC+3KCl+3H_2O$$

Q. 365 Define the following with a suitable examole in each:

(i) Oligosaccharides

(ii) Denaturation of protein

(iii) Vitamins

Solution:
(i) Oligosaccharides: Carbohydrates which on hydrolysis give 2 -10 molecules of monosaccharides are called as oligosaccharides. For example: Sucrose.

(ii) Denaturation of Proteins: On heating or on treatment with the mineral acids, the water soluble globular proteins undergo coagulation or precipitation with loss of biological activity to give watre insoluble fibrous proteins.This process is known as denaturation of proteins.

(iii) Vitamins: A group of biomolecule, most of which cannot be produced by the body and must be supplied in small amounts in diet to perfom the specific biological functions fo the life growth and health of human beings and animals.

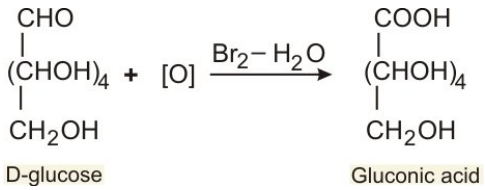
Q. 366 Write the reaction involved when D-glucose is treated with the following reagents:

(i) Br_2 water

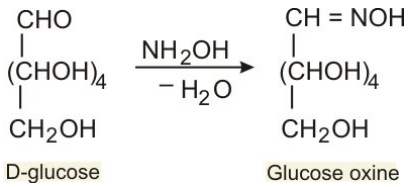
(ii) H_2N-OH

(iii) $(CH_3CO)_2O$

Solution:
(i)

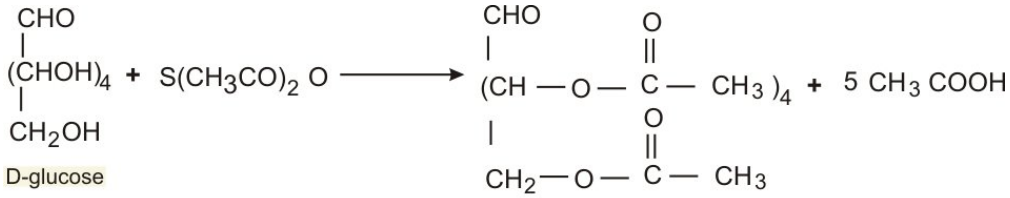


(ii)



D-glucose Glucose oxine

(iii)



D-glucose

Glucose pentaacetate

Q. 367 Out of KCl and $AgCl$, which one shows Schottky defect and why?

OR

Why does ZnO apear yellow on heating?

Solution:

1(a) KCl shows schottky defect because size of cation $[K]^+$ and anion $[Cl]^-$ are similar in size.

OR

1(b) On heating ZnO, it loses oxygen and turns yellow. The excess of Zn^{2+} ions thus formed get trapped into the vacant interstitial sites and the electrons in the neighbouring interstitial sites.

$$ZnO \rightarrow Zn^{2+} + \frac{1}{2}O_2 + 2e^-.$$

Q. 368 Arrange the following in decreasing order of basic character :

$$C_6H_5NH_2,\ (CH_3)_3N,\ \ C_2H_5NH_2$$

Solution:

The following order shows the relative order of basicity:$C_2H_5NH_2 > (CH_3)_3N > C_6H_5NH_2$

Q. 369 What type of colloid is formed when a solid is dispersed in a liquid? Give an example.

Solution:

Sol is a colloidal suspension with solid particles in a liquid. For e.g. Paints, Cell fluids etc.

Q. 370 Out of Chlorobenzene and Cyclohexyl chloride, which one is more reactive towards nucleophilic substitution reaction and why?

Solution:
Cyclohexyl chloride is more reactive towards nucleophilic substitution reaction because C-Ce bond strength is less in cyclohexylchloride than chlorobenzene.

In chlorobenzene, due to the conjugation of chlorine with benzene ring, partial double bond character develops between chlorine atom and carbon atom of benzene ring through which carbon is attached.

Q. 371 What is the basic structural difference between starch and cellulose?

OR

Write the products obtained after hydrolysis of DNA.

Correct Answer:

Solution:
Starch is a linear polymer of $\alpha - D\ glucose$ having helical structure in which C_1 of one glucose unit is attached to C of the other through $\alpha - glycosidic$ linkage whereas cellulose is linear condensation polymer of $\beta - D\ glucose$ in which there is $\beta - D\ glycosidic$ linkage.

OR

On complete hydrolysis of DNA, a pentose sugar, nitrogenous bases like Adenine, Guanine and Phosphoric acid are obtained.

Q. 372 Write balanced chemical equations for the following processes :

(a) Cl_2 is passed throug slaked lime.

(b) SO_2 gas is passed through an aqueous solution of $Fe(III)$ salt.

Solution:
Following are the reactions:

$$(a) 2Ca(OH)_2 + Cl_2 \rightarrow Ca(OCl)_2 + CaCl_2 + 2H_2O.$$

calcium hypochlorite

$$(b) SO_2 + Fe_2(SO_4)_3 + 2H_2O \rightarrow 2FeSO_4 + 2H_2SO_4$$

Q. 373 Give reasons :

(a) Cooking is faster in pressure cooker than in cooking pan.

(b) Red Blood Cells (RBC) shrink when placed in saline water but swell in distilled water.

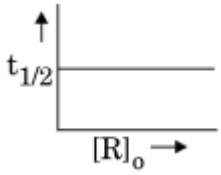
Solution:

(a) It is so because the pressure inside the cooker is high, as very less steam goes out. Higher the pressure, higher is the boiling point. Hence, the cooking is faster in pressure cooker.

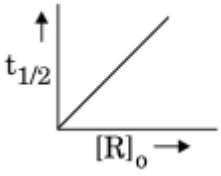
(b) As the concentration of saline solution is higher than the concentration inside the cell. Thus, water will move outside the cytoplasm and the cell will shrink, termed as Plasmolysis or Crenation. On the other hand, when RBC is placed in distilled water, water will enter the cell leading to swelling of the cell.

Q. 374 Define order of reaction. Predict the order of reaction in the given grahs :

(a)



(b)



where $[R]_o$ is the initial concentration of reactant and $t_{1/2}$ is half-life.

Solution:

(a) 1st order $\left[t_{1/2} = \frac{0.693}{k}\right]$

(b) Zero order $\left[t_{1/2} = \frac{R_o}{2k}\right]$

Q. 375 (a) Write two poisonous gases prepared from chlorine gas.

(b) Why does Cu^{2+} solution give blue colour on reaction with ammonia ?

Solution:

$Phosphene\ [COCl)_2]\ ,\ \ Tear\ gas[CCl_3NO_2]$

$$CuSO_4(aq) + NH_4OH(aq) \rightarrow [Cu(NH_3)_4]\, SO_4(aq) + 4H_2O.$$

(blue)

OR

$$Cu^{2+}(aq) + 4NH_3(aq) \rightarrow [Cu(NH_3)_4]^{2+}\ (aq)$$

(blue)

Q. 376 When $FeCr_2O_4$ is fused with Na_2CO_3 in the presence of air it gives a yellow solution of compound(A). Compound (A) on acidification gives comound (B). Compound (B) on reaction with KCl forms an orange coloured compound (C). An acidified solution of comound (C) oxidises Na_2SO_3 to (D). Identify (A), (B), (C) and (D).

Solution:

$$4FeCr_2O_4 + 8Na_2CO_3 + 7O_2 \rightarrow 8Na_2CrO_4 + 2Fe_2O_3 + 3CO_2$$

Sodium Chronate

(Yellow)

(A)

$$2Na_2Cr_2O_4 + H_2SO_4(conc.) \rightarrow Na_2Cr_2O_7 + Na_2SO_4 + H_2O$$

Sodium dichronate

(B)

$$Na_2Cr_2O_7 + 2KCl \rightarrow K_2Cr_2O_7 + 2NaCl$$

(C)

$$K_2Cr_2O_7 + 4H_2SO_4 + 3Na_2SO_3 \rightarrow K_2SO_4 + Cr_2(SO_4)_3 + 4H_2O + 3Na_2SO_4$$

(C) (D)

Q. 377 Write IUPAC name of the complex $[Co(en)_2(NO_2)Cl]^+$. What type of structural isomerism is shownby this complex?

Solution:
$[Co(en)_3(NO_2)Cl]^+$

$chloridobis(ethane-1,2-diamine)nitro\ cobalt(III)ion$

It shows linkage isomerism.

Q. 378 Using IUPAC norms, write the formulae for the following complexes:

(a) Hexaaquachromium(III)chloride

(b) Sodium trioxalatoferrate(III)

Solution:
Co-ordination compounds.

(a) $[Cr(H_2O)_6]\,Cl_3$

(b) $Na_3\,[Fe(C_2O_4)_3]$

Q. 379 (a) Although both $[NiCl_4]^{2-}\ and\ [Ni\,(CO)_4]$ have sp^3 hybridisation yet $[NiCl_4]^{2-}$ is paramagnetic and $[Ni(\,CO)_4]$ is diamagnetic. Give reason. (Atomic no. of Ni = 28)

(b) Write the electronic configuration of d^5 on the basis of crystal field theory when

(i) $\Delta_0 < P\ \ and$

(ii) $\Delta_0 > P$

Solution:
(a) Cl, being a weak ligand, does not pair up the electrons, so, $[NiCl_4]^{2-}$ is paramagnetic, while in $[Ni(CO)_4]$, CO, being a strong ligand pair up the electrons as it approaches the metal ion, leaving no electrons unpaired, hence it is diamagnetic.

(b) (i) $\Delta_0 < P,\quad t_2^3g\ eg^2$

(ii) $\Delta_0 > P,\quad t_2^5g$

Q. 380 Write structures of main compounds A and B in each of the following reactions:

$(a)\ C_6H_5COOH \overset{PCl_5}{\rightarrow} A \overset{H_2/Pd-BaSO_4}{\rightarrow} B$

$(b)\ CH_3CN \xrightarrow[(ii)H_3O+]{(i)CH_3MgBr} A \overset{Zn(Hg)/conc.HCl}{\rightarrow} B$

Solution:

(a) $C_6H_5COOH \xrightarrow{PCl_5} C_6H_5COCl \xrightarrow{H_2/Pd-BaSO_4} C_6H_5CHO$

(A) (B)

Benzoylchloride Benzaldehyde

(b) $CH_3CN \xrightarrow[(ii)\ H_3O^+]{(i)\ CH_3MgBr} \underset{\text{Propanone (A)}}{CH_3\overset{\overset{O}{\|}}{C}-CH_3} \xrightarrow[HCl]{Zn(Hg)/Conc.} \underset{\text{Propane (B)}}{CH_3CH_2CH_3} + HCl$

Q. 381 The following data were obtained for the reaction :

$A + 2B \rightarrow C$

Experiment	[A]/M	[B]/M	Initial rate of formation of C/M min^{-1}
1	0.2	0.3	4.2×10^{-2}
2	0.1	0.1	6.0×10^{-3}
3	0.4	0.3	1.68×10^{-1}
4	0.1	0.4	2.40×10^{-2}

(a) Find the order of reaction with respect to A and B.

(b) Write the rate law and overall order of reaction.

(c) Calculate the rate constant (k).

Solution:

$A + 2B \rightarrow C$

Supose order w.r.t A is α and w.r.t B is β.

$Rate\ law [r = k[A]^{\alpha}[B]^{\beta}]$

$(Rate)\ exp_1,\ r_1 = 4.2 \times 10^{-2} = k[0.2]^{\alpha}[0.3]^{\beta} \quad ---(1)$

$r_2 = 6.0 \times 10^{-3} = k[0.1]^{\alpha}[0.1]^{\beta} \quad ---(2)$

$r_3 = 1.68 \times 10^{-1} = k[0.4]^{\alpha}[0.3]^{\beta} \quad ---(3)$

$r_4 = 2.40 \times 10^{-2} = k[0.1]^{\alpha}[0.4]^{\beta} \quad ---(4)$

$\frac{r_1}{r_3}, we\ \ get.$

$$\frac{r_1}{r_3} = \frac{4.2 \times 10^{-2}}{1.68 \times 10^{-1}} = \frac{k[0.2]^{\alpha}[0.3]^{\beta}}{k[0.4]^{\alpha}[0.3]^{\beta}}$$

$$\Rightarrow \frac{25}{100} = \left[\frac{1}{2}\right]^{\alpha}$$

$$\Rightarrow \left(\frac{1}{2}\right)^{2} = \left[\frac{1}{2}\right]^{\alpha}$$

$$\Rightarrow \alpha = 2$$

similarly for β, $\frac{r_2}{r_4} = \frac{6.0 \times 10^{-3}}{2.40 \times 10^{-2}} = \frac{k[0.1]^{\alpha}[0.1]^{\beta}}{k[0.1]^{\alpha}[0.4]^{\beta}}$

$$\Rightarrow \frac{[0.1]^{\beta}}{[0.4]^{\beta}} = \frac{6.0 \times 10^{-3}}{2.40 \times 10^{-2}} = \frac{1}{4} \Rightarrow \beta = 1$$

(a) Hence, order w.r.t A is 2, w.r.t B is 1

(b) Rate Law:

$$r = k[A]^2[B]$$

overall order $= 2 + 1 = 3$

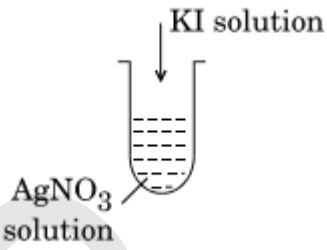
(c) $k = \frac{r_1}{[0.2]^{\alpha}[0.3]^{\beta}}$ using eq^{n} (1)

$$= \frac{4.2 \times 10^{-2}}{[0.2]^2[0.3]} = 3.5 mol^{-2} L^{-2} min^{-1}$$

Q. 382 (a) Write the dispersed phase and dispersion medium of dust.

(b) Why is physisortion reversible whereas chemisorption is irreversible?

(c) A colloidal sol is prepared by the method given in the figure. What is the charge on AgI colloidal particles in the test tube? How is this sol represented?



Solution:
(a) Dispersed phase : Solid

Dispersion medium : Gas.

(b) Physisorption is reversible whereas chemisorption is irreversible because it does not involve the formation of new compound while the latter does.

(c) Negative, AgI/I^-

Q. 383 An element X with an atomic mass of $81u$ has density $10.2gcm^{-3}$. If the volume of unit cell is $2.7 \times 10^{-23}cm^3$, identify the type of cubic unit cell.

$\left(Given: N_A = 6.022 \times 10^{23}mol^{-1}\right)$

Solution:

$$P = \frac{Z \times M}{a^3 \times N_A}$$

$$Z = \frac{P \times a^3 \times N_A}{M} = \frac{10.2 \times 2.7 \times 10^{-23} \times 6.022 \times 10^{23}}{81}$$

$$= 2$$

Hence it is BCC type of unit cell.

Q. 384 A solution containing $1.9g\ per\ 100mL\ of\ KCl\ (M = 74.5gmol^{-1})$ is isotonic with a solution containing $3g\ per\ 100mL\ of\ urea\ (M = 60gmol^{-1})$. Calculate the degree of dissociation of KCl solution. Assume that both the solutions have same temperature.

Solution:
For isotonic solutions,

$$C_{KCl}RT = C_{urea}$$

$$\Rightarrow i \times C_{KCl} = C_{urea}$$

$$\Rightarrow i \times \frac{1.9 \times 1000}{74.5 \times 100} = \frac{3}{60} \times \frac{1000}{100}$$

$$\Rightarrow i \times 0.25 = 0.5$$

$$\Rightarrow i = 2$$

$$i = \frac{observed\ colligative\ property}{calculated\ colligative\ property}$$

$KCl \rightarrow$	K^+	$+$	Cl^-
0.25	0		0
$0.25 - \alpha$	α		α

Total moles after dissociation = $0.25 - \alpha + \alpha + \alpha$

$$= 0.25 + \alpha$$

$$i = \frac{0.25 + \alpha}{0.25} \Rightarrow 2 = \frac{0.25 + \alpha}{0.25} \Rightarrow \alpha = 0.25$$

Q. 385 Write the name and principle of the method used for refining of (a) Zinc, (b) Germanium, (c) Titanium.

Solution:
(a) Zinc - refined by any of the two methods

(i) Distillation - This is based on the principle that the impure metal is evaporated to obtain the pure metal as distillate.

(ii) Electrolytic refining - The more electropositive impuration pass into solution as soluble salts while the less electropositive settle down as anode mud.

(b) Germanium - Zone refining.

Principle- It is based upon the principle that the impurities are more soluble in the molter state (melt) than in the solid state of metal.

(c) Titanium : Van Arkel Method

Principle- The metal should form a volatile compound which decomposes at higher temperature to pure metal.

Q. 386 Give reasons for the following :

(a) Transition metals form complex compounds.

(b) E^0 values for $\left(Zn^{2+}/Zn\right)\ and\ \left(Mn^{2+}/Mn\right)$ are more negative than expected.

(c) Actinoids show wide range of oxidation states.

Solution:
(a) It is because of smaller size of metal ions, high iconic charges and availability of vacant d-orbitals.

(b) It is because of extra stability of $d^5\ and\ d^{10}$ electronic configuration.

(c) It is because of less energy difference between 5s, 6d and 7d orbitals.

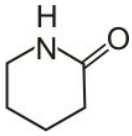
Q. 387 Write the structures of monomers used for getting the following polymers :

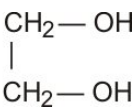
(a) Nylon-6

(b) Terylene

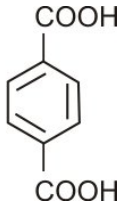
(c) Buna-N

Solution:

(a) Caprolactum 

(b) Ethylene glycol 

&

Terepthalic acid 

(c) $Buta-1,3-diene \quad CH_2=CH-CH=CH_2$

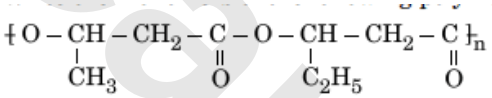
&

Acrylonitrile $CH_2=CH-CH\equiv N$

Q. 388

(a) Is  a homopolymer or copolymer? Give reason.

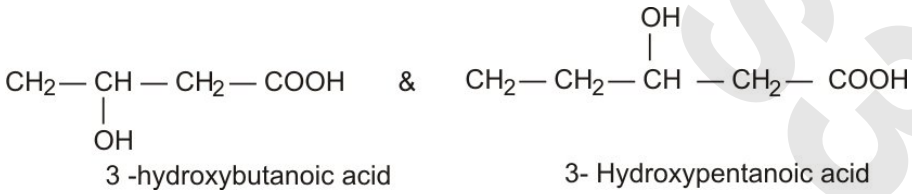
(b) Write the monomers of the following polymer:



(c) Write the role of benzoyl peroxide in polymerisation of ethene.

Solution:

(a) It is a homopolymer, as it is made up of same monomers.

(b) 

3 -hydroxybutanoic acid 3- Hydroxypentanoic acid

(c) It acts as an initiator for polymerisation by generating free radicle or decomposition.

Q. 389

(a) Pick out the odd one from the following on the basis of their medicinal properties:

Equanil, Seconal , Bithional, Luminal

(b) What type of detergents are used in dishwashing liquids?

(c) Why is the use of aspartame limited to cold foods?

Solution:
(a) Bithional is an antiseptic while the other three are tranquillizers.

(b) Anionic detergents

(c) It is because Aspartame decomposes at baking or cooking temperature.

Q. 390 Define the following terms with a suitable example of each:

(a) Antibiotics

(b) Antiseptics

(c) Anionic detergents.

Solution:
(a) Antibiotics : Antibacterial agents which in low concentration either kill or inhibit the growth of microorganisms by intervening in their metabolic processes e.g. Chloramphenicol, Penicillin

(b) Antiseptics: Antibacterial agents which prevent the growth of micro-organisms and may even kill them. e.g. Dettol, Bithional

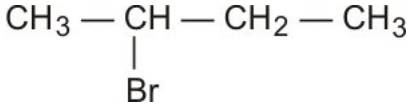
(c) Anionic detergents: Synthetic detergents in which a large part of the molecules are anions and it is the anionic part which is involved in their cleansing action e.g. Sodium lauryl sulphate.

Q. 391 Among all the isomers of molecular formula C_4H_9Br, identify

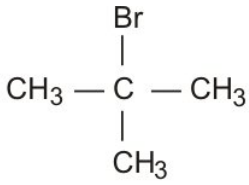
(a) the one isomer which is optically active.

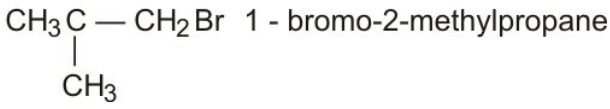
(b) the one isomer which is highly reactive towards S_N2.

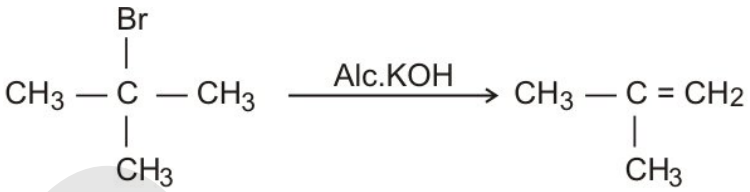
(c) the two isomers which give same product on dehydrohalogenation with alcoholic KOH.

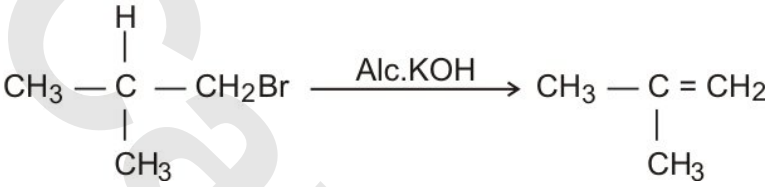
Solution:
(a) $2-Bromobutane$ 

(b) $CH_3CH_2CH_2CH_2Br$ is highly reactive towards SN^2 as it is a primary halide.

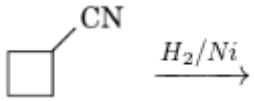
(C) (i)  2-Bromo-2-methylpropane

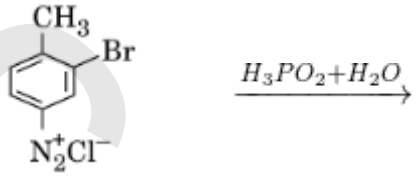
(ii)  1 - bromo-2-methylpropane

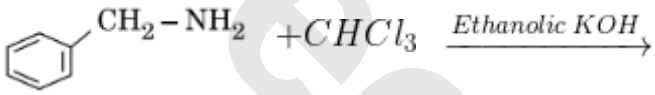




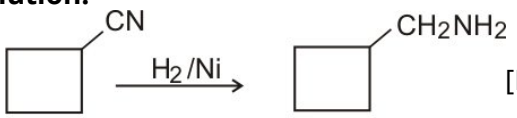
Q. 392 Complete the following reactions :

(a) 

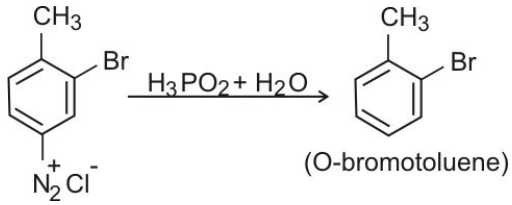
(b) 

(c) 

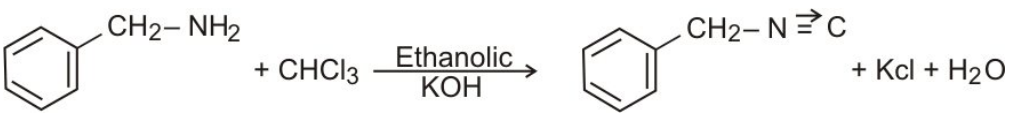
Solution:

(a) 

[Mendius Reaction] [Medius Reaction]

(b) 

(O-bromotoluene)

(c) 

Q. 393 How do you convert the following :

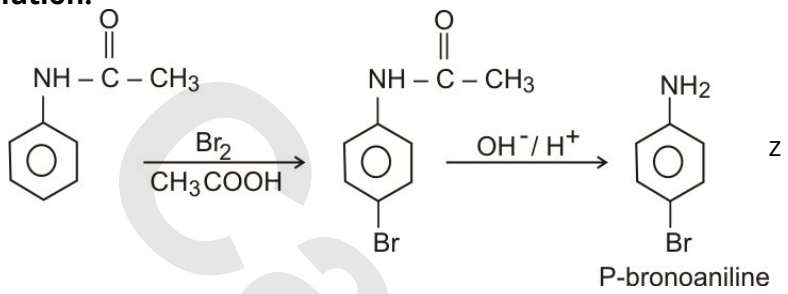
(a) N-phenylethanamide to p-bromoaniline

(b) Benzene diazonium chloride to nitrobenzene

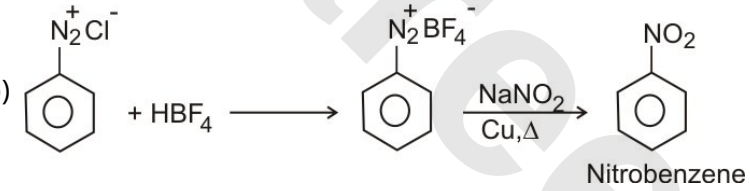
(c) Benzoic acid to aniline

Solution:

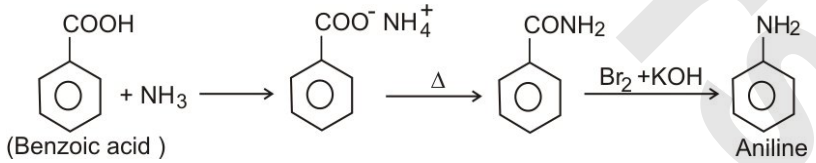
(a)



(b)



(c)



Q. 394 (a) Give reasons :

(i) Benzoic zcid is a stronger acid than acetic acid.

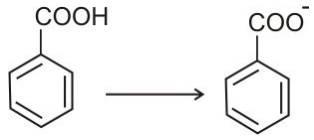
(ii) Methanal is more reactive towards nucleophilic addition reaction than ethanal.

(b) Give a simple chemical test to distinguish between propanal and propanone.

Solution:

(a)

(i) Benzoic acid is stronger acid than acetic acid because the conjugate base formed after losing H^+, is resonance stabilised in case of benzoic acid.



(Resonance stabilised)

(ii) It is due to steric and electronic reasons. Presence of methyl groupin ethanol, $CH_3-\overset{\overset{O}{\|}}{C}-H$ hinders the approach of nucleophile to carbon of $-\overset{\overset{O}{\|}}{C}-$ and it also reduces the electrophilicity of the carbonyl gp. due to $+I$ effect.

(b) Fehling's Test

$$CH_3CH_2CHO+[Ag(NH_3)_2]^+ + OH^- \xrightarrow{\triangle} CH_3CH_2COO^- + Ag\downarrow + NH_3 + H_2O$$

The silver thus deposited shines like a mirror.

Propanone does not show fehling's test.

Q. 395 (a) What are the products of hydrolysis of maltose?

(b) What type of bonding provides stability to $\alpha - helix$ structure of protein?

(c) Name the vitamin whose deficiency causes pernicious anaemia.

Solution:
(a) On hydrolysis of Maltose, $D - glucose$ is obtained.

(b) Hydrogen - bonding

(c) Vitamin $B - 12$.

Q. 396 Define the following terms :

(a) Invert sugar

(b) Native protein

(c) Nucleotide

Solution:

(a) Invert Sugar : The equimolar mixture of $D-(+)-glucose$ and $D-(-)-fructose$ obtained as a result of hydrolysis of sucrose is called invert sugar.

(b) Native Protein : A protein found in a biological system having a unique 3-D structure and specific biological activity is called a native protein.

(c) Nucleotide : A nucleotide contains all the three components of nucleic acids i.e a phosphoric acid group, a pentose sugar and a nitrogenous base.

Q. 397 (a) The conductivity of $0.001molL^{-1}$ acetic acid is $4.95\times10^{-5}Scm^{-1}$. Calculate the dissociation constant if $\wedge_m^o$ for acetic acid is $390.5Scm^2mol^{-1}$.

(b) Write Nernst equation for the reaction at $25^\circ C$:

$$2Al(s)+3Cu^{2+}(aq)\rightarrow\rightarrow 2Al^{3+}(aq)+3Cu(s)$$

(c) What are secondary batteries? Give an example.

Solution:

(a) Given $C=0.001molL^{-1}=10^{-3}molL^{-1}$

$K=4.95\times10^{-5}Scm^{-1}$

$$\wedge_m^c=\frac{k\times1000}{C}=\frac{4.95\times10^{-5}\times1000}{10^{-3}}=49.5Scm^2mol^{-1}$$

$$\alpha=\frac{\wedge_m^c}{\wedge\frac{m}{o}}=\frac{49.5}{390.5}=0.1267=12.67\,{}^o/_o$$

$$CH_3COOH\rightleftharpoons CH_3COO^-+H^+$$

C	O	O
$c(l-\alpha)$	$c\alpha$	$c\alpha$

$$K_\alpha=\frac{[CH_3COO^-]\,[H^+]}{[CH_3COOH]}=\frac{C\alpha^2}{1-\alpha}$$

$$=\frac{1\times10^{-3}\times(0.127)^2}{1-0.127}=1.844\times10^{-5}molL^{-1}$$

(b) $2Al+3Cu^{2+}\rightarrow 2Al^{3+}+3Cu$

$(s)\quad(aq)\quad(aq)\quad(s)$

Nernst equation :

$$E_{cell} = E^o cell - \frac{0.0591}{n} \log \frac{[Al^{3+}]^2}{[Cu^{2+}]^3}$$

$$= E^o cell - \frac{0.0591}{6} \log \frac{[Al^{3+}]^2}{[Cu^{2+}]^3}$$

(c) Secondary Batteries : Secondary batteries are those which can be recharged by passing an electric current through them and hence can be used over and again.

e.g. Lead storage battery and Nickel cadmium storage cell.

Q. 398

(a) Represent the cell in which the following reaction takes place :

$$2Al(s) + 3Ni^{2+}(0.1M) \rightarrow 2Al^{3+}(0.01M) + 3Ni(s)$$

Calculate its emf if $E^o_{cell} = 1.41V$.

(b) How does molar conductivity vary with increase in concentration for strong electrolyte and weak electrolyte? How can you obtain limiting molar conductivity $\wedge^o_m$ for weak electrolyte?

Solution:

(a) $2Al(s) + 3Ni^{2+}(0.1M) \rightarrow 2Al^{3+}(0.001M) + 3Ni(s)$

Cell Repn: $Al(s) \mid Al^{3+}(0.01M) \parallel Ni^{2+}(0.1M) \mid Ni(s)$

Nernst Eqn : $E_{cell} = E^0 cell - \frac{0.0591}{n} \log \frac{[Al^{3+}]^2}{[Ni^{2+}]^3}$

$$= 1.41 - \frac{0.0591}{6} \log \frac{[10^{-2}]^2}{[10^{-1}]^3} = 1.41 - 0.00985 \log 10^{-1}$$

$$= 1.41985V = 1.42V$$

(b) With increase in temperature, the greater inter-ionic attraction retard the motion of the ions and therefore the molar conductivity falls in case of both strong and weak electrolytes.

The limiting molar conductivity $(\wedge^o_m)$ for weak electrolyte can be calculated by using Kohlrausch's Law.

Q. 399 (a) Give equations of the following reactions:

(i) Phenol is treated with $conc.HNO_3$.

(ii) Propene is treated with B_2H_6 followed by H_2O_2/OH^-.

(iii) Sodium t-butoxide is treated with CH_3Cl.

(b) How will you distinguish between $butan-1-ol$ and $butan-2-ol$?

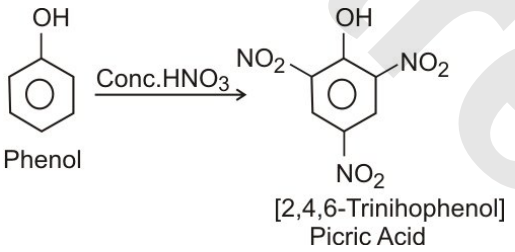
(c) Arrange the following in increasing order of acidity :

Phenol, ethanol, water

Solution:

(a)

(i)

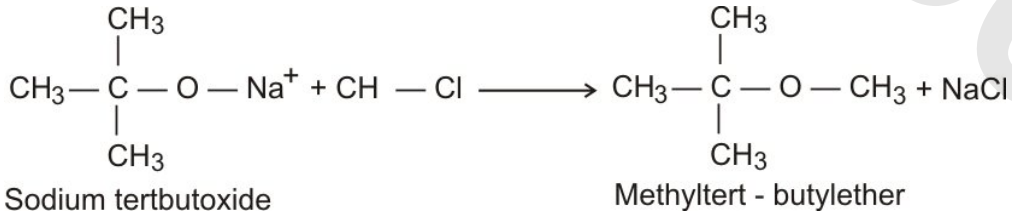


(ii) $CH_3CH=CH_2 \xrightarrow[(ii)H_2O_2/OH^-)]{(i)B_2H_6} (CH_3-CH_2-CH_2)_3B$

$$\downarrow H_2O/OH^-$$

$$3CH_3-CH_2-CH_2-OH+B(OH)_3$$

(iii)



(b) Iodoform Test:

$$CH_3CHOHCH_2CH_3+4I_2+NaOH \xrightarrow{\triangle} CHI_3\downarrow +CH_3CH_2COONa+$$

Butan-2-ol [Iodoform yellow ppt.]

$$5NaI+5H_2O$$

$CH_3CH_2CH_2CH_2OH + I_2 + NaOH \xrightarrow{\Delta}$ No Reaction.

(Butan-1-ol)

(c) $Ethanol < Water < Phenol$

Q. 400 (a) How can you obtain Phenol from (i) Cumene, (ii) Benzene sulphonic acid, (iii) Benzene diazonium chloride?

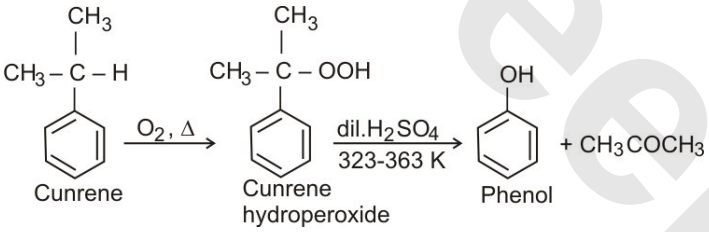
(b) Write the structure of the major product obtained from dinitration of $3-methylphenol.$

(c) Write the reaction involved in Kolbe's reaction.

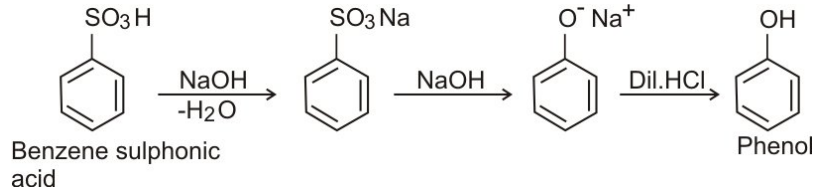
Solution:

(a)

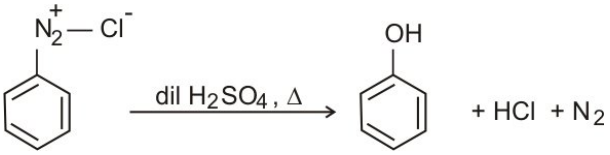
(i)



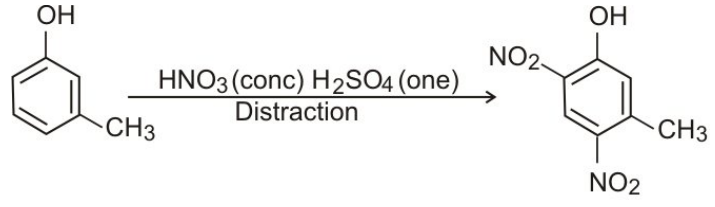
(ii)



(iii)

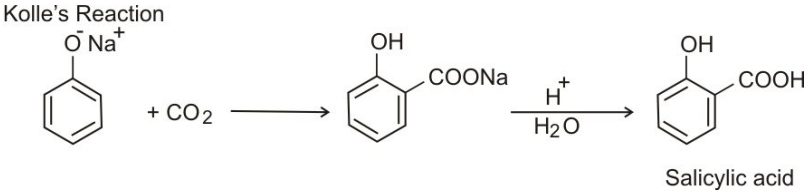


(b)



5-Methyl-2,4-dinitophenol

(c) Kolbe's Reaction



Q. 401 (a) Give one example to show the anomalous reaction of fluorine.

(b) What is the structural difference between white phosphorus and red phosphorus?

(c) What happens when XeF_6 reacts with NaF?

(d) Why is H_2S a better reducing agent than H_2O ?

(e) Arrange the following acids in the increasing order of their acidic character :

HF, HCl, HBr and HI

Solution:

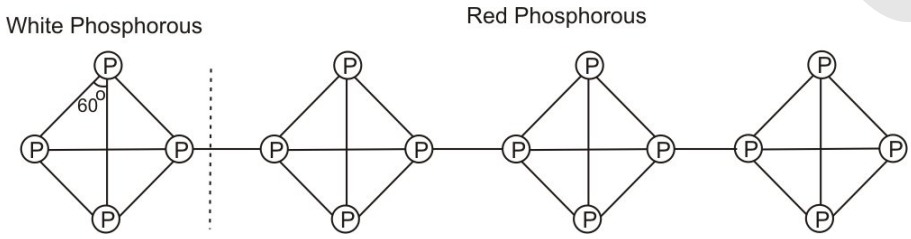
(a)

$$2F_2(g) + 2HO(l) \rightarrow 4H^+(aq) + 4F^-(aq) + O_2(g)$$

$$X_2(g) + H_2O(l) \rightarrow\rightarrow H \times (aq) + HO \times (aq)$$

Fluorine oxidises water to oxygen whereas Chlorine and Bromine react with water to form corresponding hydrohalic and hypohalous acids.

(b)



It consists of discrete It is polymeric, consisting of chain of P_4 tetrathedral tetrahedral P_4 molecule linked together

(c)

$$XeF_6 + NaF \rightarrow Na^+[XeF_7]^-$$

(d)

In H_2O, bond dissociation enthalpy of $O-H$ is more than $S-H$ bond of H_2S, is better reducing agent than H_2O.

(e)

$$HI > HBr > HCl > HF$$

Q. 402 (a) Account for the following :

(i) Tendency to show -3 oxidation state decreases from n to Bi in group 15.

(ii) Acidic character increases from H_2O to H_2Te.

(iii) F_2 is more reactive than CIF_3, whereas CIF_3, is more reactive than Cl_2.

(b) Draw the structure of (i) XeF_2, $(ii) H_4P_2O_7$.

Solution:
(a)

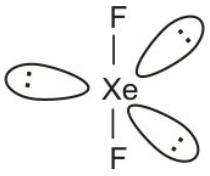
(i) The tendency to exhibit-3 oxidation state decreases down the group due to increase in size and metallic character.

(ii) Acidic character increases from H_2O to H_2Te because down the group, bond enthalpy for dissociation decreases.

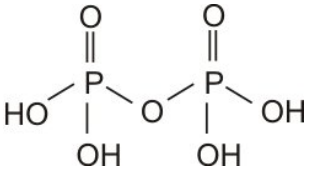
(iii) F-F bond is weaker than Cl-F bond due to small size and high electron density, more repulsion between fluorine atoms therefore F_2 is more reactive than ClF_3. Whereas in Cl_2, $Cl-Cl$ bond is stronger than ClF_3. Therefore, ClF_3 is more reactive than Cl_2

(b)

(i) XeF_2



(ii) $H_4P_2O_7$



Q. 403 Arrange the following in increasing order of pKb values :

$$C_6H_5CH_2NH_2,\ C_6H_5NHCH_3,\ C_6H_5NH_2$$

Solution:

$C_2H_5NH_2 < C_6H_5NHCH_3 < C_6H_5NH_2$

Q. 404 What type of colloid is formed when a liquid is dispersed in a solid ? Give an example.

Solution:

When a liquid is dispersed in a solid (liquid in solid), the colloid formed is Gel. Examples are Cheese, butter, jellies etc.

Q. 405 Give reasons :

1. A decrease in temperature is observed on mixing ethanol and acetone.
2. Potassium chloride solution freezes at a lower temperature than water.

Solution:

(a) Ethanol & acetone forms a non-ideal solution showing positive deviation which is accompanied by absorption of heat and a slight increase in volume, whats why a decrease in temperature is observed.

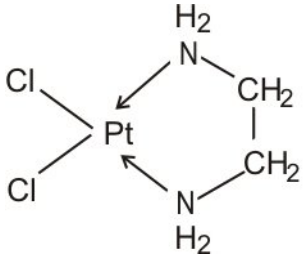
(b) Potassium chloride solution freezes at a lower temperature than water because the vapour pressure of the solution is less than that of pure solvent, hence the freezing point decreases.

Q. 406 Define the following terms with a suitable example of each :
(a) Chelate complex
(b) Ambidentate ligand

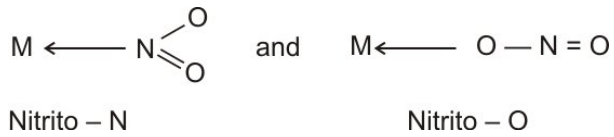
Solution:

(a) Chelate complex: The complex formed by the ligand that contains two donor atoms positioned in a way such that a five or six numbered ring is formed with the mi ion. The ring formed is called chelate ring.

For eg: $[PtCl_2(en)]$



(b) Ambidentate Ligand: Unidentate ligands containing more than one co-ordinating atoms are called ambidentate ligands.

For eg: 

Nitrito – N Nitrito – O

Q. 407 Using IUPAC norms, write the formulae for the following complexes :
(a) Tetraamminediaquacobalt(III) chloride
(b) Dibromidobis(ethane-1,2-diamine)platinum(IV) nitrate

Solution:
(a) $[Co(NH_3)_4(H_2O)_2]Cl_3$

(b) $[Pt(en)_2Br_2](NO_3)_2$

Q. 408 (a) Using valence bond theory, write the hybridisation and magnetic character of the complex $[Fe(CN)_6]^{4-}$. Atomic Number of Fe = 26)

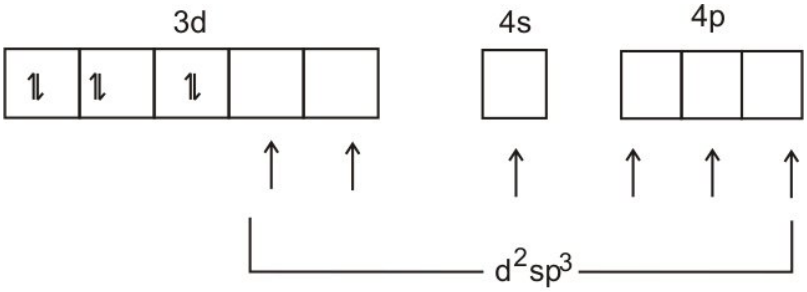
(b) Write the electronic configuration of d 6 on the basis of crystal field theory when

1. $\Delta_0 < P$ and
2. $\Delta_0 > P$

Solution:
(a)

$Fe = 3d^6 4s^2$
$Fe^{+2} = 3d^6 4s^0$

CN^- being a strong ligand, par up the electron & we get



Hybridization $= d^2sp^3$

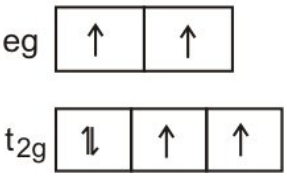
Since there are no unpaired electrons, it is diamagnetic.

(b)

(1)

$\Delta_o < P$

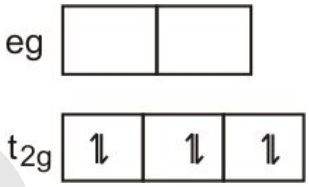
$d^6 = t_{2g}^4 e^2 g$



(2)

$\Delta_0 > P$

$d^6 = t_{2g}^6 e^0 g$



Q. 409 (a) Write the dispersed phase and dispersion medium of milk.
(b) Why is adsorption exothermic in nature?
(c) Write Freundlich adsorption isotherm for gases at high pressure.

Solution:

(a) Milk -

Dispersed phase: Liquid

Dispersion medium: Liquid

(b) During the process of adsorption, molecules of adsorbate and adsorbent come closer to form physical or chemical bonds, hence, getting stabilized, in this process, heat is evolved leading to release of heat energy, making the process exothermic.

(c) $\frac{x}{m} = kp^{\frac{1}{n}}$

where n > 1, $x \rightarrow$ mass of gas absorbed on the mass of the adsorbent at pressure p. k is constant that depends on the nature of adsorbent and the gas at a particular temperature.

Q. 410 Write the name and principle of the method used for refining of (a) Tin, (b) Copper, (c) Nickel.

Solution:

(a) Tin: Liquidation

Principle: It is based on the difference in the melting point of impurities and metals. i.e metal contains impurities that are also less feasible than metal themselves.

(b) Copper: Electrolytic Refining

Principle: The more electropositive impurities pass into solution as soluble salts while the less electropositive settle down as anode mod.

(c) Nickel: Mond's process

Principle: In this method, the crude metal is freed from impurities by first converting it into a suitable volatile compound by heating and then decomposing the volatile compound at some higher temperature to give the pure metal.

Q. 411 Give reasons for the following :

(a) Transition metals show variable oxidation states.
(b) E^o value for (Zn^{2+}/Zn) is negative while that of (Cu^{2+}/Cu) is positive.
(c) Higher oxidation state of Mn with fluorine is +4 whereas with oxygen is +7.

Solution:
(a) It is because their d-orbitals are incompletely filled.

(b) $E^o[Zn/Zn^{2+}]$ is negative because of the conversion of $Zn \rightarrow Zn^{2+}$ gives it a filled d^5 configuration which is very stable whereas, conversion of Cu to Cu^{2+} does not give any extra stabity, hence it has positive E^o value.

(c)This is because in case of oxygen, Mn forms pπ-dπ multiple bonding using 2p orbitals of oxygen and 3d orbitals of Mn.
With F, Mn shows +4 because of the single bond formation caused by the unavailability of 2p orbitals in F for multiple bonding.

Q. 412 (a) Write one example each of

(i) Thermoplastic polymer
(ii) Elastomers

(b) Arrange the following polymers in the increasing order of their intermolecular forces :
Polythene, Nylon-6,6, Buna-S

(c) Which factor provides crystalline nature to a polymer like Nylon?

Solution:
(a) (i) Polythene, Polystyrene

(ii) Neoprene

(b) Buna-S < Polyethene < Nylon-6,6

(c) Strong intermolecular forces such as Hydrogen bonding are responsible for imparting crystalline nature,

Q. 413 Write the structures of monomers used for getting the following polymers :

(a) Nylon-6,6
(b) Bakelite
(c) Buna-S

Solution:

(a) Adipic Acid & hexomethylenediamine

$$HOOC-CH_2-CH_2-CH_2-CH_2-COOH$$
$$NH_2-CH_2-CH_2-CH_2-CH_2-CH_2-CH_2-NH_2$$

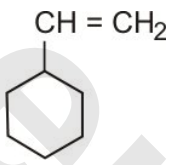
(b) Phenol & Formaldehyde

Phenol

$$HCHO$$

(c) 1,3-butadiene & Styrene

$$CH_2=CH-CH=CH_2$$



Q. 414 Arrange the following in decreasing order of solubility in water :

$$(C_2H_5)_2NH, C_2H_5NH_2, C_6H_5NH_2$$

Solution:

$$C_2H_5NH_2 > (C_2H_5)_2NH > C_6H_5NH_2$$

Q. 415 What type of colloid is formed when a solid is dispersed in a gas? Give an example.

Solution:

colloid formed when a solid is dispersed in gas is Aerosol. e.g. smoke, dust.

Q. 416 What is the difference between amylose and amylopectin ?

Solution:

Anylose

(1) It is water soluble component.

(2) It constitutes about 15-20% of starch.

Amylopectin

(1) It is water insoluble

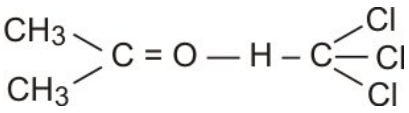
(2) It constitutes about 80-85% of starch.

Q. 417 Give reasons :

(a) An increase in temperature is observed on mixing chloroform and acetone.

(b) Aquatic animals are more comfortable in cold water than in warm water.

Solution:
(a) A mixture of chloroform and acetone forms a solution with negative deviation from Raoult's law because of the formation of hydrogen bond between the two.



Therefore, $\Delta H = -ve$

(b) Solubility of O_2 in water increases with decrease of temperature. It makes aquatic species more comfortable in cold water than in warm water.

Q. 418 Define the following terms with a suitable example of each:

(a) Polydentate ligand

(b) Homoleptic complex

Solution:
(a) When more than one donor atoms are present in a ligand, the ligand is said to be polydentate. e.g. $[EDTA]^{4-}$

(b) The complexes in which a metal is bound to only one kind of donor groups are known as homoleptic complexes

e.g $[Co(NH_3)_6]$

Q. 419 Write structures of main compounds A and B in each of the following reactions :

(a) $CH_3CH_2OH \xrightarrow{PCC} A \xrightarrow{CH_3OH\ /\ dry\ HCl(g)} B$

(b) $C_6H_5COCH_3 \overset{NaOI}{\rightarrow} A + B$

Solution:

(a) $CH_3CH_2OH \xrightarrow{PCC} CH_3-\underset{\underset{O}{\|}}{C}-H \xrightarrow[dry\ HCl]{CH_3OH} CH_3-CH(OCH_3)(OCH_3) + H_2O$

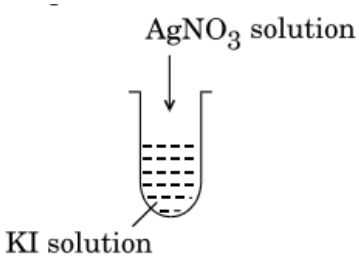
(A) Acetal (B)

(b) $C_6H_5COCH_3 \xrightarrow{NaOI} \underset{(A)}{C_6H_5COONa} + \underset{(B)}{CHI_3}$

Q. 420 (a) Write the dispersed phase and dispersion medium of butter.

(b) Why does physisorption decrease with increase in temperature ?

(c) A colloidal sol is prepared by the method given in the figure. What is the charge on AgI colloidal particles formed in the test tube?How is this sol represented ?



Solution:

(a) Dispersion medium of butter is fat and dispersed phase is water.

(b) Physisorption is due to weak Vander's force of attraction These forces decrease with increase in temperature leading to decrease in physisorption.

(c) A negative charged AgI colloid is formed.

$AgI|I^-$

$KI + AgNO_3 \rightarrow AgI|I^-$

Q. 421 Write the principle of the following :

(a) Hydraulic washing

(b) Chromatography

(c) Froth-floatation process

Solution:
(a)Hydraulic washing

Principle: It is based on the difference in the specific gravities of the gangue particles and the ore particles.

(b) Chromatography

Principle: It is based on selective distribution of the various constituents of a mixture between two phases, a stationary phase and a moving phase.

(c) Froth- floatation process

Principle: It is based on the difference in the wetting properties of the ores particles and gangue particles by oil and water respectively.

Q. 422 Give reasons for the following :

(a) Transition metals have high enthalpies of atomization.

(b) Manganese has lower melting point even though it has a higher number of unpaired electrons for bonding.

(c) Ce^{4+} is a strong oxidising agent.

Solution:
(a) It is due to availability of large number of valence electrons and high effective nuclear charge, hence, they form very strong metallic bonds leading to high enthalpies of atomization.

(b) It is due to its complex structure.

(c) It gains one electron to become Ce^{+3}, which is more stable , so it behaves as strong oxidising agent.

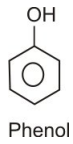
Q. 423 Write the structure of monomers used for getting the following polymers:

(a) Novolac

(b) Neoprene

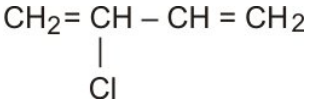
(c) Buna-S

Solution:
(a) Novolac- Phenol formaldehyde

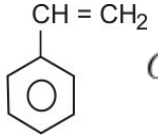


$HCHO$

(b) Neoprene- 2-chlorobuta-1,3-diene.



(c)Buna-S -Styrene 1,3-Butadiene



$CH_2 = CH - CH = CH_2$

Q. 424 (a) Write the product when D-glucose reacts with $Br_2(aq)$.

(b)What type of bonding provides stability to $\alpha - helix$ structure of protein.

(c) Name the vitamin whose deficiency causes pernicious anaemia.

Solution:
(A) (a)

(b) Hydrogen - bonding

(c) Vitamin B-12

Q. 425 **(a)** Write one example each of

(i) Cross-linked polymer

(ii) Natural polymer

(b) Arrange the following in the increasing order of their intermolecular forces:

Terylene, Buna-N, Polystyrene

(c) Define biodegradable polymers with an example.

Solution:
(a) :(i) Bakelite

(ii) starch

(b): starch

(b) Buna-N < Polystrene <Terylene

(c) Biodegradable polymers- Natural or synthetic polymer which can be degraded to small molecules by bacterialdecomposition process e.g Nylon-2,Nylon-6, PGA(Polyglycolic acid)

Q. 426 Define the following terms:

(a) Invert sugar

(b) Native protein

(c) Nucleotide

Solution:
(B) (a) Invert sugar- The equimolar mixture of D-(+)-glucos and D -(-) - fructose obtained as a result of

hydrolysis of sucrose is called invert sugar.

(b)Native Protein - A protein foundin a biological system having a unique 3-D structure and specific biological activity is called a native protein.

(c) Nucleotide: A nucleotide contains all the three components of nuclic acids i.e a phosphore acid group, sugar and a nitrogenous base.

Q. 427 Using IUPAC norms, write the formulae for the following complexes :

(a) Potassium tri(oxalato) chromate(III)

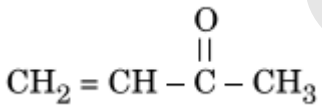
(b) Hexaaquamanganese (II) sulphate

Solution:

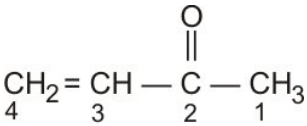
(a) $K_3[Cr(C_2O_4)_3]$

(b) $[Mn\,(H_2O)_6]\,SO_4$

Q. 428 Write the IUPAC name of the following compound :



Solution:



But - 3 en - 2 - one

Q. 429 Arrange the following in increasing order of their acidic character :

Benzoic acid, Phenol, Cresol

Solution:

$Benzoic\,acid > Phenol > Cresol$

Q. 430 Write IUPAC name of the complex

$[Co(en)_2(H_2O)(CN)]^{2+}$

Solution:
aqua cyano bis $(ethane-1,2-diamine)cobalt(III)ion$

Q. 431 Using IUPAC norms, write the formula of Ammonium tetrafluoridocobaltate (II).

Solution:
$(NH_4)_2\,[CoF_4]$

Q. 432 What is the difference between a glycosidic linkage and a peptide linkage ?

Solution:
The linkage between two monosaccharides through an ethereal or oxide linkage $(-O-)$ in an polysaccharide is known as glycosidic linkage whereas the amide linkage $\left(-\overset{\overset{O}{\|}}{C}-NH-\right)$ between two $\alpha-$amino acids formed with a loss of water molecule is called a peptide linkage.

Q. 433 What is the difference between Nucleotide and Nucleoside ?

Solution:
A nuceoside is composed of two components of nucleic acids is a pentose sugar and a nitrogenous loss. It is formed when 1-position of the pyramidine or 9-position of purine is linked to C_1 of the sugar (ribase or deoxyribase) by a B-linkage . A nucleotide contains all the three basic components of nucleic acids i.e, a phosphoric acid group, a pentose sugar and a nitrogenous base formed by esterification of C_5-OH of sugar of nucleoxide with phosphoric acid.

Q. 434 What happens when $AgCl$ is doped with $CdCl_2$? What is the name of this defect ?

Solution:
$CdCl_2$ doping leads to an impurity defect i.e, catonic vacency defect in the crystali Ag^+ ions are replaced by one Cd^{2+} ions. The Cd^{2+} ion occupies the site of one of Ag^+ion and a cation vacancy is created at the site of the other Ag^+ ion.

Q. 435 What type of defect is shown by $NaCl$ in

(a) stoichiometric defects, and

(b) non-stoichiometric defects ?

Solution:

(a) Schottky defect.

(b) Metal excess defect and Impurity defect.

Q. 436 (a) Out of 0.1 molal aqueous solution of glucose and 0.1 molal aqueous solution of KCl, which one will have higher boiling point and why ?

(b) Predict whether van't Hoff factor,(i) is less than one or greater than one in the following :

(i) CH_3COOH dissolved in water

(ii) CH_3COOH dissolved in benzene

Solution:
(a) 0.1 molal aq. solution of KCl shows higher boiling point because its 1 mole dissociates into 2 moles of ions.

$$\underset{1}{KCl} \rightarrow K^+ + \underset{2moles}{Cl^-}$$

whereas Glucose remains as such without any dissociation.

(b)

(i) $i > 1$ (ii) $i < 1$

Q. 437 Complete and balance the following equations :

(a) $C + H_2SO_4(Conc.) \rightarrow$

(b) $XeF_2 + PF_5 \rightarrow$

Solution:
(a) $C + H_2SO_4(Conc.) \rightarrow CO_2 + 2SO_2 + 2H_2O$

(b) $XeF_2 + PF_5 \rightarrow [XeF]^+ [PF_6]^-$

Q. 438 Write balanced chemical equations involved in the following reactions :

(a) Fluorine gas reacts with water.

(b) Phosphine gas is absorbed in copper sulphate solution.

Solution:
(a)

$$\underset{(g)}{2Fe} + \underset{(l)}{2H_2O} \rightarrow \underset{(ag)}{4H^+} + \underset{(ag)}{4f^-} + \underset{(g)}{O_2}$$

(b)

$$2PH_3 + 3CuSO_45H_2O \rightarrow Cu_3P_2 + 3H_2SO_4 + 15H_2O$$

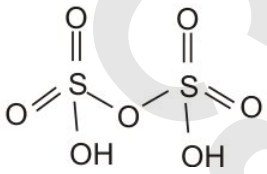
Q. 439 Draw structures of the following :

(a) $H_2S_2O_7$

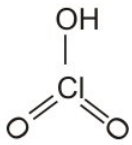
(b) $HClO_3$

Solution:

(a)



(b)



Q. 440 Write anode and cathode reactions that occur in dry cell. How does a dry cell differ from a mercury cell ?

Solution:

$$Anode : -Zn(s) \rightarrow \underset{ag}{Zu^{2+}} + 2e^-$$

$$Cathode : \underset{(s)}{2MnO_2} + \underset{(aq)}{2NH_4^+} + 2e^- \rightarrow \underset{(s)}{Mn_2O_3} + \underset{(g)}{2NH_3} + H_2O$$

Mercury cell gives a constant potential throughout its life while dry cell does not.

Q. 441 Account for the following :

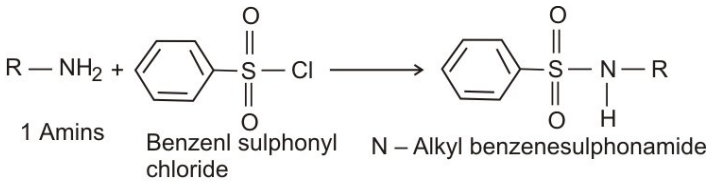
(a) Gabriel phthalimide synthesis is not preferred for preparing aromatic primary amines.

(b) On reaction with benzene sulphonyl chloride, primary amine yields product soluble in alkali whereas secondary amine yields product insoluble in alkali.

Solution:

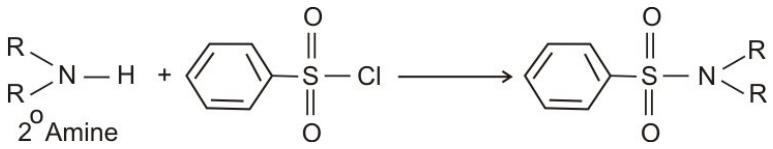
(a) Aromatic 1° amines such as aniline, fluidences etc. cannot be prepared by Gabriel Phthalimide because aryl halides do not undergo nucleophilic substitution reaction.

(b)

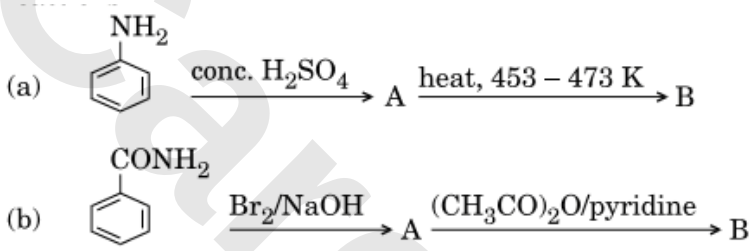


[Soluble in alkali]

The product formed in case of 1° amine contains acidic hydrogen on the N-atom which makes it soluble whereas, in case of 2° amine, no acidic hydrogen is present on N-atom

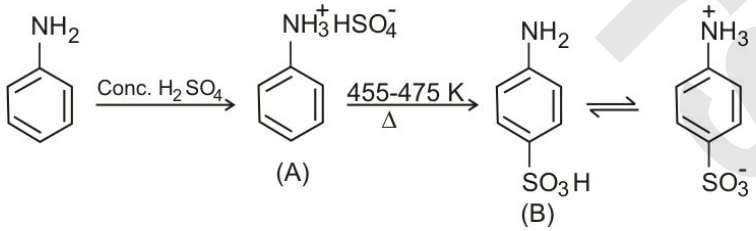


Q. 442 Write structures of compounds A and B in each of the following reactions :

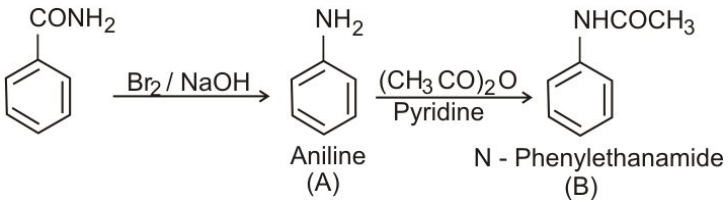


Solution:

(a)



(b)



Q. 443 (a) Following reaction takes place in the cell :

$$Zn(s) + Ag_2O(s) + H_2O(l) \rightarrow Zn^{2+}(aq) + 2Ag(s) + 2OH^-(aq)$$

Calculate $\Delta_r G^\circ$ of the reaction .

[Given : $E^0_{(Zn^{2+}/Zn)} = -0.76\ V$,

$E^0_{(Ag^+/Ag)} = 0.80\ V,\ 1\ F = 96,500\ C\ mol^{-1}$]

(b) How can you determine limiting molar conductivity, $(\wedge^\circ_m)$ for strong electrolyte and weak electrolyte ?

Solution:

(a) $Zn(s) + Ag_2O(s) + H_2O(l) \rightarrow Zn^{2+}(aq) + 2Ag(s) + 2OH^-(aq)$

$$E^\circ cell = E^\circ cathode - E^\circ anode$$

$$= E^\circ_{Ag^+/Ag} - E^\circ_{Zn^{2+}/Zn}$$

$$= 0.80V - (-0.76V) = +1.56V$$

$$\Delta_r G^\circ = -nFE^\circ cell$$

$$= -2 \times 96500 \times 1.56 = -301080 Jmol^{-1}$$

$$= -301.08\ kJmol^{-1}$$

(b) The limiting molar conductivity $(\wedge^\circ_m)$ for strong and weak electrolytes can be determined by Kohlrauschs law which states that the limiting molar conductivity of an electrolyte can be represented as the sum of the individual contribution of the cation and anion of the electrolyte.

Q. 444 Define the following with a suitable example, of each :

(a) Coagulation

(b) Multimolecular colloid

(c) Gel

Solution:

(a) Coagulation: The process of aggregating together the colloidal particle so as to change them into large-sized particles which ultimately acts as a participant is called coagulation or precipitation.

(b) Multimolecular colloid: When on the dispersion of a substance in the dispersion medium, a large number of the atom or smaller molecules of the substance aggregate together to form species having the size in the colloidal range. The species thus formed are called multimolecular colloids.for eg. Sulphur

sol.

(c) Gel: A colloid formed when a liquid is dispersed in the solid dispersion medium.

For eg. Cheese,Butter, Jellies

Q. 445 (a) Out of starch and ferric hydroxide sol, which one can easily be coagulated and why?

(b) What is observed when an emulsion is centrifuged?

(c) What is the role of promoters and poisons in catalysis?

Solution:
(a) $Fe(OH)_3$ can be easily coagulated them starch because it is a hydrophobic sol, hence, the interaction between the dispersed phase and dispersion medium is weak whereas, starch is lyophilic so, it is very stable.

(b) When an emulsion is Centrifuged, demulsification takes place.

(c) Promoters increase the efficiency of catalyst whereas poison decreases the efficiency of a catalyst.

Q. 446 (a) An element crystallizes in bcc lattice with a cell edge of $3 \times 10^{-8} cm$. The density of the element is $6.89\ g\ cm^{-3}$. Calculate the molar mass of the element.
$(NA = 6.022 \times 10^{23} mol^{-1})$

(b) What type of semiconductor is obtained when

(i) Ge is doped with In?

(ii) Si is doped with P?

Solution:
(a) $$P = \frac{Z \times M}{a^3 \times N_A} = \frac{2 \times M}{(3 \times 10^{-8})^3} \times 6.022 \times 10^{23}$$

$$\rightarrow M = \frac{6.89 \times (3 \times 10^{-8})^3 \times 6.022 \times 10^{23}}{2}$$

$$= 56.019 \simeq 56g$$

(b) (i) $p - type$ semiconductor

(ii) $n - type$ semiconductor

Q. 447 A solution 0·1 M of Na_2SO_4 is dissolved to the extent of $95\ ^o/_o$. What would be its osmotic pressure at $27^\circ C$? $(R = 0.821\ L\ atm\ K^{-1} mol^{-1})$

Solution:

$Na_2SO_4 \rightleftharpoons 2Na^+ + SO_4^{2}$

$\alpha = 95^o/_o$

$\alpha = \frac{i-1}{n-1}$

$n = 3, \quad 0.95 = \frac{i-1}{3-1} \Rightarrow i = 2.9$

$T = 27 + 273 = 300K$

$\pi = i\ CRT \Rightarrow 2.9 \times 0.1 \times 0.0021 \times 300$

$= 7.143\ atm$

Q. 448 Write down the reactions taking place in blast furnace related to the metallurgy of iron in the temperature range 500 K – 800 K. What is the role of limestone in the metallurgy of iron ?

Solution:

$\underset{(s)}{3Fe_2O_3} + \underset{(g)}{CO} \rightarrow \underset{(s)}{2Fe_3O_4} + \underset{(g)}{CO_2}$

$\underset{(s)}{Fe_3O_4} + 4\underset{(g)}{CO} \rightarrow \underset{(s)}{2Fe} + 4CO_2(g)$

$\underset{(s)}{Fe_2O_3} + \underset{(g)}{CO} \rightarrow \underset{(s)}{2FeO} + CO_2(g)$

Limestone provides the flux, C_aO which combines with an impurity SiO_2 to form easily fusible $CaSiO_3$ (slag). Thus, it helps in the removal of impurity i.e,SiO_2

$CaCO_3 \rightarrow CaO + CO_2$

$CaO + SiO_2 \rightarrow CaSiO_3$

Q. 449 What happens when

(a) Silver is leached with $NaCN$ in the presence of air?

(b) Copper matte is charged into silica lined converter and hot air blast is blown?

(c) $NaCN$ is added in an ore containing PbS and ZnS during concentration by froth floatation method?

Solution:

(a) $4Ag + 8NaCH + 2H_2O + O_2 \rightarrow 4Na\left[Ag(CN)_2\right] + 4NaOH$

During leaching, silver is oxidized when they combine with CN^- forming their respective soluble complex cyanide while the impurities remain unaffected which are filtered of.

(b) Where copper matte is charged into silica lined converters and hot air blast is blown the following reaction takes place,

$$2FeS + 3O_2 \rightarrow 2FeO + SO_2$$

$$\underset{(Impurity)}{FeO} + \underset{(Flux)}{SiO_2} \rightarrow FeSiO_3(Slag)$$

$$2Cu_2S + 3O_2 \rightarrow 2Cu_2O + 2SO_2$$

$$2Cu_2o + Cu_2s \rightarrow 6cu + So_2$$

The solidified upper obtained has blistered appearance due to evolution of SO_2. So, it is called blister copper.

(c) $NaCH$ acts as a depressant that is used to prevent one type of are, i.e, ZnS from forming a soluble zinc complex, $ZNa_2\,[Zn(CN)_4]$

$$\underset{Depressant}{NaCH} + \underset{Ore}{ZnS} \rightarrow \underset{Sodiumtetracarbonate}{Na_2\,[Zn(CN)_4]} + Na_2S$$

Q. 450 Give reasons for the following :

(a) Dioxygen is a gas but sulphur a solid.

(b) NO (g) released by jet airplanes is slowly depleting the ozone layer.

(c) Interhalogens are more reactive than pure halogens

Solution:
(a) The intermolecular forces in oxygen are weak Vander Waal's forces which cause it to exist as a gas but in Sulphur the atoms are held together by strong covalent bonds.

(b) NO released by jet aeroplanes gets converted into nitric oxide that causes depletion of the ozone layer.

$$NO + O_2 \rightarrow NO_2 + O_2$$

(c) It is so because $x = x'$ bond between dissimilar electronegative elements is weaker than the bond between two similar atoms $x - x$ due to less effective overlapping of orbitals in case of two dissimilar atoms.

Q. 451 Write the structures of monomers used to obtain the following polymers :

(a) Neoprene

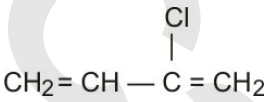
(b) PHBV

(c) Bakelite

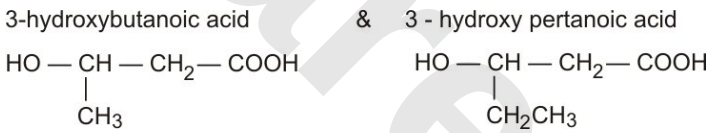
Solution:

(a) Neoprene

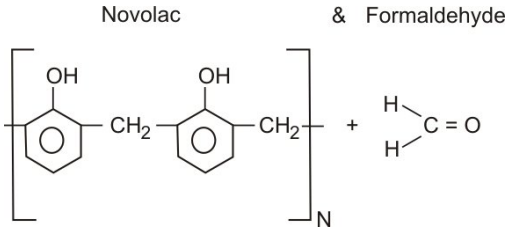
$Chloroprene\,[2-Chloro-1,3-butadine]$



(b) PHBV

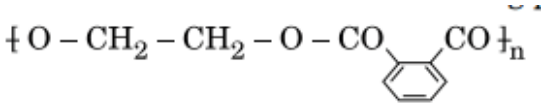


(c) Bakelite



Q. 452 (a) Arrange the following polymers in decreasing order of their intermolecular forces: Bakelite, Polythene, Buna-S, Nylon-6,6

(b) Write the monomers of the following polymer :



(c) What is the structural difference between high-density polythene (HDP) and low-density polythene (LDP)?

Solution:

(a) $Nylon 6,6 > Bakelite > Polyethane > Buna-S$

(b) Ethylene glycol & Phthalic acid

(c) High-density polyethylene (HDP) is a linear chain whereas low-density polyethylene (LDP) is highly branched.

Q. 453 (a) Why are metal hydroxides better alternatives than sodium hydrogen carbonate in antacids?

(b) Why is aspirin used in the prevention of heart-attacks?

(c) Why antihistamines do not affect the secretion of acid in the stomach ?

Solution:
(a) Metal hydroxides are better alternatives because they do not increase the pH above neutrality as they are insoluble, whereas bicarbonate makes the stomach alkaline.

(b) It is because it had anticlotting properties.

(c) It is because antihistamines act on different receptors.

Q. 454 Define the following terms with a suitable example of each :

(a) Tranquilizers

(b) Antibiotics

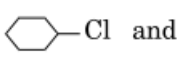
(c) Non-ionic detergents

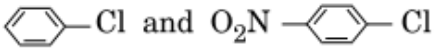
Solution:
(a) Tranquilizers: The drugs that are used for the treatment of stress, fatigue, mild & severe mental diseases are called tranquilizers.

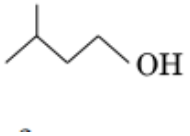
(b) Antibiotics: The chemical substances which in low concentration either kill or inhibit the growth of microorganisms by intervening in their metabolic processes are known as antibodies. eg. Penicillin, ofloxacin.

(c) Non-ionic detergents: These are esters of high molecular mass alcohols obtained by reaction between polyethylene glycol and stearic acid

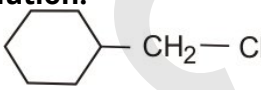
For eg. Polyethylene glycol stearate.

Q. 455 (a) Out of  which one is more reactive towards SN2 reaction and why?

(b) Out of  which one is more reactive towards nucleophilic substitution reaction and why?

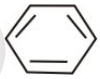
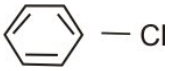
(c) Out of  which one is optically active and why?

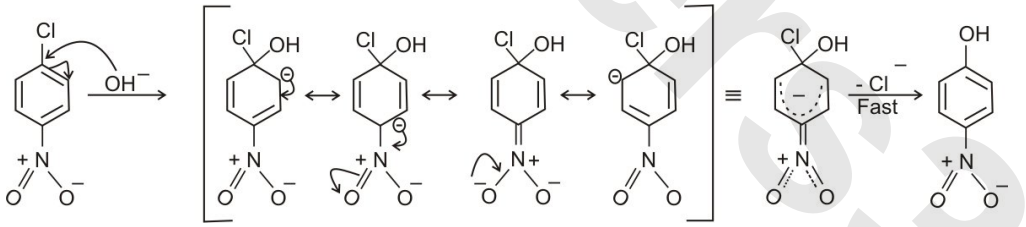
Solution:

(a)  because it is a primary halide

Orders Reactivity of Alkyl halides for Sn^2 mechanism :

$$1^\circ R - X > 2^\circ R - X > 3^\circ R - X$$

(b)  is more reactive than  towards nucleophilic substitution reaction because the presence of NO_2 group at para-position withdraws the electron from the benzene ring, thereby facilitating the attack of the nucleophile on 



(c)  is a chiral molecule, therefore, it is optically active

Q. 456 What happens when

(a) Salicylic acid is treated with $(CH_3CO)_2O/H^+$?

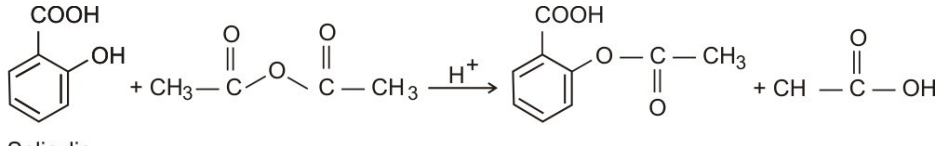
(b) Phenol is oxidized with $Na_2Cr_2O_7/H^+$?

(c) Anisole is treated withCH_3Cl/anhydrous $AlCl_3$?

Write the chemical equation in support of your answer.

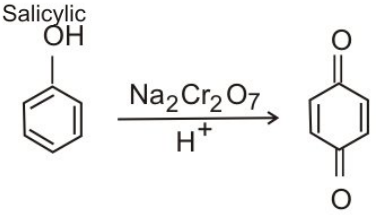
Solution:

(a)



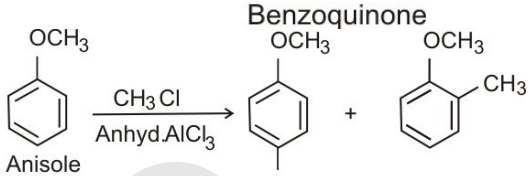
Salicylic

(b)



Benzoquinone

(c)



Anisole

CH3 (Major) 4 - methoxy toluene

(Minor) 2-methoxy toluene

Q. 457 (a) Give one chemical test as an evidence to show that

$[CO(NH_3)_5Cl]\,SO_4$ and $[CO(NH_3)_5(SO)_4]\,Cl$ are ionization isomers.

(b) $[NiCl_4]^{2-}$ is paramagnetic while $[Ni(CO)_4]$ is diamagnetic though both are tetrahedral. Why ? (Atomic no. of $Ni = 28$)

(c) Write the electronic configuration of $Fe(III)$ on the basis of crystal field theory when it forms an octahedral complex in the presence of

(i) strong field ligand, and

(ii) weak field ligand. (Atomic no. of $Fe = 26$)

Solution:

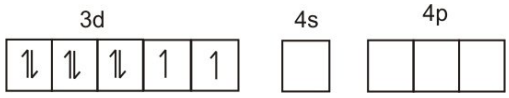
(a)

$[CO(NH_3)_5Cl]\,SO_4$ gives SO_4^{2-} ions in the solution which will give white precipitate with $BaCl_2$ solution while $[CO(NH_3)_5(SO)_4]\,Cl$ gives Cl^- ion in the solution which will give white precipitate with $AgNO_3$ solution

(b)

$[NiCl_4]^{2-}$

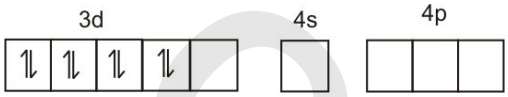
$Ni = 4s^2 3d^8$

$Ni^{+2} = 4s^{\circ}3d^{8}$ 

$[NiCl_4]^{2-}$ is paramagnetic as it contains two unpaired electrons and no pairing takes place as Cl is a weak-field ligand.

$[NiCl_4]^{2-}$ is diamagnetic as it contains CN^{-}, a strong field ligand pairs up the electron leaving no unpaired electron.

$Ni^{2+} = 4s^{\circ}3d^{8}$



(c) $Fe^{+3} = 4s^{\circ}3d^{5}$

(i) electronic configuration in case of strong field ligand

$=t_{2g}^{5} \quad e^{\circ}g$

(ii) Electronic configuration in case of weak field ligand $= t_{2g}^{3} \quad e^{2}g$

Q. 458 Define the following terms with a suitable example of each :

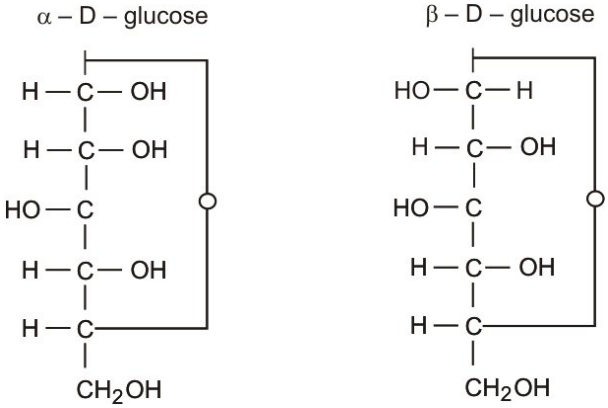
(a) Anomers

(b) Essential amino acids

(c) Denaturation of protein

Solution:
(a) Anomers - The pair of stereoisomers that differ in configuration only around C_1 are called anomers.

For eg. $\alpha - D - glucose \quad and \quad \beta - D - glucose$



(b) Essential Amino Acids - The amino acids which the human body can not synthesize are called essential amino acids For eg. Valine, tryptophan.etc,

(c) Denaturation of proteins - On heating or a treatment with mineral acids, the water-soluble globular proteins undergo coagulation or precipitation with the loss of biological activity to give water-insoluble fibrous proteins. The process is called denaturation and the coagulated protein thus formed is called denatured protein.

Q. 459 (a) Define order of reaction. How does order of a reaction differ from molecularity for a complex reaction?

(b) A first-order reaction is $50\ ^{o}/_{o}$ complete in 25 minutes. Calculate the time for $80\ ^{o}/_{o}$ completion of the reaction.

Solution:

(a) Order of a Reaction: The sum of the power of the concentration of the reactants in the rate law expression is known as the order of the reaction

Consider the general reaction

$$bA + bB \rightarrow cC + dD$$

$$Rate = K\,[A]^{x}\,[B]^{y}$$

Where x is order w.r.t A and Y is order w.r.t B

Overall order $= x + y$

Order of Reaction	Molecularity
(1) It is the sum of the concentration terms on which the rate of reaction actually depends.	(1) It is the number of atom ions or molecules that must collide with one another simultaneously so as to result into a chemical reaction.
(2) It can be fractional as well as zero.	(2) It is always a whole number. It cannot be zero or fractional.

(b) For a first-order reaction :

$$t_{\frac{1}{2}} = \frac{0.693}{K}$$

$$K = \frac{0.693}{t_{\frac{1}{2}}} = \frac{0.693}{25} = 0.028\ min^{-1}$$

Now, using the first-order reaction,

$$K = \frac{2.303}{t} \log \frac{[R_0]}{[R]}$$

$$t = \frac{2.303}{0.028} \log \frac{R_o}{0.2R_o} = \frac{2.303}{0.028} log\ 5$$

$$= 82.25 \times 0.6991 = 57.50\ min$$

Q. 460 (a) The decomposition of a hydrocarbon has value of rate constant as $2.5 \times 10^4 s^{-1}$ at $27°C$. At what temperature would rate constant be $7.5 \times 10^4 s^{-1}$ if energy of activation is $19.147 \times 10^3\ J\ mol^{-1}$?

(b) Write a condition under which a bimolecular reaction is kinetically first order. Give an example of such a reaction.

$$(Given : log\ 2 = 0.3010, log\ 3 = 0.4771, log\ 5 = 0.6990)$$

Solution:

(a) $k = 2.418 \times 10^{-5} s^{-1}$

$T = 546\ K$

$E_a = 1979.9\ kJ\ mol^{-1} = 179.9 \times 10^3\ J\ mol^{-1}$

$k = Ae^{-Ea/RT}$

$Lnk = LnA - \frac{Ea}{RT}$

$\Rightarrow Log\ k = logA - \frac{Ea}{2.303RT}$

$\Rightarrow Log\ k = log 2.418 \times 10^{-5} + \frac{179.9 \times 10^3}{2.303 \times 8.314 \times 546}$

$= (0.3835 - 5) + 17.2082$

$logA = 12.5917$

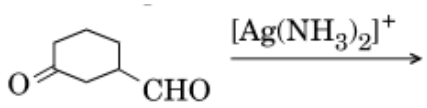
$A = antilog\ 12.5917 = 3.9 \times 10^{12} s^{-1}$

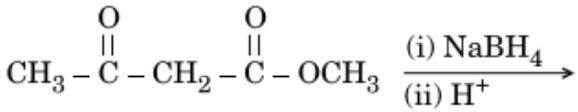
(b) When one of the reactants is taken in excess so that its concentration hardly changes. In such a condition, the bimolecular reaction will be of 1st order.

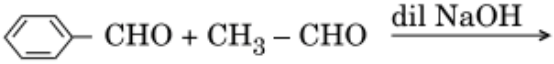
for eg. Hydrolysis of ethyl acetate $(0.01\ mol)$ with $10\ mol$ of water.

$$\underset{0.01mol}{CH_3COOC_2H_5} + \underset{10mol}{H_2O} \rightarrow CH_3COOH + C_2H_5OH$$

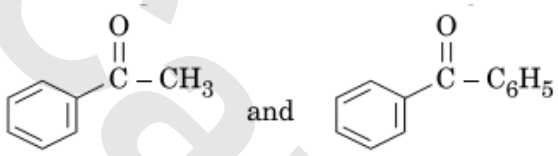
Q. 461 (a) Predict the main product of the following reactions :

(i) 

(ii) 

(iii) 

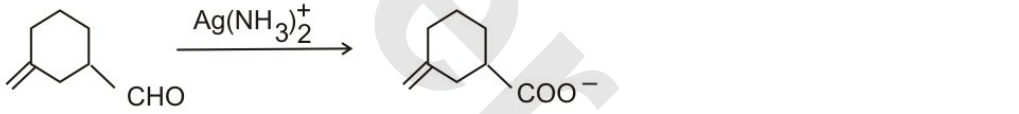
(b) Give a simple chemical test to distinguish between

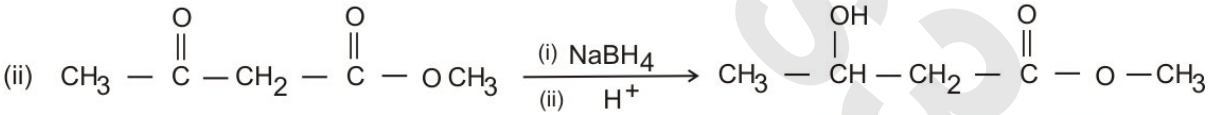


(c) Why is alpha (α) hydrogen of carbonyl compounds acidic in nature?

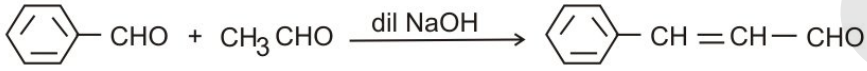
Solution:

(a)

(i) 

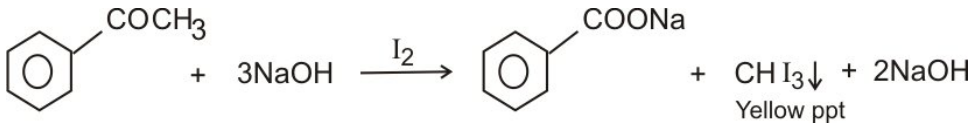
(ii) 

Methyl – 3 – hydroxybutanoate

(iii 

3 – Phenyl prop – 2 – en – 1 – al

(b) Acetophenone gives iodoform first & gives a yellow precipitate on addition of $NaOH$ and I_2 but benzophenone one does not.



Yellow ppt

(c) The acidity of $\alpha-$ hydrogen atom of carbonyl carbon is due to the strong e^-withdrawing effect of the carbonyl group and resonance stabilisation of the conjugate base.

Q. 462 (a) Write the main product formed when propanal reacts with the following reagents :

(i) 2 moles of CH_3OH in presence of dry HCl

(ii) Dilute $NaOH$

(iii) $H_2N - NH_2$ followed by heating with KOH in ethylene glycol

(b) Arrange the following compounds in increasing order of their property as indicated :

(i) $F - CH_2COOH, O_2N - CH_2COOH, CH_3COOH, HCOOH -$ — acid character

(ii) Acetone, Acetaldehyde, Benzaldehyde, Acetophenone — reactivity towards the addition of HCN.

Solution:

(a) (i)

$$CH_3CH_2CHO + 2CH_3OH \xrightarrow{HCl} C_2H_5 - CH(OCH_3)_2$$

OR

$$C_2H_5 - \overset{O-CH}{CH} - O - CH_3$$

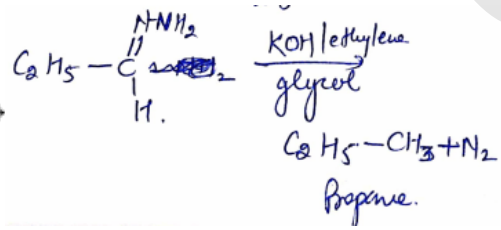
(ii)

$$CH_3CH_2CHO + \underset{(dil)}{NaOH} \rightarrow C_2H_5 - \underset{OH}{CH} - \overset{CH_3}{CH} - CHO$$

$$CH_5 - CH = \overset{CH_3}{CH} - CHO$$

(iii)

$$CH_3CH_2CHO \xrightarrow[-H_2O]{NH_2-NH_2}$$



(b) (i) $CH_3COOH < HCOOHF - CH - COOH < D_2N - CH_2 - COOH$

(ii) $Acetophenone < Benzealdehyde < Acetone < Acetaldehyde.$

Q. 463 (a) Account for the following :

(i) Manganese shows maximum number of oxidation states in 3d series.

(ii) E° value for Mn^{3+}/Mn^{2+} couple is much more positive than that for Cr^{3+}/Cr^{2+}.

(iii) Ti^{4+} is colourless whereas V^{4+} is coloured in an aqueous solution.

(b) Write the chemical equations for the preparation of $KMnO_4$ from MnO_2. Why does purple colour of acidified permanganate solution decolourise when it oxidises Fe^{2+} to Fe^{3+} ?

Solution:

(a) (i) All the seven electrons of $3d$ and $4s$ subshell can participate in bond formation. Therefore, it shows the maximum number oxidation state $[+2]$ in the 3d series.

(ii) It is due to much higher third ionisation enthalpy of Mn where the charge is $d5$ to $d4$.

(iii) Ti^{4+} has no d-electron $\left[Ti^{4+} = [Ar]\, 3d^{\circ}4s^{\circ}\right]$, Therefore, no d-d transition is possible, hence, it is colourless in aqueous solutions, on the other hand, V^{4+} V^{4+} $[[Ar]\, 4s^{\circ}3d^{\circ}]$ has one electron in d-orbital, which undergoes d-d transition, importing colour in aqueous solutions.

Conversion of MnO_2 to K_2MnO_4 :

(b) (i) $2MnO_2 + 4KOH + O_2 \rightarrow 2K_2MnO_4 + 2H_2O$

Conversion of K_2MnO_4 to $KMnO_4$:

(ii) $2K_2MnO_4 + Cl_2 \rightarrow 2KMnO_4 + 2KCl$

$$MnO_4^- + 5Fe^{2+} + 8H^+ \rightarrow Mn^{2+} + 5Fe^{3+} + 4H_2O$$

The purple colour of MnO_4 decolourise as it gets reduced to Mn^{2+}

Q. 464 (a) Write one difference between transition elements and p-block elements with reference to variability of oxidation states.

(b) Why do transition metals exhibit higher enthalpies of atomization?

(c) Name an element of lanthanoid series which is well known to shown $+4$ oxidation state. Is it a strong oxidising agent or reducing agent ?

(d) What is lanthanoid contraction? Write its one consequence.

(e) Write the ionic equation showing the oxidation of $Fe(III)$ salt by acidified dichromate solution.

Solution:
(a) In transition elements, the oxidation states are more stable for the heavier elements in a group.

eg. $M_0\ (Vi)$n is more stable than $Cr\ (Vi)$ whereas in p-block elements, the lower oxidation states are more stable for heavier elements due to inert pair effect.

$\rightarrow$In transition elements, the oxidation states differ from each other by unity i.e, Fe^{3+} and Fe^{2+} while in p-block elements, the oxidation status differ by two Pb^{2+} and Pb^{4+} etc.

(b) This is because transition metals have strong metallic bonds as they have a large number of unpaired electrons.

(c) Ce^{+4}, it is a strong oxidizing agent.

(d) Lanthanoid Contraction: The regular decrease in the atomic radii and ionic radii of lanthanoids with increasing atomic number is known as lanthanoid contraction.

Consequence: Difficulty in the separation of lanthanoids due to similar ionic radii.

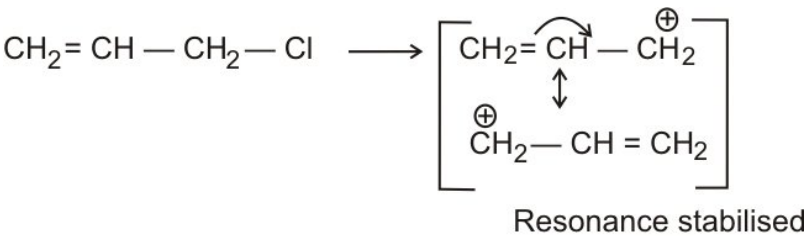
(e) $Cr_2O_7^{2-} + 14H^+ + 6Fe^{2+} \rightarrow 2Cr^{3+} + 6Fe^3 + 7H_2O$

Q. 465 Using IUPAC norms write the formula of Hexaamminecobalt(III) sulphate.

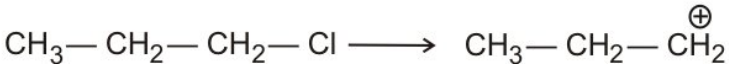
Solution:
$[Co(NH_3)_6]_2(SO_4)_3$

Q. 466 Why is $CH_2 = CH - CH_2 - Cl$ more easily hydrolysed than $CH_3 - CH_2 - CH_2 - Cl$?

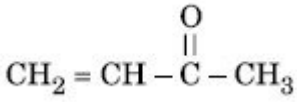
Solution:
This is because the allylic carbocation formed in the slowest step in case of $CH_2 = CH - CH_2 - Cl$ is resonance stabilized whereas there is no such resonance stabilization of carbocation formed in case of $CH_3 - CH_2 - CH_2 - Cl$



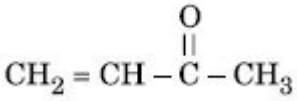
Resonance stabilised



Q. 467 Write the IUPAC name of the following compound:



Solution:



But-3-en-2-one

Q. 468 Arrange the following in increasing order of their boiling point:

$CH_3CH_2OH, CH_3CHO, CH_3 - O - CH_3$

Solution:

$CH_3 - O - CH_3 < CH_3CHO < CH_3CH_2OH$

Q. 469 Complete and balance the following equations:

(a) $S + H_2SO_4(conc.) \rightarrow$

(b) $PCl_3 + H_2O \rightarrow$

Solution:

(a) $3S + 2H_2SO_4(conc.) \rightarrow 3SO_2 + 2H_2O$

(b) $PCl_3 + 3H_2O \rightarrow H_3PO_3 + 3HCl$

Q. 470 Write balanced chemical equations involved in the following reactions:

(a) Chlorine gas reacts with cold and dilute NaOH.

(b) Calcium phosphide is dissolved in water.

Solution:

a) $2NaOH + Cl_2 \rightarrow NaCl + NaOCl + H_2O$

(Cold and dil)

b) $Ca_3P_2 + 6H_2O \rightarrow 3Ca(OH)_2 + 2PH_3$

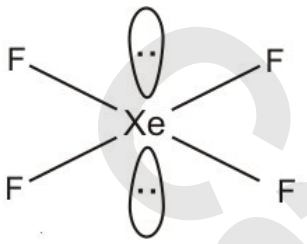
Q. 471 Draw structures of the following:

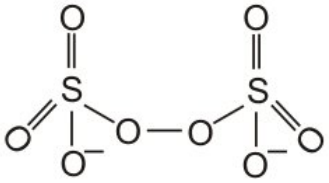
a) XeF_4

b) $S_2O_8^{2-}$

Solution:

XeF_4 $S_2O_8^{2-}$





Q. 472 (a) Write the reaction that occurs at anode on electrolysis of concentrated H_2SO_4 using platinum electrodes.

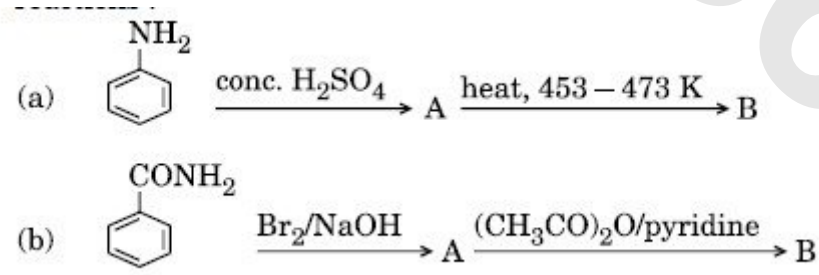
(b) What is the effect of temperature on ionic conductance?

Solution:

a) Anode: $2SO_4^{2-}(aq) \rightarrow S_2O_8^{2-}(aq) + 2e^-$

b) Ionic conductance increases with an increase in temperature because of the decrease in solute-solute, solute-solvent, and solvent-solvent interactions.

Q. 473 Write structures of compounds A and B in each of the following reactions:



Solution:

(a) It is due to greater inter-electronic repulsion between the lone pairs of electrons present on smaller size O-atoms of O-O bond.

(b) It is due to a gradual decrease in their electronegativity and ionization enthalpy.

(c) Cl_2 acts as a bleaching agent in the presence of moisture. The bleaching action of Cl_2 is due to nascent oxygen.

$$Cl_2 + H_2O \rightarrow 2HCl + [O]$$

$$Coloured\ Substance + [O] \rightarrow Colourless\ Substance$$

Q. 474 Write the structures of monomers used to obtain the following polymers:

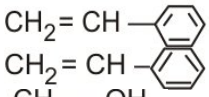
(a) Buna-S

(b) Glyptal

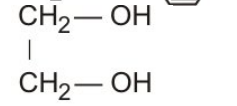
(c) Nylon-6

Solution:

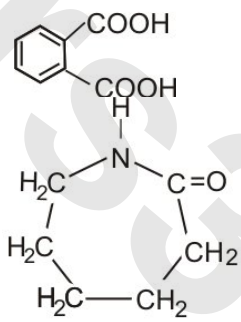
(a)

	Monomer	Structure
Buna - S	1 - 3 Butadiene	$CH_2 = CH - CH = CH_2$
	Styrene	

(b)

Glyptal	Ethylene Gloycol + Phthalic acid	

(c)

Nylon - 6	Caprolactum	

Q. 475 (a) Arrange the following polymers in increasing order of their intermolecular forces:

Polyvinylchloride, Neoprene, Terylene

(b) Write one example each of

(i) Natural Polymer

(ii) Thermosetting polymer

(c) What is the significance of numbers 6,6 in the polymer Nylon-6,6?

Solution:

(a) Neoprene<Polyvinylchloride<Terylene

(b) (i) Cellulose (ii) Bakelite

(c) In Nylon-6,6, 6,6 stands for two types of monomers containing six carbon atoms i.e. Adipic acid $HOOC-(CH_2)_4-COOH$ and hexamethylene diamine $[NH_2-(CH_2)_6-NH_2]$

Q. 476

(a) Which one of the following is disinfectant?

0.2% solution of phenol or 1% solution of phenol.

(b) What is the difference between agonists and antagonists?

(c) Write one example each of

(i) Artificial sweetener

(ii) Antacids

Solution:
(a) 1% solution of phenol

(b) Agonists are the drugs that mimic the natural messenger by switching on the receptor whereas Antagonists are the drugs that bind to the receptor site and inhibit its natural function.

(c)

(i) Saccharin

(ii) Ranitidine

Q. 477

Define the following terms with a suitable example of each:

(a) Antiseptics

(b) Bactericidal antibiotics

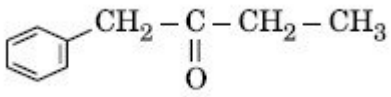
(c) Cationic detergents

Solution:
(a) Antiseptics are the chemical substances that prevent the growth of microorganisms or even kill them but are not harmful to living human tissues. eg: Dettol, Boric Acid, etc

(b) Bactericidal Antibiotics are those that have killing effect on microbes eg: Penicillin, Ofloxacin, etc

(c) Cationic detergents are quarternary ammonium salts of amines with acetates, chloride or bromides as anions eg: cetyltrimethylammonium bromide

Q. 478 Write the IUPAC name of the following compound:



Solution:
1-Phenylbutan-2-one

Q. 479 Write IUPAC name of the complex $[Co(en)_2Cl_2]^+$

Solution:
Dichloride[ethane-1,2-diamine] cobalt(III) ion.

Q. 480 Arrange the following in increasing order of their acidic character:

Ethanol, Phenol, Water

Solution:
$Ethanol < Water < Phenol$

Q. 481 Complete and balance the following equations :

a)$NH_3(excess) + Cl_2 \rightarrow$

b)$XeF_6 + 2H_2O \rightarrow$

Solution:
a)$8NH_3(excess) + 3Cl_2 \rightarrow 6NH_4Cl + N_2$

b)$XeF_6 + 2H_2O \rightarrow XeO_2F_2 + 4HF$

Q. 482 Write balanced chemical equations involved in the following reactions :

a. XeF_4 reacts with SbF_5.
b. Ag is heated with PCl_5.

Solution:

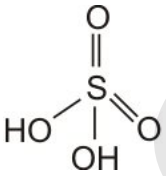
a) $XeF_4 + SbF_5 \rightarrow [XeF_3]^+ + [SbF_6]^-$

b) $Ag + PCl_5 \rightarrow AgCl + PCl_3$

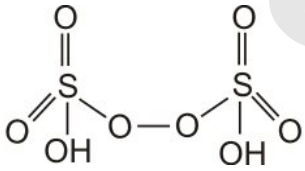
Q. 483 Write any two oxoacids of sulphur and draw their structures.

Solution:

a) Sulphuric acid $[H_2SO_4]$



b)Peroxodisulphuric acid $[H_2S_2O_8]$



Q. 484 Write the name of two fuels other than hydrogen used in fuel cell. Write two advantages of fuel cell over an ordinary cell.

Solution:

Methanol and Oxygen.

Advantages:

(i) Because of the continuous supply such cells never become dead.

(ii) Fuel-cell is pollution free.

(iii) Fuel cell has high efficiency.

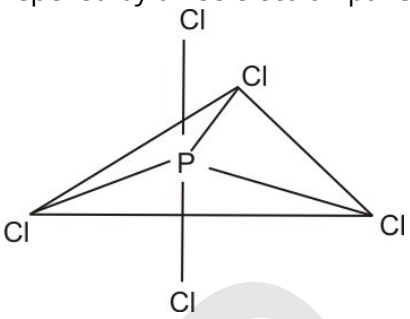
Q. 485 Give reasons for the following :

a. Acidic character decreases from N_2O_3 to Bi_2O_3
b. All the P – Cl bonds in PCl_5 are not equivalent.
c. HF is a weaker acid than HCl in an aqueous solution.

Solution:

(a) Acidic character decreases from N_2O_3 to Bi_2O_3 because of decrease in electronegativity down the group.

(b) The three halogen atoms occupy equitorial position while the other two occupy axial positions. Since the three equatorial E-X bonds are repelled by two 'electron pairs but the two axial E-X bonds are repelled by three electron pairs, therefore axial bonds are usually longer than the equitorial bonds.



(c) It is due to high bond dissociation enthalpy of HF than HCl, it does not release hydrogen easily hence a weaker acid than HCl.

Q. 486 Write the structures of monomers used to obtain the following polymers :

a. Natural rubber
b. PVC
c. Nylon-6,6

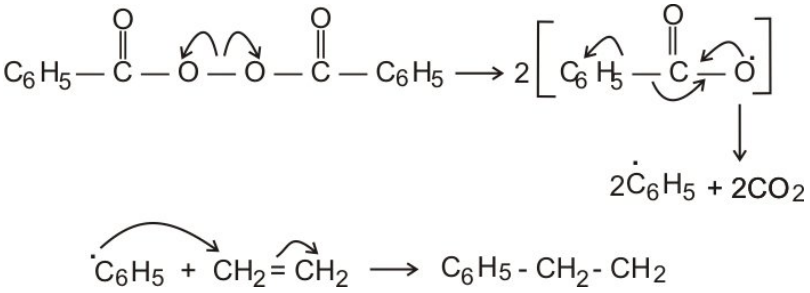
Solution:

Polymer	Monomer	Structure
(i) Natural rubber	Isoprene	$CH_2 = C(CH_3) - CH = CH_2$
(ii) PVC	Vinyl chloride	$CH_2 = CH - Cl$
(iii) Nylon 6,6	Adipic acid Hexamethylene diamine	$HOOC - (CH_2)_4 - COOH$ $NH_2 - (CH_2)_6 - NH_2$

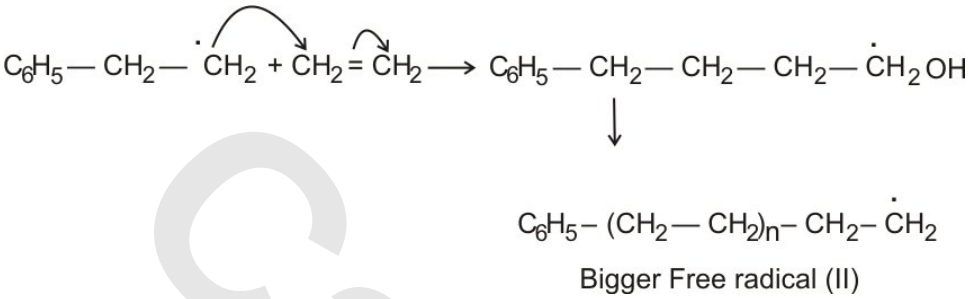
Q. 487 Write the mechanism of free radical polymerisation of ethene.

Solution:
Mechanism

1)Chain initiating steps

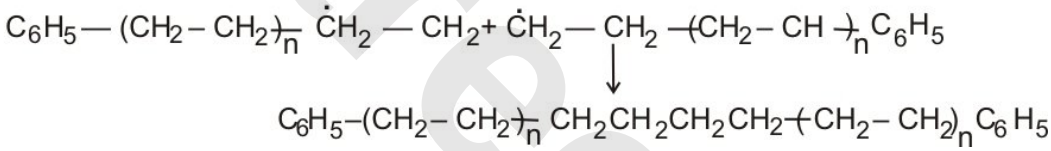


2) Chain propagating steps:

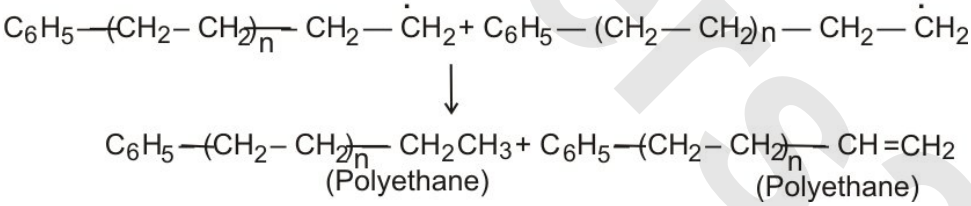


3) Chain terminating steps:

Step-1 :- By combination of free radicals



Step-2 :- By disproportionation of free radicals



Q. 488 Define the following terms with a suitable example of each :

a. Tertiary structure of protein
b. Essential amino acids
c. Disaccharides

Solution:

a) **Tertiary structure of protein**: It regers to the manner in which the entire protein molecule folds up in the 3d space to produce a specific shape. It represents overall folding of polyptide chains.

b) **Essential amino acids** : The amino acids which a human body cannot synthesize are called essential amino acids. eg: Lysine, Tryptophan

c) **Dissacchorides**: Carbohydrates which upon hydrolysis give two molecules of the same or different monosaccharides are called disaccharides.

$$C_{12}H_{22}O_{11} + H_2O \overset{H^+}{\rightarrow} C_6H_{12}O_6(glucose) + C_6H_{12}O_6(fructose)$$

Q. 489 Name the defect in the following crystal :

$X^+ Y^- X^+ Y^-$

$Y^- \square Y^- X^+$

$X^+ \square X^+ Y^-$

$Y^- X^+ Y^- X^+$

Solution:
Schottky defect is there in the crystal.

Q. 490 When a coordination compound $CrCl_3.6H_2O$ is mixed with $AgNo_3$, two moles of $AgCl$ are precipitated per mole of the compound. What is the structural formula of the coordination compound ?

Solution:
$CrCl_3.6H_2O + AgNO_3 \rightarrow 2AgCl\downarrow$

Formula :- $[Cr\,(H_2O)_5\,Cl]\,Cl_2.H_2O$

Q. 491 What is the difference between a complex and a double salt ?

Solution:
Double salts dissiciate completely into ions when dissolved in water .

Example - $KCl.\ MgCl_2.\ 6H_2O$

Complex when dissolved in waters does not loses its identity i.e, the complex ion almost does not dissociate.

Example - $K_4\,[Fe(CN)_6]$

Q. 492 Define associated colloid with an example.

Solution:
Associated collids or miscelles are substances which act as electrolytes at low concentration but at high

concentration associate with each other to form partocles having size in collidal range.

Example - loops.

Q. 493 Why is t-butyl bromide more reactive towards S_N1 reaction as compared to n-butyl bromide ?

Solution:
t-butybromide will be more reactive towards S_N1 reaction. because it give 3 degree carbocation which is more stable, hence increasing its reactivity.

Q. 494 Write the reaction involved in the Hoffmann bromamide degradation reaction.

Solution:
Hoffmann bromide digradation reaction,

$$CH_3CONH_2 + Br_2 + 4NaOH.(aq)$$

$$\downarrow$$

$$CH_3NH_2 + 2NaBr + Na_2CO_3 + 2H_2O$$

Q. 495 Propanamine and N,N-dimethylmethanamine contain the same number of carbon atoms, even though Propanamine has higher boiling point than N,N-dimethylmethanamine. Why ?

Solution:
Propamine has higher boiling point than N,N diamethylamine because propamine is more associated than through H-bonding due to presence of 2 N-H bonds.

Q. 496 Give reasons for the following :

(a) Aquatic species are more comfortable in cold water than warm water.

(b) At higher altitudes people suffer from anoxia resulting in inability to think.

Solution:
(a) Aquatic species are more comfortable in cold nature than warm. since, availibility of dissolved in air is more as decrease in temperature, increases in solubility of gases.

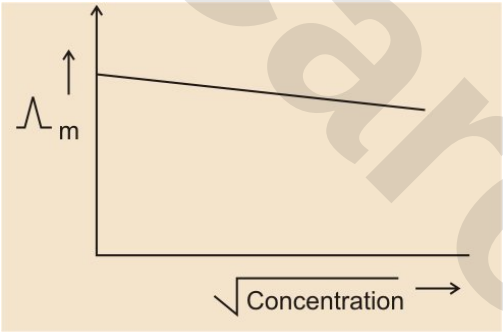
(b) At higher altitudes people suffer from anoxia resulting in mobillity to think as they suffer from low concentration of oxygen in blood since at higher altitudes the pressure of air is less which makes them weak.

Q. 497 What type of azeotropic mixture will be formed by a solution of acetone and chloroform ? Justify on the basis of strength of intermolecular interactions that develop in the solution.

Solution:
Mixture of acetone and chloroform form maximum boililng azeotrophes.in pure state acetone has dipole. dipole attractions whereas $CHCl_3$ has rander waals forces, when two are mixed they form H-bonds with each other, this increases the forces in solution and and hence shows negative derivations from Roult's law.

Q. 498 Explain with a graph, the variation of molar conductivity of a strong electrolyte with dilution.

Solution:



Increase in molar conductivity for a strong electrolyte is not much but is due to decrease in intellonic attraction.

Q. 499 When dilute ferrous sulphate solution is added to an aqueous solution containing nitrate ion followed by careful addition of concentrated sulphuric acid along the sides of test tube, a brown ring is formed at the interface between the solution and sulphuric acid layers. Which anion is confirmed by the appearance of brown ring ? What is the composition of the brown ring ?

Solution:
NO_3^- anium is confirmed by appearance of brown ring.

Composition of brown ring - $[Fe(H_2O)_5NO]^{2+}$

Q. 500 How can you prepare Cl_2 from HCl and HCl from Cl_2 ? Write reactions only.

Solution:
Cl_2 from HCl

$MnO_2 + 4HCl \rightarrow MnCl_2 + Cl_2 + 2H_2O$

HCl from Cl_2

$Cl_2 + H_2O \rightarrow 2HCl + [O]$

Q. 501 Use the data to answer the following and also justify giving reason :

	Cr	Mn	Fe	Co
$E^0_{M^{2+}/M}$	-0.91	-1.18	-0.44	-0.28
$E^0_{M^{3+}/M}$	-0.41	$+1.57$	$+0.77$	$+1.97$

(a) Which is a stronger reducing agent in aqueous medium, Cr^{2+} or Fe^{2+} and why ?

(b) Which is the most stable ion in $+2$ oxidation and why ?

Solution:
(a) Cr^{2+} because lower the E^0 value, more is the tendency of metal to get oxidised and hence stronger reducing agent.

(b) Mn^{+2} is most stable ion due to presence half filled extra stable d^5 configuration.

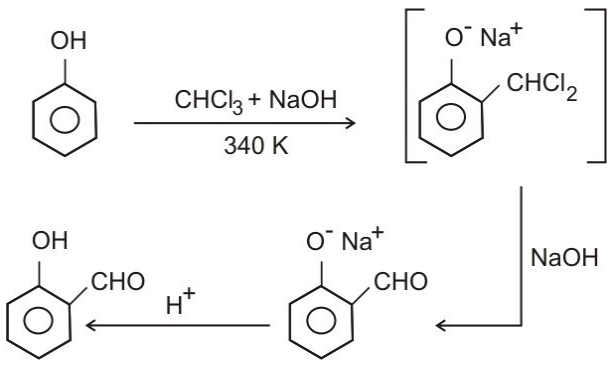
Q. 502 Define with equation :

(a) Riemer-Tiemann Reaction

(b) Williamson's Synthesis

Solution:
(a) Remove Tiemann reaction -

Phenol on reaction with $CHCl_3$ in presence of alkali, followed by acidification of resulting product gives $O - Salicyaldehyde$ as the major product.



(b) Williameonis synthesis-

Alkylhalides on reaction with sodium alkoxide or sodium phenoxide gives ethers.

$$CH_3Br + CH_3CH_2O^-Na^+ \rightarrow CH_2CH_2OCH_3 + NaBr$$

Q. 503 Give the structures of monomers of the following polymers :

(a) Nylon-6,6

(b) Buna-S

Solution:
(1) Nylon - 6,6

$H_2N-(CH_2)_6-NH_2$ and $HOOC-(CH_2)_4-COOH$

(2) Buna - S

$$CH_2 = CH - CH = CH_2 + C_6H_5 - CH = CH_2$$

Q. 504 Classify the following as addition and condensation polymers giving reason :

(a) Teflon

(b) PHBV

Solution:
(a) Tedlon - Addition polymer as in this, monomer simply add on to one another reading to formation of polymer.

(b) PHBV - Condensation polymer, as it is formed by condensation reaction between two bifunctional monomers and involves ions of water.

Q. 505 Chromium crystallises in bcc structure. If its edge length is $300\ pm$, find its density. Atomic mass of chromium is $52\ u$.$\left[N_A = 6.022 \times 10^{23}\ mol^{-1}\right]$

Solution:
$BCC, \quad z = 2$

edge $= 300\ pm = 300 \times 10^{-10} cm$

$M = 52\ u$

$d = \frac{Z \times M}{a^3 \times N_a}$

$$= \frac{2 \times 52}{(300 \times 10^{-10})^3} \times 6.023 \times 10^{23}$$

$= 6.396\ g/cm^3$

Q. 506 At 300 K, 30 g of glucose present in a litre of its solution has an osmotic pressure of 4·98 bar. If the osmotic pressure of a glucose solution is 1·52 bar at the same temperature, what would be its concentration ?

Solution:

$T = 300\ K$

$W = 30\ g$

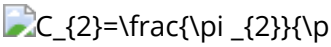
$V = 1\ L$

$\pi_1 = 4.98\ bar$

$\pi_2 = 1.52\ bar$

$C_2 = ? \pi_1 = C_1RT \quad ; \quad \pi_2 = C_2RT$

$\frac{\pi_1}{\pi_2} = \frac{C_1}{C_2}$



$C_2 = \frac{1.52}{4.98} \times \frac{30}{180 \times 1}$

$= 0.0508\ M$

Q. 507 Calculate $\Delta_r G^\circ$ and $log\ K_c$ for the following reaction :

$Cd^{+2}(aq) + Zn(s) \rightarrow Zn^{2+}(aq) + Cd(s)$

Given : $E^0_{Cd^{2+}/Cd} = -0.403\ V$

$E^0_{Zn^{2+}/Zn} = -0.763\ V$

Solution:

$\Delta_r G^\circ = ? \quad log\ K_c = ?$

$Cd^{+2}(aq) + Zn(s) \rightarrow Zn^{2+}(aq) + Cd(s)$

$E^0 Cd^{2+}/Cd = -0.403\ V$

$E^0 Zn^{2+}/Zn = -0.763\ V$

$E^0_{cell} = E^0_C - E^0_A$

$= -0.403 - (-0.763)$

$= 0.36\ V$

$n = 2$

$\Delta_r G^\circ = -nFE^\circ_{cell}$

$= -2 \times 96500 \times 0.36$

$= -69480\ J/mol$

$\Delta_r G^0 = -2.303\ RT\ logK_c$

$logK_c = \frac{-\Delta_r G^0}{2.303\ RT}$

$= \frac{69480}{2.303 \times 8.314 \times 298}$

$= 12.1769$

Q. 508 Chromium metal is electroplated using an acidic solution containing CrO_3 according to the following equation :

$CrO_3(aq) + 6H^+ + 6e^- \rightarrow Cr(s) + 3H_2O$

Calculate how many grams of chromium will be electroplated by 24,000 coulombs. How long will it take to electroplate 1·5 g chromium using 12·5 A current ?

[Atomic mass of $Cr = 52\ g\ mol^{-1}$, $1\ F = 96500\ C\ mol^{-1}$]

Solution:

$CrO_3(aq) + 6H^+ + 6e^- \rightarrow Cr(s) + 3H_2O$

$n \neq 6$

$Q = 24000\ C$

$Q = n \times nfactor \times f$

$= 0.04145\ mol$

Molar mass of $Cr = 52$

$\therefore 52 \times 0.04145 = 2.155\ g$

Charge $= \dfrac{6 \times 1.5}{52} \times 96500$

$= 12.5 \times t = \dfrac{1.5}{52} \times 6 \times 96500$

$t = \dfrac{1.5 \times 6 \times 96500}{52 \times 12.5}$

$= 1.336.15\ t$

Q. 509 Give reasons for the following :

(a) Leather gets hardened after tanning.

(b) $FeCl_3$ is preferred over KCl in case of a cut leading to bleeding.

(c) Freundlich isotherm becomes independent of pressure at high pressure for a gas absorbed on a solid.

Solution:
(a) Leather gets hardened after tannings because animal is collidal and has positively charged particles, whereas forming has negatively charged particles, resulting in mutual coagulation, when they are mixed, which hardens the rather.

(b) $FeCl_3$ is preferred over KCl in case of a out reading to bleeding as Fe in $+3$ oxidation state , whereas K is in $+1$, higher the valency better is the coagulation efficiency of compound.

(c) Freundlich adsorption isotherm becomes independent of pressure at high pressure for a gas absorbed on solid, because at high pressure, the curves approch saturation, i.e, more pressure will not increase the number of particles absorbed.

Q. 510 What is the role of

(a) Depressants in froth floatation ?

(b) Carbon monoxide in Mond's process ?

(c) Concentrated sodium hydroxide in leaching of alumina from bauxite ?

Solution:
(a) Deoressants in froth flotation are used to present one type of sulphide are particles from forming the froth with air bubbles.

(b) Carbon monoxide in Mond's process hups to form volatile complex of nickel. i.e, $Ni(CO)_4$ which is subjected to high temperature so that it is decomposes to give pure nickel.

(c) Concentrated sodium hydroxide in leaching - Alumina from bauxite acts as a reducing agent and Alumina dissolves as sodium meta-aluminate and silica as sodium silicate having behind impurities.

Q. 511 Write chemical reactions taking place in the extraction of Aluminium from Bauxite ore.

Solution:
Chemical reactions in attraction of Aluminium from Bauxite are-

$$Al_2O_3(s) + 2NaOH(aq) + 3H_2O(s) \rightarrow 2Na[Al(OH)_4(aq)]$$

$$2Na[Al(OH)_4] + CO_2 \rightarrow Al_2O_3.xH_2O(s) + 2NaHCO_3$$

$$Al_2O_3.x\ H_2O(s) \overset{1473K}{\rightarrow} Al_2O_3(s) + x\ H_2O(g)$$

Q. 512 Explain the method of preparation of sodium dichromate from chromite ore. Give the equation representing oxidation of ferrous salts by dichromate ion.

Solution:
Preperation of sodium dichromate from chromite ore.

$$\underset{(chromite ore)}{4Fe\ Cr_2\ O_4} + 8\ Na_2CO_3 + 7\ O_2$$

$$\downarrow$$

$$8Na_2CrO_4 + 2Fe_2O_3 + 8CO_2$$

$$2Na_2CrO_4 + H_2SO_4 \rightarrow Na_2Cr_2O_7 + Na_2SO_4 + H_2O$$

Oxidation of ferrous salts by dichromate ion.

$$Cr_2O_7^{2-} + 6Fe^{2+} + 14H^+ \rightarrow 2Cr^{3+} + 6Fe^{3+} + 7H_2O$$

Q. 513 Complete the following reactions :

$$MnO_2 + KOH + O_2 \rightarrow$$

$$I^- + MnO_4^- + H^+ \rightarrow$$

$$Cr_2O_7^{2-} + Sn^{2+} + H^+ \rightarrow$$

Solution:
(1) $2MnO_2 + 4KOH + O_2 \rightarrow 2K_2MnO4 + 2H_2O$

(2) $2MnO_2 + 10I^- + 16H^+ \rightarrow 2Mn^{2+} + 5s + 8H_2O$

(3) $Cr_2O_7^{2-} + 3Sn^{2+} + 14H^+ \rightarrow 2Cr^{3+} + 3Sn^{4+} + 7H_2O$

Q. 514 Write the hybridization and magnetic character of the following complexes :

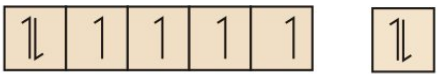
(i) $[Fe(H_2O)_6]^{2+}$

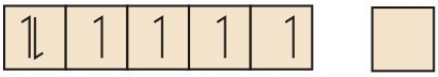
(ii) $[Ni(CN)_4]^{2-}$

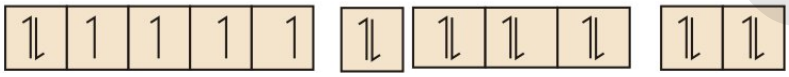
[Atomic number : $Fe = 26, Ni = 28$]

Solution:

(1) $[Fe(H_2O)_6]^{2+}$

Fe (26) = 

Fe(+2) = 

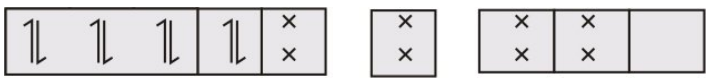
$[Fe(H_2O)_6]^{2+}$ = 

sp^3d^2 hybridisation and paramagnetic.

(2) $[Ni(CN)_4]^{2-}$

$Ni(28) =$ 

$Ni(+2) =$ 

$[Ni(CN)_4]^2 =$ 

dsp^2 hybridisation diamagnetic.

Q. 515 Give reasons for the following :

(a) The presence of $-NO_2$ group at ortho or para position increases the reactivity of haloarenes towards nucleophilic substitution
reactions.

(b) p-dicholorobenzene has higher melting point than that of ortho or meta isomer.

(c) Thionyl chloride method is preferred for preparing alkyl chloride from alcohols.

Solution:
(1) Presence of nitro group at $O-$ and p^- positions increasesreactivity of haloarness towards nucleophilic substitution reactions as they stabilize the intermidiate carbanion due to disposal of negative charge.

(2) $p-dichlorobenzene$ has higher melting point than that of $O-$ or $m-$ isomer because it fits better in crystal lattice as compared to $O-$ and $m-$. Hence due to symmetry.

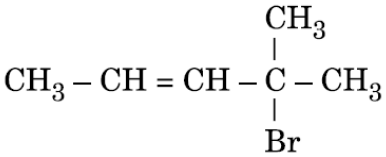
(3) Thionyl chloride method is prefferred for preparing alkyl chloride from alcohols because by product formed are gases.

$$CH_3OH + SOCl_2 \rightarrow CH_3Cl + SO_2\uparrow + HCl\uparrow$$

Q. 516 (a) Write equation for preparation of $1-iodobutane$ from $1-chlorobutane$

(b) Out of $1-bromopentane$, $2-bromo-2-methylbutane$ and $1-bromopentane$, which compound is most reactive towards elimination reaction and why ?

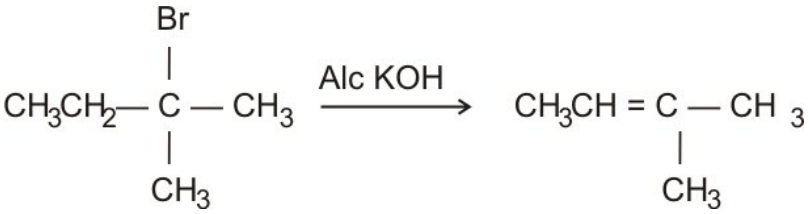
(c) Give IUPAC name of :



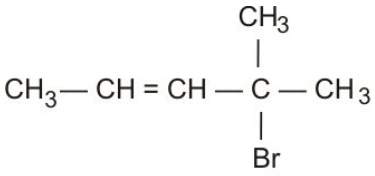
Solution:
(a) $1-iodobutane$ from $1-chlorobutane$

$$CH_3CH_2CH_2CH_2Cl + NaI \xrightarrow{acetone} CH_3CH_2CH_2CH_2\ I + NaCl$$

(b) $2-bromo-2-methylbutane$ will be most reactive towards elimination reaction as more substituted alkene is more stable

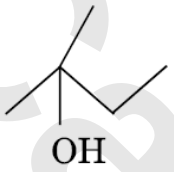


(c)



4-Bromo-4-methylpent-2-ene

Q. 517 (a) How will you synthesise the following alcohol from appropriate alkene :

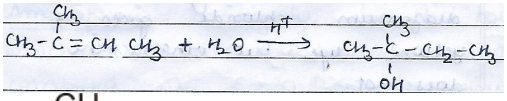


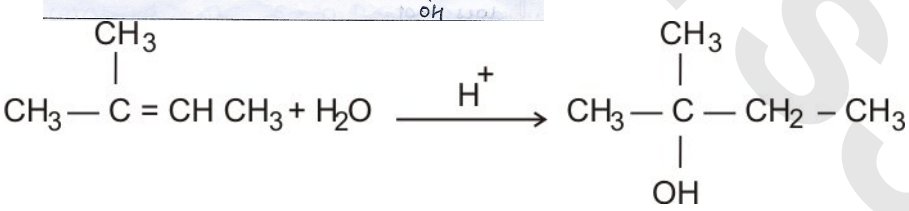
(b) Write the mechanism of the following reaction :

$$CH_3CH_2OH \xrightarrow[443\ K]{H^+} CH_2 = CH_2 + H_20$$

Solution:

(a)

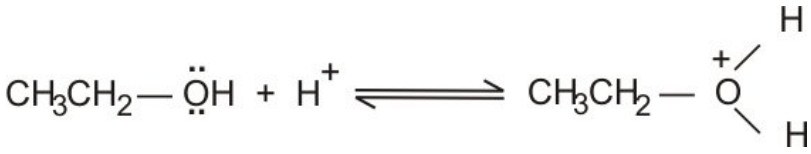




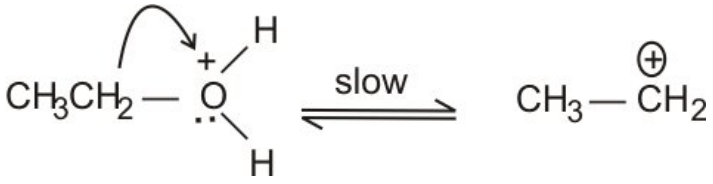
(b) Mechanism of

$$CH_3CH_2OH \xrightarrow[443\ K]{H^+} CH_2 = CH_2 + H_2O$$

Step -I Protonation of alcohol



Step -II Loss of H_2O to form intermidiate cabocation



Step- III Deprotonation

Q. 518 (a) Give one chemical test to distinguish between the compounds of the following pairs :

(i) CH_3NH_2 and $(CH_3)_2NH$

(ii) Aniline and Ethanamine

(b) Why aniline does not undergo Friedel-Crafts reaction ?

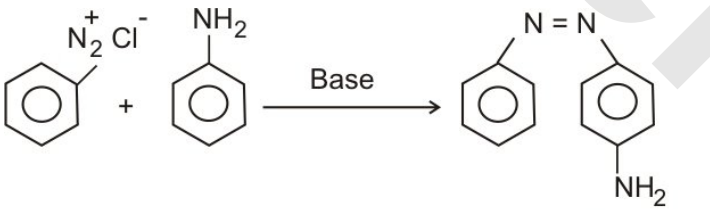
Solution:
(a) (1) CH_3NH_2 and $(CH_3)_2NH$

CH_3NH_2 being a primary amine on reaction with chloroform in presence of alcoholic alkali gives bad smelling alkyl isocyanide.

$$CH_3NH_2 + CHCl_3 + 3\underset{(alc)}{KOH} \rightarrow CH_3N \rightarrow C + 3KCl + 3H_2O$$

(2) Aniline and ethanamine

Aniline on coupling with benzene diazonium chloride gives a yellow dye but ethanamine does not



(Yellow dye)

(b) Aniline does not undergo priedel crafts reaction due to salt, formation between aniline and the catalyst anhydrous $AlCl_3$ (lewis acid) as a result n acquires positive charge and acts as a deactivating group for further reaction.

Q. 519 (a) Give any one property of glucose that cannot be explained by the open chain structure.

(b) Compare amylase with amylopectin in terms of constituting structure.

(c) Why do amino acids show amphoteric behaviour ?

Solution:
(1) One property of glucose that cannot be explained by the open chain structure is despite having $-CHO$ group, it does not give 2,4 - DNP test.

(2) Amylose is a linear polymer of $\alpha - D$ glucose units joined together by glycosidic linkages involving C_1 or one glucose and C_4 of next. It can have 100-3000 glucose units. It is soluble in water.

Amylopectin is highly branched polymer which is insoluble in water . It is composed of 25-30 D-glucose joined by $\alpha - D - glycosidic$ linkages between C_1 of next . There chains are connected with each other , by $1, 6 - linkages.$

(3) Amino acids show amphoteric behaviour because they circuits in witter ionic form, in acidic solution they act as cations and in alkaline solution they act as anions.

Q. 520 Define the following with suitable example of each :

(a) Antiseptics

(b) Non-narcotic analgesics

(c) Cationic detergents

Solution:
(1) Antiseptics are chemical substances which present the growth of microorganisms and may even kill them ,

Example - $0.2\ ^{o}/_{o}$ solution of phenol

(2) Non-narcotic analgesics are drugs which reduce or abolish pain , there are effective in releiving skeletal pain or reducing fever. Example - Aspirin

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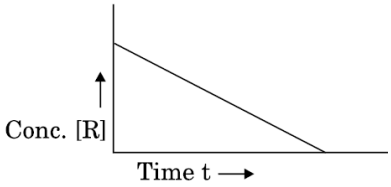
Q. 521 (a) Consider the reaction $R \rightarrow P$ for which the change in concentration of R with time is shown by the following graph :



(i) Predict the order of reaction.

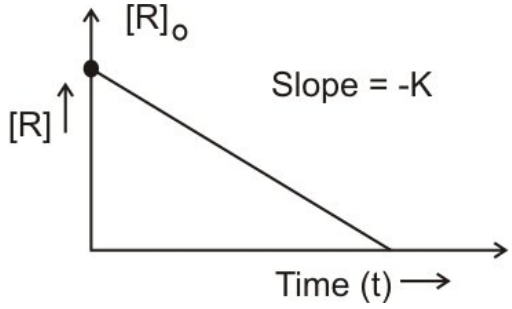
(ii) What does the slope of the curve indicate ?

(b) The rate of reaction quadruples when temperature changes from $293\ K$ to $313\ K$. Calculate E_a assuming that it does not change with time. $\left[R = 8.314\ JK^{-1\ mol^{-1}}\right]$

Solution:
(a) Order =zero (0)

slope = -K

$$[R] = -Kt + [R]$$



(b) $E_a = ?$

$$T_1 = 293\ K \quad T_2 = 313\ K$$

$$log\frac{K_2}{K_1} = \frac{E_a}{2.303R}\left[\frac{T_2 - T_1}{T_1T_2}\right]$$

$$k_2 = 4k_1$$

$$log\frac{4K_1}{K_1} = \frac{E_a}{2.303 \times 8.314}\left[\frac{313 - 293}{(313)(293)}\right]$$

$$log\ 4 = \frac{20 \times E_a}{2.303 \times 8.314 \times 313 \times 293}$$

$$E_a = \frac{0.6021 \times 2.303 \times 8.314 \times 313 \times 293}{20}$$

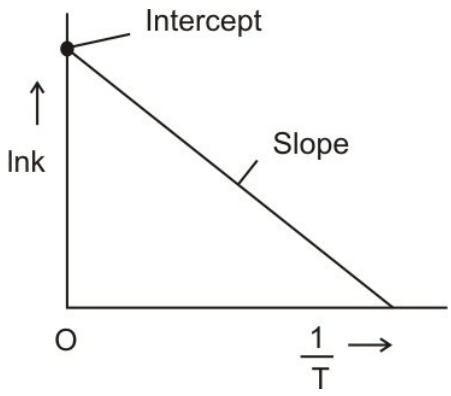
$$E_a = 52863.33\ J/mol$$

Q. 522 (a) Draw the plot of $ln\ k$ vs $1/T$ for a chemical reaction. What does the intercept represent ? What is the relation between slope and E_A?

(b) A first order reaction takes 30 minutes for $20\ ^o/_o$ decomposition. Calculate $t_{\frac{1}{2}}$. $[log\ 2 = 0.3010]$

Solution:

(a) plot of $ln\ k$ v/s $\frac{1}{T}$



$$Intercept = ln\ A$$

$$slope = \frac{-E_a}{R}$$

(b) 1st order reaction

$$t_{1/2} = ?$$

$$t_{1/2} = \frac{0.693}{K}$$

$$t_{20^o/_o} = 30\ min$$

$$K = \frac{2.303}{t} log \frac{a}{a-x}$$

$$K = \frac{2.303}{30} log \frac{a}{a-0,20a}$$

$$K = \frac{2.303}{30} log \frac{1}{0.8}$$

$$= 0.007439\ min^{-1}$$

$$t_{1/2} = \frac{0.693}{0.007439}$$

$$= 93\ min$$

Q. 523 (a) Draw the structure of the following :

(i) $HClO_3$

(ii) $H_2S_2O_8$

(b) Give reasons for the following :

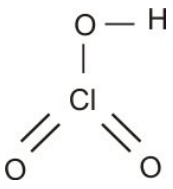
(i) Above $1000\ K$ sulphur shows paramagnetism.

(ii) Although electron gain enthalpy of fluorine is less negative than that of chlorine, yet flourine is a better oxidising agent than chlorine.

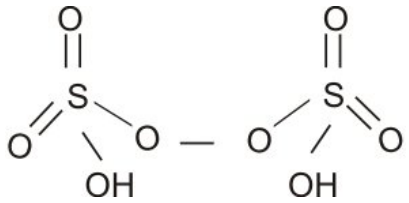
(iii) In solid state PCl_5 exists as an ionic compound.

Solution:

(a) (1) $HClO_3$



(2) $H_2S_2O_8$



(b) (i) Above $1000\ K$, sulphur exhibits paramagnetism, Δ is in vapour state, it partly exists as S_2 molecule which has two unpaired electrons in the antibonding (π) orbitals.

(ii) Although electron gain enthalpy of flumine is less negative than that of chlorine, yet fluorine is a better oxidising agent than chlorine because bond dissociation enthalpy of f-f much lower than $Cl-Cl$ and hydration enthalpy of F^- is much higher than Cl^-. These two factors more than comperrate the negative electron gain enthalpy of F^-.

(iii) In solid state, PCl_5 exists in ionic compound as it exists as $[PCl_4]^+[PCl_6]^-$ containing tetra and hexa coordinated species.

Q. 524 (a) Complete the following reactions :

(i) $PbS(s) + O_3 \rightarrow$

(ii) $XeF_6 + NaF \rightarrow$

(b) Arrange the following in increasing order of property indicated, giving reason :

(i) Hydrides of group 15 – boiling points

(ii) Hydrides of group 17 – acidic strength

(iii) Hydrides of group 16 – reducing character

Solution:

(a) (1) $Pb(s) + 4O_3 \rightarrow PbSO_4 + 4O_2$

(2) $XCF_6 + NaF \rightarrow Na^+\,[XeF_4]^-$

(b) (1) increasing boiling point

$$PH_3 < A_sH_3 < NH_3 < SbH_3 < BiH_3$$

(2) Increasing acidic strength

$$HF < HCl < HBr < HI$$

(3) Increasing reducing character

$$H_2O < H_2S < H_2S_c < H_2T_c < H_2Po$$

Q. 525 (a) Carry out the following conversions :

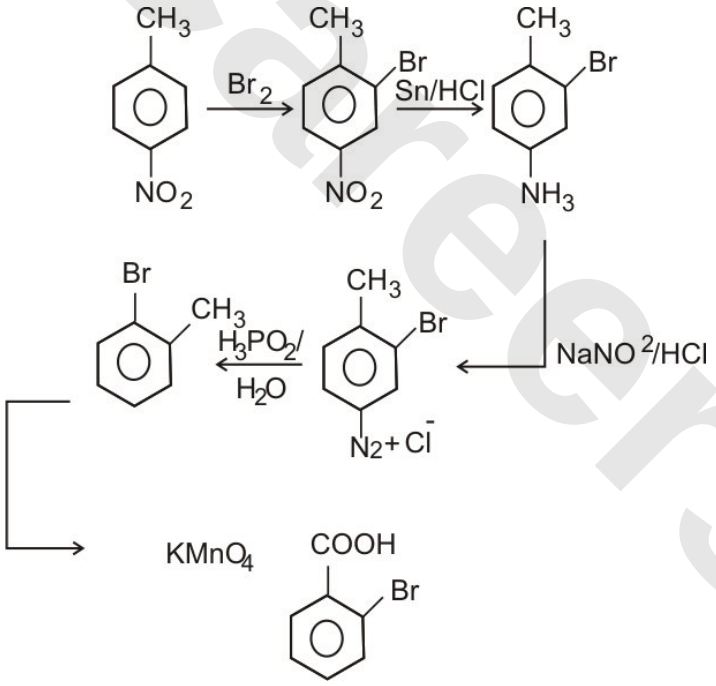
(i) $P-nitrotoluene$ to $2-bromobenzoic\ acid$

(ii) Propanoic acid to acetic acid

(b) An alkene with molecular formula C_5H_{10} on ozonolysis gives a mixture of two compounds, B and C. Compound B gives positive
Fehling test and also reacts with iodine and $NaOH$ solution. Compound C does not give Fehling solution test but forms
iodoform. Identify the compounds A, B and C.

Solution:

(a) (1) $P-nitrotoluene$ to $2-bromobenzoic\ acid$



(2) Propanoic acid to acetic acid

$$CH_3CH_2COOH \overset{LiALH_4}{\rightarrow} CH_3CH_2CH_2OH \overset{H^+}{\rightarrow} CH_3CH=CH_2 \xrightarrow[OH^-]{KMNO_4} CH_3COOH$$

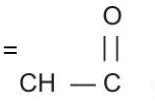
(b) (A) $C_6H_{10}-(alkene)$
$\downarrow ozonolysis$
$B+C$

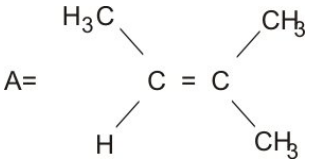
B= Positive Fenling - aldehyde group $=-CHO$

= Positive Iodoform test $\Rightarrow CH_3CHO\ \ (B)$

C - negative testing

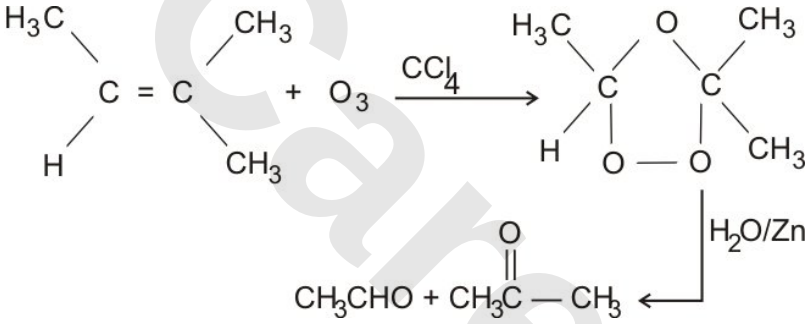
= positive Iodoform

=  group

A= 

$B = CH_3CHO$

$C = CH_3 - COCH_3$

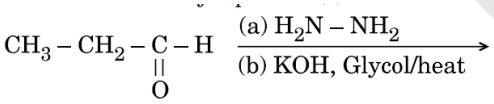


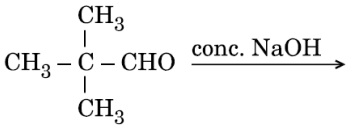
Q. 526 (a) Carry out the following conversions :

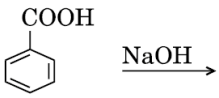
(i) Benzoic acid to aniline

(ii) Bromomethane to ethanol

(b) Write the structure of major product(s) in the following :

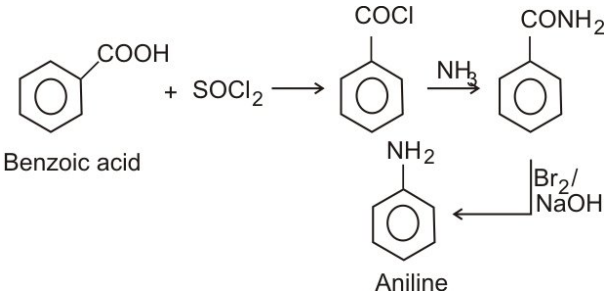
(i) 

(ii) 

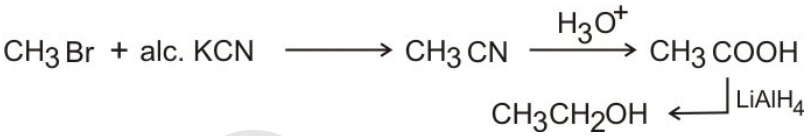
(iii) 

Solution:

(a) (1) Benzoic acid to aniline

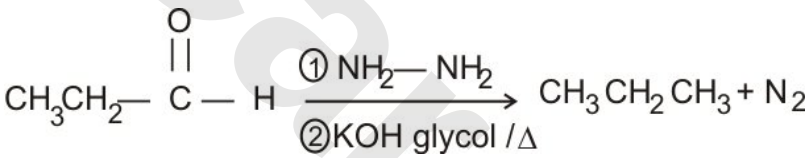


(2) Bromomethane to ethanol

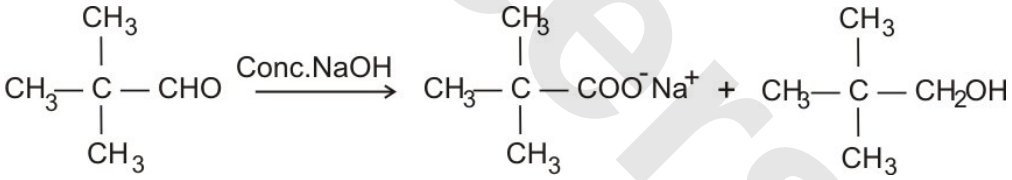


(b)

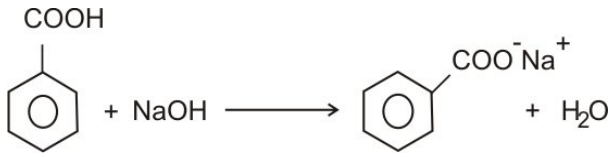
(1)



(2)



(3)



Q. 527 What is the coordination number of atoms in a (i) bcc structure, and (ii) fcc structure ?

Solution:
Coordination number of atoms in

a) bcc structure - 8

b) fcc structure - 12

Q. 528 Which alkyl halide from the following pair would you expect to react more rapidly by an SN_2 mechanism ?

$$CH_3-CH_2-\underset{\displaystyle CH_3}{\overset{|}{CH}}-Br \quad \text{or} \quad CH_3-\underset{\displaystyle CH_3}{\overset{\displaystyle CH_3}{\overset{|}{\underset{|}{C}}}}-Br$$

Solution:

$CH_3-CH_2-\underset{\displaystyle CH_3}{\overset{|}{CH}}-Br$ will react more rapidly by SN_2 mechanism.

Q. 529 Why are powdered substances more effective adsorbents than their crystalline forms ?

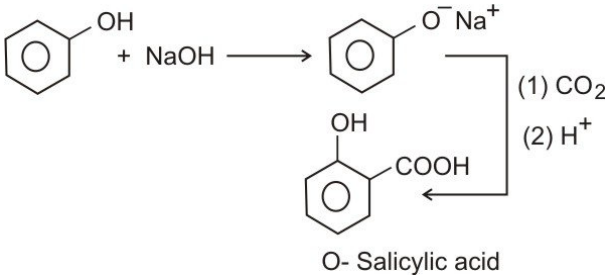
Solution:
Powdered substances are more effective adsorbents than their crystalline forms because more the surface area of adsorbent, more is the extent of adsorption.

Q. 530 Write the equations involved in the following reactions :

(a) Kolbe's reaction

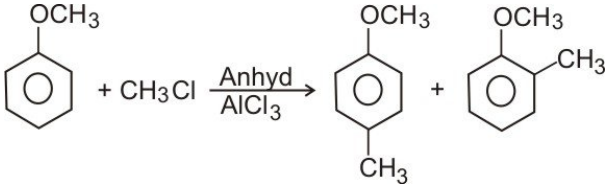
(b) Friedel-Crafts alkylation of anisole

Solution:
(1) Kolbe's Reaction:



O- Salicylic acid

(2) Friedlel Craft alkylation of anisole :



Q. 531 Write the structures of monomers of the following polymers :

(a) Terylene

(b) Buna-N

Solution:
(1) Terylene

$OH - CH_2 - CH_2 - OH$ and 

(2) Buna - N

$CH_2 = CH - CH = CH_2$ and $CH_2 = CH - CN$

Q. 532 Give reasons for the following :

(a) Brownian movement provides stability to the colloidal solution.

(b) True solution does not show Tyndall effect.

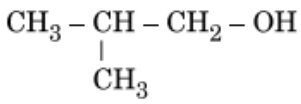
(c) Addition of alum purifies the water.

Solution:
(1) Brownian movement provides stability to colloidal solution since it dosen't allow colloidal particles to settle down.

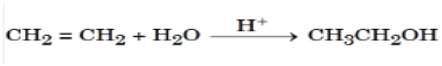
(2) True solution does not show tyndall effect because in true solution size of particles is not large enough to scatter the particles of light i.e size of dispersed particles is much smaller than the wavelength of light used.

(3) Addition of alum purifies water as it coagulates the suspended impurities present in the water to form heavier particles which gets settle down.

Q. 533 (a) Show how you will synthesise the following alcohol prepared by the reaction of a suitable Grignard reagent on methanal ?

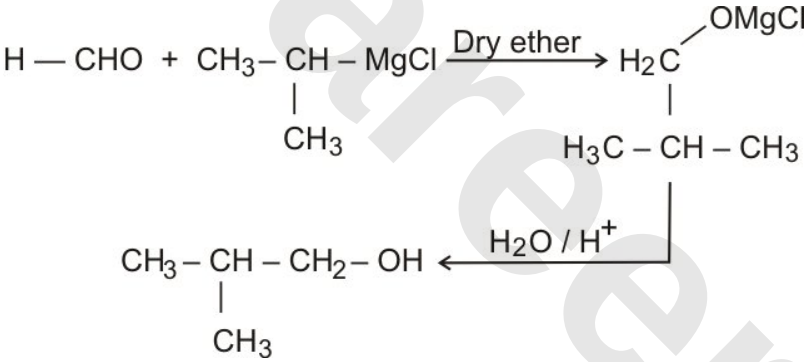


(b) Write the mechanism of the following reaction :



Solution:

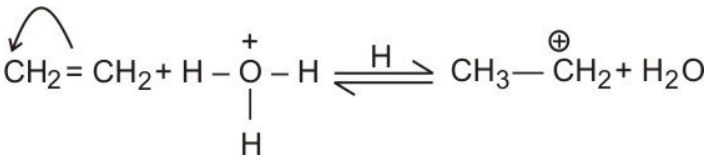
(1) Synthesis by Grignard Reagent on methanal :



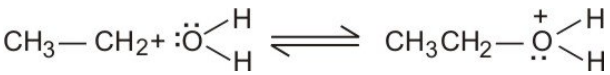
(2) Mechanism of

$$CH_2 = CH_2 + H_2O \overset{H^+}{\rightarrow} CH_3CH_2OH$$

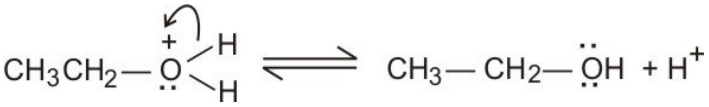
Step 1 : Addition of H^+



Step 2 : Nucleophillic attack of water



Step 3 : Removal of H^+



Q. 534 What happens when D-Glucose is treated with the following reagents :

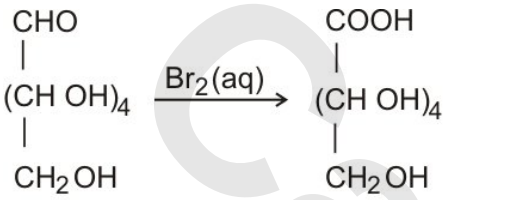
(a) Br_2 water

(b) HCN

(c) $(CH_3CO)_2O$

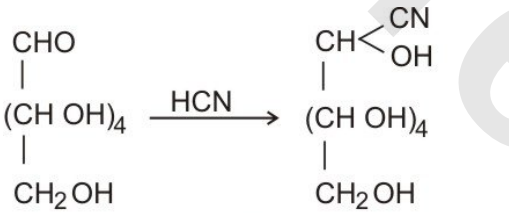
Solution:

(i) Br_2 water



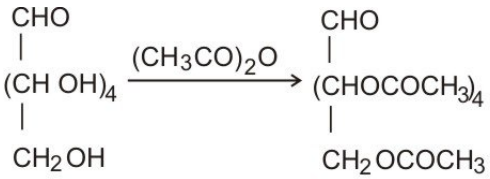
Gluconic Acid

(ii) HCN



Gluconic cyanohydrin

(iii) $(CH_3CO)_2O$



Glucose penta acetate

Q. 535 Define the following terms with a suitable example of each :

(a) Antacids

(b) Artificial sweeteners

(c) Anionic detergents

Solution:

(a) Antacids :

Antacids are substances which remove excess acid and raise pH to appropriate level in stomach.

Example : $NaHCO_3$

(b) Artificial sweeteners :

Artificial sweeteners are agents that add sweet taste to food. They are sugar substitutes as sucrose add to calorie and promote tooth decay.

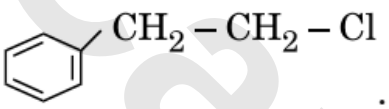
Example : Saccharin

(c) Anionic detergents :

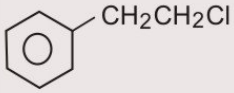
Anionic detergents are prepared by treating long chain alcohols with conc. H_2SO_4 to form alkyl hydrogen sulphates which are treated with alkalies to form salt.

Example : Sodium lauryl sulphate $(C_{11}H_{23}CH_2OSO_3^-Na^+)$

Q. 536 Write the IUPAC name of



Solution:



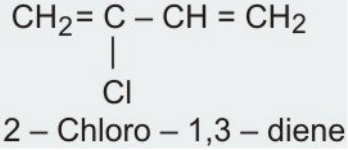
I – Chloro – 2 – phenylethane

Q. 537 Write the name of monomers and their structures for the following polymers :

(a) Neoprene

(b) Nylon-6

Solution:
(1) Neoprene



2 – Chloro – 1,3 – diene

(2) Nylon 6

$H_2N-(CH_2)_5COOH$

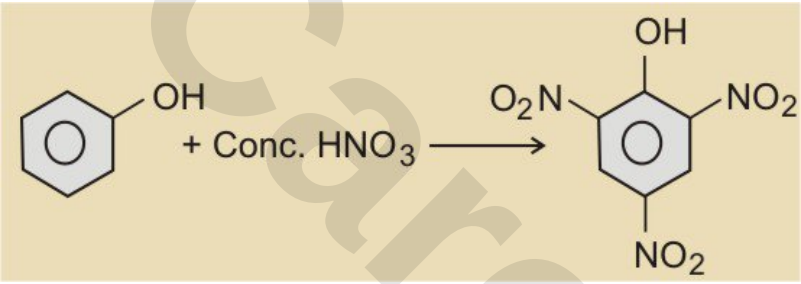
Q. 538 What happens when

(a) Phenol reacts with Conc. HNO_3?

(b) Ethyl chloride reacts with $NaOC_2H_5$?

Write the chemical equations involved in the above reactions.

Solution:
(1) 2,4,6 - Trinitrophenol is formed



(2) $CH_3CH_2Cl + NaOC_2H_5 \rightarrow CH_3CH_2 - O - C_2H_5$

Diethylether is formed.

Q. 539 Define the following terms with a suitable example of each :

(a) Sol

(b) Aerosol

(c) Hydrosol

Solution:
(1) Sol:

Sol is a colloidal solution in which dispersed phase is solid and dispersion medium is liquid.

Example : Paints

(2) Aerosol :

Aerosol are colloidal systems of solids in gas or liquid in gas.

Example : Solid in gas - smoke, dust; Liquid in gas - fog, cloud

(3) Hydrosol :

Hydrosol are colloidal solutions of solid in water.

Example : Gold sol

Q. 540 (a) What are antidepressant drugs ? Give an example.

(b) Name the sweetening agent used in preparation of sweets for a diabetic patient.

(c) Why are detergents non-biodegradable ?

Solution:
(1) Antidepressant drugs are medications that can help releive symptoms of depression, anxiety disorders. They aim to correct chemical imbalances of neurotransmitters.

Example : Equanil

(2) Saccharin (O - sulphobenzimide) is used as sweetening agent for diabetic patients.

(3) Detergents are non - biodegradable because the side chain in them prevent bacteria from attacking and breaking chains.

Q. 541 (a) What is the difference between native protein and denatured protein ?

(b) Which one of the following is a disaccharide : Glucose, Lactose, Amylose, Fructose

(c) Write the name of the vitamin responsible for the coagulation of blood.

Solution:
(a) Proteins found in a biological system with unique 3D structure and biological activity is called native proteins. They exist in primary, secondary and tertiary structures.

When native protein is subjected to physical and chemical changes, protein loses its biological activities, it is caled denatured protein. Secondary and tertiary structures are destroyed during denaturation.

(b) Lactose is a disaccharide.

(c) Vitamin K is responsible for coagulation.

Q. 542 (a) Butan-1-ol has a higher boiling point than diethyl ether. Why ?

(b) Write the mechanism of the following reaction :

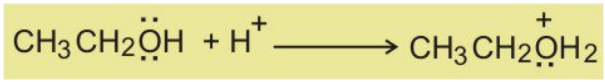
$$2CH_3CH_2OH \xrightarrow[413K]{H^+} CH_3CH_2 - O - CH_2 - CH_3$$

Solution:
(1) Butan-1-ol has higher boiling point than diethyl ether because Butan-1-ol has strong intermollecular hydrogen bonding but in diethylether they are associated with weak dipole-dipole attractions.

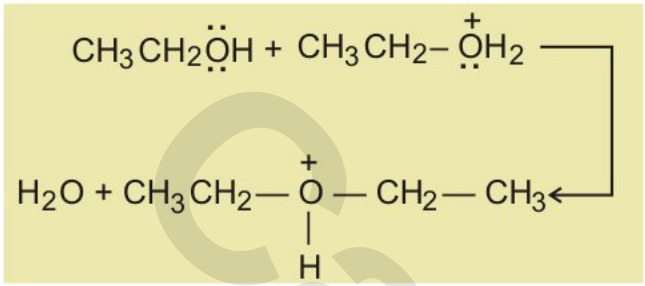
(2) Mechanism of

$$2CH_3CH_2OH \xrightarrow[413K]{H^+} CH_3CH_2OCH_2CH_3$$

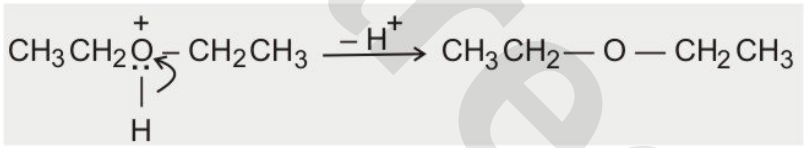
Step 1: Protonation



Step 2: Nucleophillic attack



Step 3 : Deprotonation



Q. 543 A cube solid is made up of two elements A and B. Element A forms ccp while atoms of element B occupy one - third of the tetrahedral voids. What is the formula of the soild?

Solution:
Tetrahedral voids is double the ccp atoms.

ccp atoms = A

tetrahedral voids = 2A

$$B = \frac{1}{3} \times 2A = \frac{2}{3}A$$

Ratio of A and B = $\frac{A}{B} = \frac{A}{\frac{2}{3}A} = \frac{3}{2}$

Formula = B_2A_3

Q. 544 How will you prepare arsenic sulphide sol in the lab?

Solution:

Arsenic sulphide is prepared in the lab by passing H_2S gas through, As_2O_3.

$$As_2O_3 + 3H_2S \rightarrow As_2S_3 + 3H_2O$$

Q. 545 Give an example of heterogenous catalysis.

Solution:
Hydrogenation of ethene using nickel as a catalyst with hydrogen gas is an example of heterogenous catalysis.

$$H_2C = CH_2 + H_2 \overset{Ni}{\rightarrow} H_3C - CH_3$$

Q. 546 CH_3CHO is more reactive than CH_3COCH_3 towards reaction with HCN. Why?

Solution:
Due to +I effect of CH_3^- groups present on both the sides of the carbonyl carbon, carbonyl carbon of ketone becomes less susceptible towards nucleophilic attack. Hence CH_3CHO is more reactive than CH_3COCH_3.

Q. 547 What are the products of exhaustive ammonolysis of an alkyl halide?

Solution:
The product formed by exhaustive ammonolysis is quaternary ammonia salt.

$$4R - X + NH_3 \rightarrow [NR_4]^+ X^-$$

Q. 548 What are type of isomerism is shown by complex $[Co(NH_3)_5 Cl]SO_4$?

Solution:
$[Co(NH_3)_5 Cl]SO_4$ show ionisation isomerism with $[Co(NH_3)_5 SO_4]Cl$.

Q. 549 Arrange the following in increasing order of crystal field splitting energy:

$[Cr(CN)_6]^{3-}$, $[Cr(NH_3)_6]^{3+}$, $[CrCl_6]^{3-}$

Solution:

$[CrCl_6]^{3-} < [Cr(NH_3)_6]^{3+} < [Cr\,(CN)_6]^{3-}$

Q. 550 Following reactions may occur at carhode and anode during electrolysis of aqueous sodium chloride. What products will be held at anode and cathode? Use given E° values to justify your answer.

Cathode : $Na^+(aq) + e^- \rightarrow Na(s), E^\circ = -2.71V$

$$H^+(aq) + e^- \rightarrow \frac{1}{2}H_2(g), E^\circ = 0.00V$$

Anode : $Cl^-(aq) \rightarrow \frac{1}{2}Cl_2(g) + e^-, E^\circ = +1.36V$

$$2H_2O(aq) \rightarrow O_2(g) + 4H^+ + 4e^-, E^\circ = +1.23V$$

Solution:
Since reduction potential of hydrogen is greater, reduction of H^+ tkes place at cathode.

Cathode : $H^+(aq) + e^- \rightarrow \frac{1}{2}H_2(g)$

Since the oxidation potential of chlorine is greater than water, oxidation of Cl^- takes place at anode.

Anode : $Cl^-(aq) \rightarrow \frac{1}{2}Cl_2(g) + e^-$

Net cell reaction: $H^+(aq) + Cl^-(aq) \rightarrow \frac{1}{2}H_2(g) + \frac{1}{2}Cl_2(g)$

hence, H_2 gas is formed at cathode and Cl_2 gas is formed at anode.

Q. 551 Show that for a first order reaction, time required for completion of 99% of reaction is twice the time required for complrtion of 90% of reaction.

Solution:
Time = $\frac{2.303}{K} log \frac{initial\,concentration}{final concentration}$

for 99% completion of reaction:

$$T_1 = \frac{2.303}{K} \times \log \frac{100}{100-99} = \frac{2.303}{K} \times \log \frac{100}{1} = \frac{2 \times 2.303}{K}$$

for 90% completion of reaction:

$$T_2 = \frac{2.303}{K} \times \log \frac{100}{100-90} = \frac{2.303}{K} \times \log 10 = \frac{1 \times 2.303}{K}$$

$$\therefore T_1 = 2 \times T_2$$

Q. 552 Arrange the hydrides of group 16 in order of increasing boiling points, giving reason. Name the hydride which is most stable thermodynamically.

Solution:
→ H_2O show hydrogen bonding due to high electronegativity of oxygen.

→ As we go down the group, the size of atom increases and hence the strength of Van der Waal's force increases. Thus, the boiling point increases down the group.

→ Hence, increasing order of boiling point is,

$$H_2S < H_2Se < H_2Te < H_2O$$

→ Shorter is the hydride bond, larger is the stability. Hence, H_2O is the most stable thermodynamically.

Q. 553 How is $KMnO_4$ prepared from pyrolusite? Give steps involved with equations.

Solution:
→ Alkali metal hydroxide is fused with powedered pyrulosite in the presence of air to form potassium manganate.

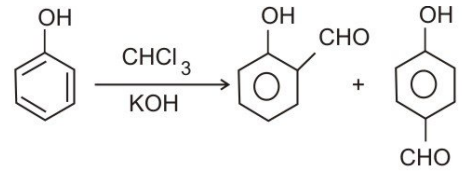
$$2MnO_2 + 4KOH + O_2 \rightarrow 2K_2MnO_4 + 2H_2O$$

→ Potassium manganate in netural or acidic solution undergo disproportionation to form potassium permanganate.

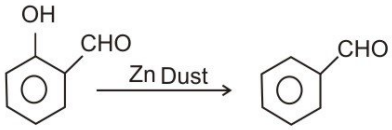
$$MnO_4^{2-} + 4H^+ \rightarrow MnO_4^- + MnO_2 + 2H_2O$$

Q. 554 An aromatic compound 'A' on treatment with $CHCl_3$ and KOH gives two compounds, both of which gives same product 'B' when distilled with zinc dust. Oxidation of 'B' gives 'C' with molecular formula $C_7H_6O_2$. Sodium salt of 'C' on heating with soda lime gives 'D' which may also be obtained by distilling 'A' with Zinc dust. Identify 'A', 'B', 'C' and 'D'.

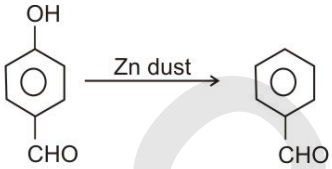
Solution:
The reaction take place:



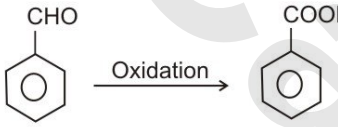
(A) Phenol O-hydroxy Benzaldehyde P-hydroxy Benzaldehyde.



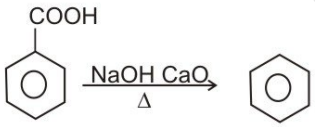
(B) Benazaldehyde



(B) Benzaldehyde



(C) Benzoic acid



Benzoic acid (D) Benzyne

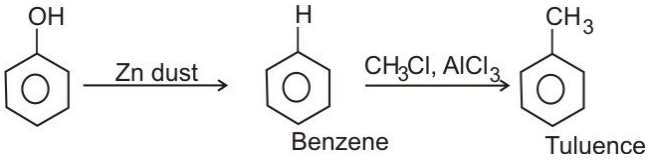
Q. 555 How to convert the following:

(a) Phenol to Toluene

(b) Ethanol to Ethanal

Solution:

(a) Phenol to Toluene



(b) Ethanol to Etnanal

$$CH_3CH_2OH \xrightarrow[acidic]{Na_2Cr_2O_7} CH_3CHO$$

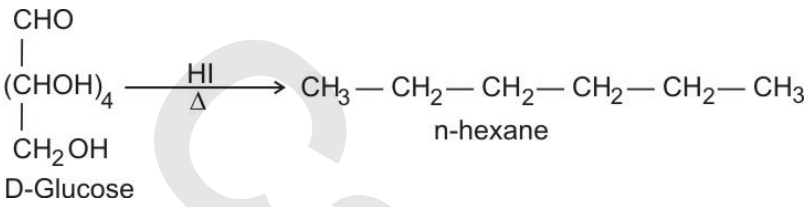
Q. 556 What happens when D- glucose is treated with the following? Give equations to support your answer.

(a) HI

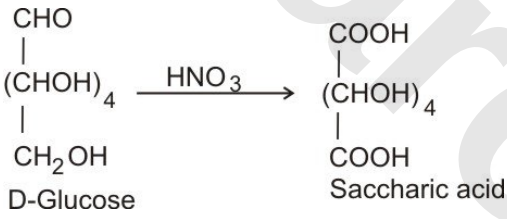
(b) HNO_3

Solution:

(a)



(b)



Q. 557 Give any two points of difference between globular and fibrous proteins.

Solution:

Globular proteins	Fibrous proteins
→ Globular proteins are spherical in shape.	→ Fibrous protein have thread like structure.
→ They are soluble in water	→ They are insoluble in water.
eg. Albumin	eg.Keratin

Q. 558 Write two differences between DNA and RNA.

Solution:

DNA	RNA
DNA is a double stranted (exception in some viruses)	RNA is single stranded (except in some viruses)
Pyrimidine present in DNA are cytosine and thymidine.	Pyrimidine present in RNA are cytosine and Uracil.

Q. 559 (a) Following is the alignment of magnetic moments of a substance when placed in a magnetic field. Identify the type of magnetism exhibited by the substance.

(b) Analysis shows that nickel oxide has formula $Ni_{0.98}O_{1.00}$. What frctions of nickel exist as Ni^{2+} and Ni^{3+} ions?

Solution:

(a) Since all the magnetic moments are directed in the same direction, the substance exhibit ferromagntism.

(b) Ratio of Ni and O in Nickel oxide is,

$$\frac{Ni}{O} = \frac{0.98}{1.00} = \frac{98}{100}$$

Total nickel atoms for 100 atoms of oxygen is 98.

Let x be the number of nickel with +2 charge.

$\therefore$ Nickel with +3 charge = 98 - x

charge of nickel = charge on oxygen

$$\therefore 2 \times x + (+3)(98 - x) = 2 \times 100$$

$$2x + 294 - 3x = 200$$

$$-x = 200 - 294 = -94$$

$$x = 94$$

$\therefore$ Nickel with +2 charge = $\frac{94}{98} = 96\%$

$\therefore$ Nickel with +3 charge = $98 - 94 = 4 out of 98 = \frac{4}{98} = 4\%$

Q. 560 Calculate the emf of the following cell at $25^{\circ}C$:

$$Al(s) \left| Al^{3+}(0.001M) \right| || 0.1Ni^{2+} \left| Ni(s) \right|$$

Given: $E^{\circ}_{(Ni^{2+}/Ni)} = -0.25V$

$E^{\circ}_{(Al^{3+}/Al)} = -1.66V$

(log 2 = 0.3010, log 3 = 0.4771)

Solution:

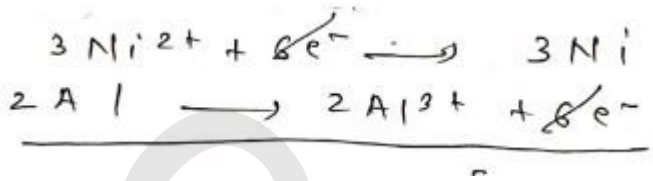
Cathode Half cell reaction:

$$Ni^{2+} + 2e^- \rightarrow Ni, E^\circ = -0.25V$$

Anode Half cell reaction:

$$Al \rightarrow Al^{3+} + 3e^-, E^\circ = +1.66V$$

Net reaction:



$$3Ni^{2+} + 2Al \rightarrow 3Ni + 2Al^{3+}, E^\circ = 1.66 + (-0.25) = +1.41V$$

Transfer of $6e^-$ takes place, hence n = 6

$$E^\circ = +1.41V$$

According to Wernest Equation, emf of a cell at $25^\circ C$ is calculated as,

$$E_{cell} = E^\circ_{cell} - \frac{0.0591}{n} \log \frac{[product]}{[reactant]} = 1.41 - \frac{0.0591}{6} \log \frac{[Al^{3+}]}{[Ni^{2+}]}$$

$$= 1.41 - 0.00985 \times log \frac{0.001}{0.1} = 1.41 - 0.00985 log(10^{-2}) = 1.41 - 0.00985 \times (-2) = 1.41 + 0.197 = 1.43V$$

Q. 561 The reaction between A and B is first order with respect to A and zero order with respect to B. For this reaction, fill in the blanks in the following table.

Experiment	[A] mol/L	[B] mol/L	Initial rate mol/L/min
I	0.1	0.1	2.0×10^{-2}
II	-	0.2	4.0×10^{-2}
III	0.4	0.4	-
IV	-	0.2	2.0×10^{-2}

Solution:

Experiment	[A] mol/L	[B] mol/L	Initial rate mol/L/min
I	0.1	0.1	2.0×10^{-2}
II	0.2	0.2	4.0×10^{-2}
III	0.4	0.4	8.0×10^{-2}

IV	0.1	0.2	2.0×10^{-2}

(II) Since the reaction is first order with respect to A, the rate of the reaction doubles by doubling the concentration.

$$\therefore [A] = 0.2mol/L$$

(III) Concentration of A changed from 0.2 to 0.4, hence, the rate of the reaction doubles concentration of B changed from 0.2 to 0.4, it does not affect the rate of the reaction.

(IV) The rate of the reaction becomes $\frac{1}{4}th$ of the precedingone, hence the concentration of A becomes $\frac{1}{4}th$ irrespective of concentration of B.

Q. 562

(a) A colloidal solution of AgI is prepared by adding $AgNO_3$ solution drop - by - drop to excess of KI solution. What will be the charge on sol so formed? What is the cause of the charge?

(b) Which of the following adsorption isobars reperesnts physiorption? Justify the answer.

(x/m - extent of adsorption, t- temperature.)

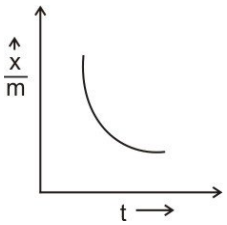
(c) Two gases A and B have critical temperature 430K and 190K respectively. Which gas will be readily adsorbed and why?

Solution:

(a) On addition of $AgNO_3$ to excess of KI, AgI precipitation. Since, KI is in excess, iodide is adsorbed on the surface of AgI to form negatively charged sols.

(b) Physisorption : adsorption is exothermic and desorption is endothermic. Thus, extent of aadsorption decreasaeswith increase in tempertaure.

Hence, the correct graph is



(c) Critical temperature is the temperature above which the gases overcome the intermolecular force of attraction and cannot be uquified.

Hence, higher the critical temperature, higher is adsorption. Thus, A readily adsorbs.

Q. 563 State the principle involved in the following metallurgical processes:

(a) Froth floation

(b) Zone refining

(c) Vapour phase refining

Solution:
(a) Froth floation: It is used to seprate metal sulphide ore from the gangue. Metal sulphide ore frm the gangue. metal sulphide is wetted by oil and hence its non - wettability towards oil is enhanced by using collectors and hence the metal ore is seprated in the froth.

(b) Zone refining : Impurities are more soluble in the liquid state of metal compared to that in solid state. Hence, heating is used to create two zones one end with crystalizing soild and other end with liquified impurities that is later seprated.

(c) Vapour phase refining: The impure metal is converted into volatile phase and then compressed to obtain pure metal.

Q. 564 Give one point difference between the following:

(a) Cast Iron and Pig Iron

(b) Hydraluic washing and Liquation

(c) Leaching and Roasting

Solution:
(a) Cast Iron and Pig Iron:

Cast iron has smaller amount of carbon (3%) and Pig iron has larger amount of carbon (4%).

(b) Hydraluic washing and Liquation

In hydraluic washing steam is used to remove impurities and in liquation metal is melted to remove impurities.

(c) Leaching and Roasting:

In leaching metal ore is converted into soluble salts and in roasting metal ore is converted into oxides of metal.

Q. 565 Giv reason for the following:

(a) The only oxidation state shown by Scandium is +3.

(b) $[Ti(H_2O)_6]^{+4}$ is colourless.

(c) MnO is basic while Mn_2O_7 is acidic.

Solution:
(a) Electronic configuration of Scadium is $[Ar]3d^1 4s^2$. After donating 3 electrons Scadium exhibits noble gas electronic configuration [Ar] . since to obtain extra stability, Scadium exhibit +3 oxidation state.

(b) The electronic configurataion Ti^{4+} is $[Ar]3d^0 4s^0$. hence, there is no electron present in d -orbital and hence there is no d-d transition taking placeto impart colour to $[Ti(H_2O)_6]^{+4}$.

(c) Oxidation state of Mn in MnO is +2 and hence electronic configuration of Mn^{2+} is $[Ar]3d^5 4s^0$.
Oxidation state of Mn in Mn_2O_7 is +7 and hence electronic configuration of Mn^{7+} is $[Ar]3d^0 4s^0$.

Thus, Mn^{2+} being rich in electrons is basic in nature, whereas Mn^{7+} being deficient in electrons is acidic in nature.

Q. 566 Answer the following:

(a) What is the general electronic configuration of lanthanoids?

(b) What are the common oxidation states of Cerium (At.no. 58)?

(c) Why do actinoids show a wide range of osidation states?

Solution:
(a) General electronic configuration of lanthnaoids is $[Xe]\ 4f^{1-14}5d^{0-1}6s^2$

(b) The common oxidation state of cerium is +3 and +4.

(C) Actinoids shows a wide range of oxidation state due to low energy gap between 4f, 5d and 6s orbitals.

Q. 567 Using valence bond theory, predict the hybridization and magnetic charater of the following:

(a) $[Co(NH_3)_6]^{3+}$

(b) $[Ni(CO)_4]$

[At.no: Co = 27, Ni = 28]

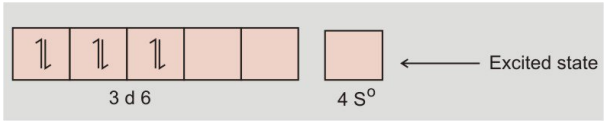
Solution:

(a) $[Co(NH_3)_6]^{3+}$

Oxidation nimber of Co is 3+

Electronic configuration of Co^{3+} is $[Ar]3d^6 4s^0$

NH_3 is a strong field ligand and hence forms inner spin complex.



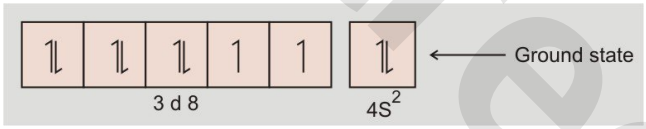
excited state

Hence it under goes d^2sp^3 hybridization for coordination number 6. with octahedral geometry. Since there are no unpaired electrons $[Co(NH_3)_6]^{3+}$ is dimagnetic.

(b) $[Ni(CO)_4]$

Oxidation state of Ni in $[Ni(CO)_4]$ is zero.

Electronic configuration of Ni : $[Ar]3d^8 4s^2$.



(CO) ligand forms inner complex, since it is strongly field ligand.

Hence hybridization of Ni is sp^3 with coordination number 4 and has tertahedral geometry. Since there are no unpaired electron, $[Ni(CO)_4]$ is diamagnetic.

Q. 568 (a) Define the following terms:

(i) Enantiomers

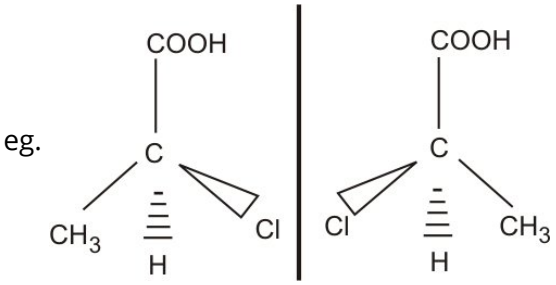
(ii) Racemic mixture

(b) Why is chlorobenzene resistant to nucleophilic substitution reaction?

Solution:

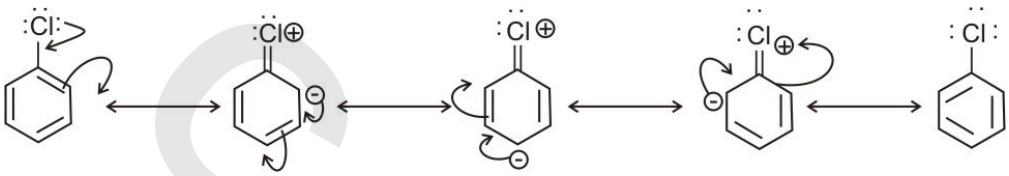
(a) (i) Enantiomers are the steroisomers that forms non - superimposable mirror images.

eg.



(ii) Racemic mixture is a mixture of equal amount of left and right handed enantiomer of a chiral carbon.

(b) In chlorobenzene, the lone pair of electrons of chlorine is delocallised over the benzene to form resonating structures.



Hence, a double bond character is developed between C and Cl making it difficult to breal C - Cl bond hence nucleohillic substitution becomes difficult.

Q. 569 Give one chemical test to distinguish between the following:

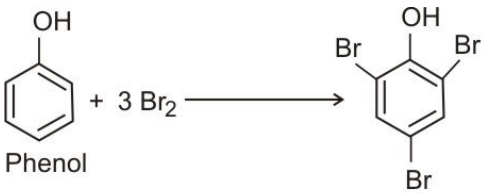
(a) Phenol and 1-Propanol

(b) Ethanol amd dimethyl ether

(c) 1-propanol and 2-Methyl - 2- propanol

Solution:

(a) Phenol reacts with Bromine water to form white precipitates, whereas alcohol does not react.



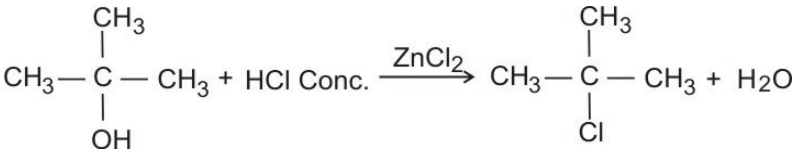
2, 4, 6 tribromophenol,

(b) Ethanol and dimethyl ether

Ethanol being acidic in nature reacts with sodium metal to release hydrogen gas whereas dimethyl ether does not react.

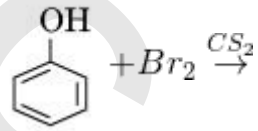
$$2CH_3CH_2OH + 2Na \rightarrow 2CH_3ONa + H_2\uparrow$$

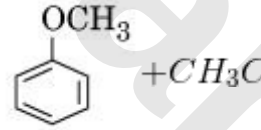
(c) 1-propanal being primary alcohol does not react with Lucus reagent. 2-methyl-2-propanol being tertiary alcohol immediately reacts with Lucas reagent to form alkyl halide and being insouble, it produces turbidity in the solution.



Q. 570 Write the products of the following reactions:

(a) $CH_3 - CH_2 - O - CH_3 + HI \rightarrow$

(b)  $+Br_2 \overset{CS_2}{\rightarrow}$

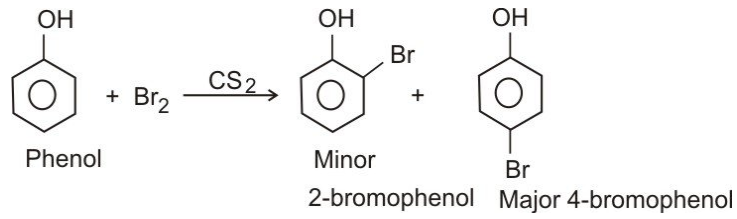
(c)  $+CH_3COCl \overset{ahyd.AlCl_3}{\rightarrow}$

Solution:

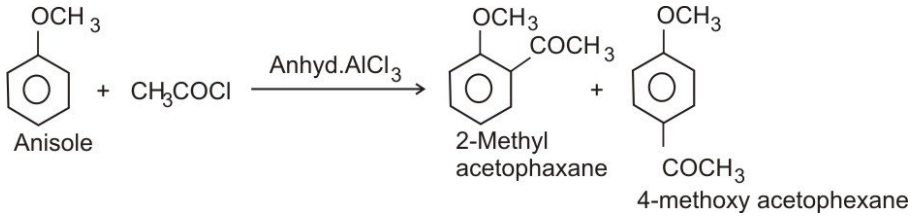
(a)

$$CH_3 - CH_2 - O - CH_3 + HI \rightarrow CH_3CH_2OH + CH_3I$$

(b)



(c)

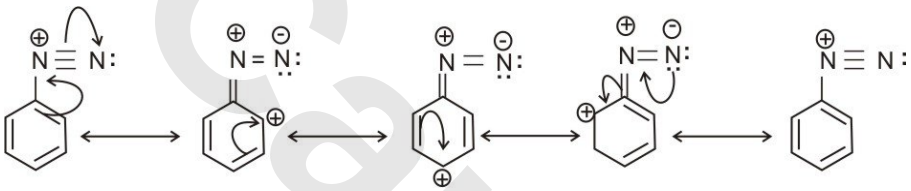


Q. 571 Account for the following, supporting your naswer with diagrams or equations wherever possible.

(a) Diazomium salts of aromatic amines are more stable than those of alihatic amines.

(b) Methylamine in water reacts with ferric chloride to precipipate hydrated ferric oxide.

Solution:
(a) Diazonium salt of aromatic amines undergo resonace that stabilizes the structure. Such effect is not observed in aliphatic amine. Hence, diazonium salts of aromatic amine is more stable.



(b) Methyl amine being basic in nature generates hydroxide ions in water.

Hyrdoxide ions reacts with ferric ion to precipitate out brown hydrated ferric oxide.

$$2Fe^{3+} + 6(OH^-) \rightarrow Fe_2O_3.3H_2O$$

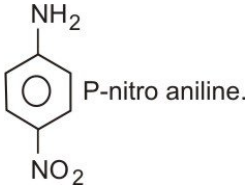
Q. 572 Arrange the following in decreasing order of pK_b gving reason:

(a) Aniline, p-nitroanilline and p-toluidine

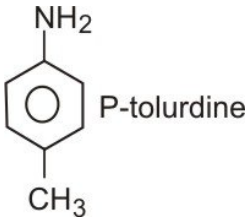
(b) $C_2H_5NH_2, (C_2H_5)_2NH, (C_2H_5)_3N$ in gaseous state.

Solution:
(a) Lower is the pK_b better is a base.

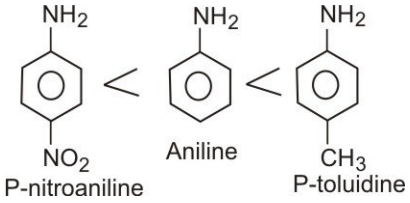
NO_2 being electron withdrawing groups decreases electron density on the para position and hence electron donating capacity of amne group decreases, lowering its basicity.



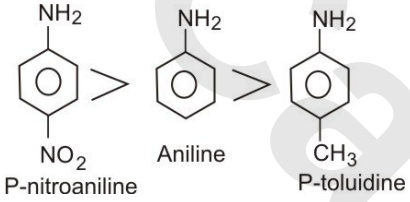
CH_3 being the electron donating group, increases the density of electron on the para position and thus the basicity of aniline increases.



Hence, the increasing order of basicity is,



Hence, the decreasing order of pK_b is,



(b) Alkyl group show +I effect.

Hence more is the alkyl group attached to the amino group, more is the basicity and lesser is the pK_b.

The decreasing order of pK_b is,

$C_2H_5NH_2 > (C_2H_5)_2NH > (C_2H_5)_3N$

Q. 573 Answer the following with reasons:

(a) Is $(NH - CHR - CO)_n$, a homopolymer or copolymer?

(b) Is PVC a condensation or addition polymer?

(c) Is Bakelite a thermoplastic or thermosetting plastic?

Solution:
(a) $(NH - CHR - CO)_n$ is a homopolymer since it is made up of single monomer $(NH - CHR - COOH)$.

(b) PVC is an addition polymer.

(c) Bakelite is a thermosetting plastic.

Q. 574 Answer the following:

(a) What is the tincture of iodine? What is the use?

(b) What are the main constituents of dettol?

(c) Label the hydrophilic and hydrophobic parts of the given compound:

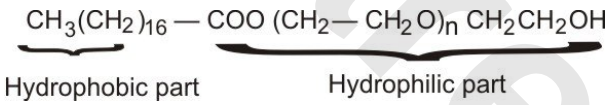
$$CH_3(CH_2)_{16}COO(CH_2CHO)_nCH_2CH_2OH$$

Solution:
(a) Tincture of iodine is 2-3% iodine solution in an alcohol water mixture with KI or NaI.

It is used as antispetic.

(b) Detol is a mixture of chloroxylenol and terpineol.

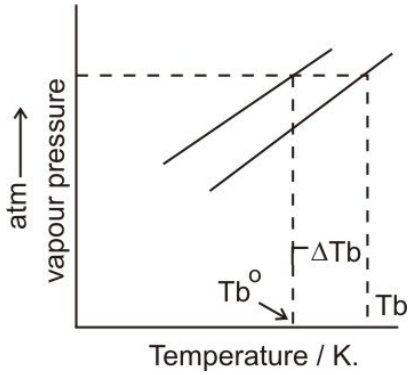
(c)



Q. 575 (a) Draw the graph between vapour pressure and temperature and explain the elevation in boiling point of a solvent in solution.

(b) Determine the osmotic pressure of a solution prepared by dissolving 25mg of K_2SO_4 in 2 litres of water at $25^\circ C$ assuming it to be completely dissiciated.(Atomic masses K = 39u, S = 32u, O= 16u)

Solution:
(a) On addition of a solute to a solvent, boiling point of the solution increases. Non-volatile solute when added to a solvent, lowers the vapour pressure and hence boiling point increases.



ΔT_b = elevation of boiling point

T_b° = vapour pressure of pure solvent

T_b = vapour pressure of the solution

Addition of non-volatile solute in a solvent, decreases the number of volatile particles on the surface of the solution. Hence, the particles that vapourises out from the surface decreases and hence decreases the vapour pressure of the solution. The elevation of boiling point is given by the formula.

$$\Delta T_b = T_b - T_b^\circ$$

(b) Weight of the solute $(W_2) = 25mg = 25 \times 10^{-3}g$

Volume of the elevation (V) = 2L

Molar mass of solute K_2SO_4 =174g/mol

Gas constant (R) = 0.0821 LatmK^{-1}

Temperature (T) = $25^\circ C$ = 25+273 = 298K

Osmotic pressure (π)= ?

$$\pi = \frac{W_2RT}{M_2V} = \frac{25 \times 10^{-3} \times 0.0821 \times 298}{174 \times 2} = 1.76 \times 10^{-3}atm$$

Q. 576

(a) Write two characteristics of non-ideal solution.

(b) 2g of benzoic acid (C_6H_5COOH) dissolved in 25g of benzene shows a dpression in freezing point equal to -1.62K. Molal depression constant for benzene is 4.9 K kg mol^{-1}. What is the percentage association of acid if it forms dimer in solution?

Solution:

(a) 1) The enthaply change of mixyure is not zero. The heat is either released or absorbed on mixing solute and solvent.

$\Delta H_{mix} \neq 0$ (-ve or +ve)

2) Change in the volume of solution an addition of solute to solute is not zero, $\Delta V \neq 0$. There is either expansion or contraction.

(b) Weight of solute (W_2) = 2g

Kf = 4.9 K kg mol^{-1}

Depression in freezing point = $\Delta T_f = 1.62K$

Weight of solvent (W_1) = 25g

$$\Delta T_f = K_f \times \frac{W_2}{M_2} \times \frac{1000}{W_1}$$

$$M_2 = \frac{K_f \times W_2 \times 1000}{\Delta T_f \times W_1} = \frac{4.92 \times 2 \times 1000}{1.62 \times 25} = 242gmol^{-1}$$

$$2C_6H_5COOH \leftrightharpoons (C_6H_5COOH)_2$$

Let x be the degree of association.

Undissociated benzoic acid = 1 - x for $\frac{N}{2}$ associated molecule.

Total no. of particles at equilibrium $= i = 1 - x + \frac{x}{2} = 1 - \frac{x}{2}$

i = $\frac{normalmolarmass}{observedmoarmass} = \frac{122}{242} = 1 - \frac{x}{2}$

$\frac{x}{2} = 1 - \frac{122}{242} = \frac{120}{242}$

$x = \frac{120}{242} \times 2 = 0.992$

% association = 0.992 X 100 = 99.2%

Q. 577 Give reasons for the following

(a) NO_2 dimerises readily.

(b) Chlorine acts as bleaching agent.

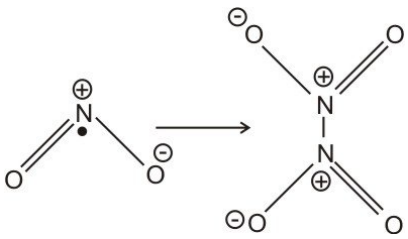
(c) In spite of small size, electron gain enthaply of oxygen is less negative as compared to sulphur.

(d) Unlike chlorine, fluorine forms only one oxaacid, HOF.

(e) Noble gas has very low boiling points.

Solution:

(a) NO_2 contains an unpaired electron that makes it reactive and hence it dimerizes to form a more stable N_2O_4.



(b) Chlorine gas in the presence of moisture reacts with water molecules to form hydrochloric acid and hypochlorous acid. Hypochlorous acid being reactive readily dissociate to generate nascent oxygen. Hence chlorine acts as bleeching agent.

$$Cl_2 + H_2O \rightarrow HCl + HOCl$$

$$HOCl \rightarrow HCl + [O]$$

(c) The larger is the force between the nucleus and the incoming electron, the larger negative is the electron gain enthaply. In case of oxygen, the size of atom is so small that an incoming electron experienceslarger electron replusion as compared to nuclear attraction of sulphur is higer and hence electron gain enthaply of oxygen is less negative as compared to that of sulphur.

(d) Due to small size and high electronegativity, fluorine cannot form multiple oxyacids unlike chlorine. Multiple oxygen atoms around fluorine get sterically hinderd.

(e) Noble gas have completely filled outermost shell and hence it becomes difficult for them to form intermolecular bond. Thus, they have low boiling point.

Q. 578 (a) Draw structure and name the shape of the following:

(i) SF_4

(ii) ICl_3

(b) What happens when (support your answer with equation)

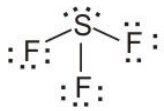
(i) Chlorine gas is passed through hot and concentrated sodium hydroxide solution?

(ii) Xenon hexafluoride is subjected to complete hydrolysis?

(iii) Concentrated sulphuric acid is poured over cane sugar?

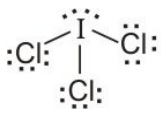
Solution:

(a) (i) SF_4



Bent - T Shaped

(ii) ICl_3



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(b) (i) Chlorine gas when passed through hot concentrated sodium hydroxide solution, disproportion reaction takes place to produce NaCl (oxidation state of Cl is -1)and sodium chlorate with +5 oxidation state of chlorine.

$$3Cl_2 + 6NaOH \rightarrow 5NaCl + NaClO_3 + 3H_2O$$

(ii) When XeF_6 is subjected to complete hydrolysis, the product formed is Xenon trioxide which is explosive and used as oxidizing agent.

$$XeF_6 + 3H_2O \rightarrow XeO_3 + 6HF$$

(iii) Concentrated sulphuric acid is a dehydrating agent and hence when added to cane sugar, dehydrates completely to generate a black carbon mass.

$$C_{12}H_{22}O_{11} \xrightarrow{conc.H_2SO_4} 12C + 11H_2O$$

Q. 579 (a) Give IUPAC name of $CH_3 - CH = CH - CHO$.

(b) How can you distinguish between ethanol and ethanal?

(c) How will you convert the following:

(i) Toulene to benzoic acid

(ii) Ethanol to propan-2-ol

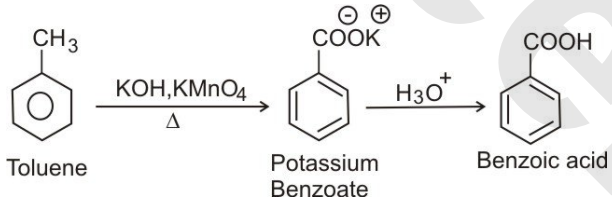
(iii) Propanal to 2- hydroxypropanic acid

Solution:

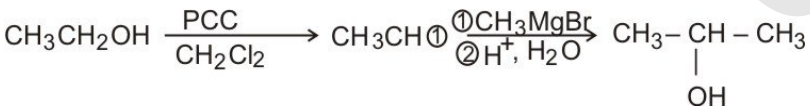
(a) $CH_3 - CH = CH - CHO$ - But-2-enal

(b) Ethanal with Tollen's reagent give sliver mirror test positive whereas ethanol does not give a positive result.

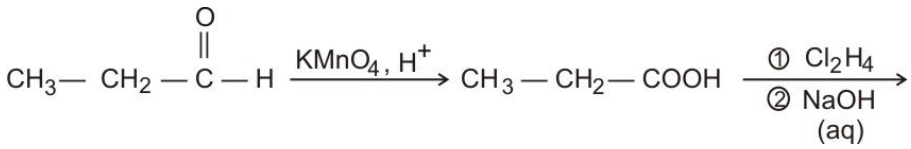
(c) (i)

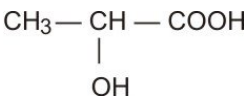


(ii) Ethanol to propan-2-ol



(iii) Propanal to 2- hydroxypropanic acid





Q. 580 (a) Give IUPAC name of Salicylic acid.

(b) Chloroacetic acid is more acidic than acetic acid. Why?

(c) Write the products formed when $(CH_3)_3C-CHO$ reacts with the following:

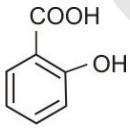
(i) Zinc amalgam and dilute hydrolic acid

(ii) Concentrated sodium hydroxide solution

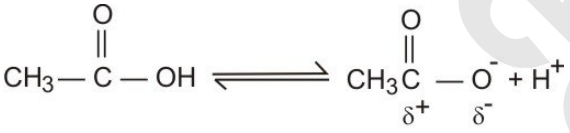
(iii) Semicarbazide and weak acid

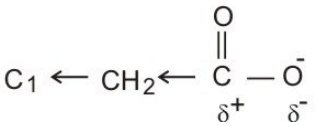
Solution:

(a) IUPAC name of Salicyclic acid is 2 -hydroxybenzoic acid.

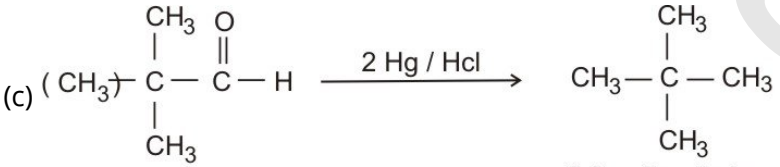


(b) Due to -I effect of chlorine, it increases the partial positive charge on carbon and hence stability the carboxylate ion and thus it increases the acidity of carboxylic acid.

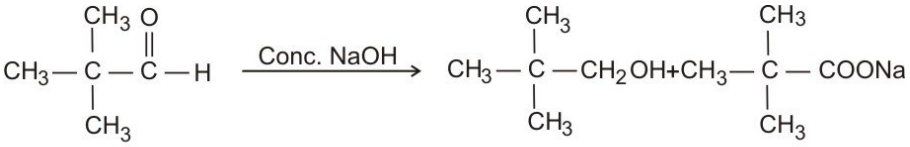




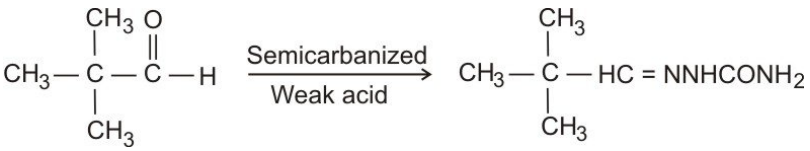
(c)



2,2 – dimethyl propane



2, 2 - dimethyl propanol sodium,
2, 2 - dimethyl propanoate



Q. 581 A cube soild is made up of two elements A and B. Element A forms hcp while atoms of element B occupy two-third of the octahedral voids. What is the formula of the soild?

Solution:
Octahedral voids is equal to the number of atom in hcp solid lattice.

Octahedral voids = A

$$B = \frac{2}{3}A$$

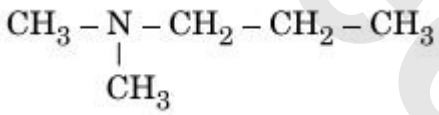
$$\frac{A}{B} = \frac{3}{2}$$

Therefore, formula of compund is B_2A_3.

Q. 582 Oxidation of $CH_3 - CHO$ is easier than $CH_3 - COCH_3$. Why?

Solution:
Oxidation of CH_3CHO involves the breaking of $-C - H$ bond, whereas in case CH_3COCH_3, breaking of $-C - C$ bond is involved which is much more difficult. Hence, oxidation of CH_3CHO is easier.

Q. 583 Write the IUPAC name of the following compound:



Solution:
$CH_3 - N(CH_3) - CH_2 - CH_2 - CH_3$ (H: Organic compounds containg nitrogen)

N,N – dimethyl propananine

Q. 584 What happens when

(a) XeF_2 is hydrolysed?

(b) SO_2 is passed into aqueous solution of Fe^{3+} salt?

Solution:
(a) XeF_2 is hydrolysed to release oxygen gas and causes the formation of elemental Xe and HF.

$$2XeF_2(s) + 2H_2O(l) \rightarrow 2Xe(g) + 4HF(aq) + O_2(g)$$

(b) SO_2 acts as reducing agent andf hence when passed through the solution of Fe^{3+} salt, reduces it to Fe^{2+}.

$SO_2 + 2Fe^{3+} + 2H_2O \rightarrow 2Fe^{2+} + 4H^+ + SO_4^{2-}$

Q. 585 Complete and balance the following equations:

(a) $MnO_4^- + I^- + H^+ \rightarrow$

(b) $Na_2Cr_2O_7 + KCl \rightarrow$

Solution:
(a) $MnO_4^- + I^- + H^+ \rightarrow Mn^{2+} + IO_3^- + 2H_2O$

(b) $Na_2Cr_2O_7 + KCl \rightarrow K_2Cr_2O_7 + 2NaCl$

Q. 586 Define the following terms:

(a) Polysacchrides

(b) Nucleotides

Solution:
(a) Polysacchrides are the carbohydrates that yield a large number of monosaccharide units on hydrolysis. Example - Starch , cellulose

(b) Nucleotides are the monomers units of nuclei acid which consists of a pentose sugar, a nitrogen base and phosphate group.

Q. 587 (a) What type of stiochiometric defect is shown by NaCl and why?

(b) Calculate its efficency of packing in case of metal crystal for face centred cubic unit cell.

Solution:
(a) NaCl sshows Schottky defect due to similar size of Na^+ and Cl^-.

(b) Atoms present in face centred cubic unit cell is 4.

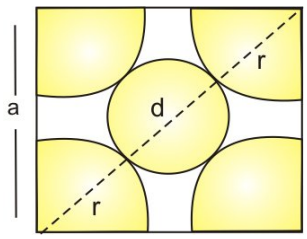
Edge length of unit cell (a) $= 2\sqrt{2}$, where r = radius of atom.

Packing efficency $= \frac{vol.of four spheres}{Vol.of unit cell} \times 100$

$$= \frac{4 \times \frac{4}{3}\pi r^3}{(2\sqrt{2}r)^3} \times 100$$

$$= \frac{\frac{16}{3}\pi r^3}{16\sqrt{2}r^3} \times 100$$

$$= \frac{\pi}{3\sqrt{2}} \times 100 = 74\%$$



$a^2 + a^2 = (4r)^2$

$2a^2 = 16r^2$

$a^2 = 8r^2$

$a = \sqrt{8r^2} = 2\sqrt{2}r$

Q. 588 Write the difference between physisorption and chemisorption.

Solution:

Physisorption	Chemisorption
The adsorbate forms weak Van der Waal's attraction bond on the surface of adsorbent.	The adsorbate from strong bond of attrtaction on the surface of adsorbent.
No new substance is formed .	New substance is formed.
It is a reversible process.	It is a irreversible process.

Q. 589 Differentiate between the following:

(a) Antispetic and Disinfecants

(b) Antacids and Antihistamines

(c) Soaps and Detergents

Solution:

(a) Antispectics are antimicrobial agents used to destroy microbes present on the surfaces of the living tissues.

Disinfectants are the antimicrobial agents used to destroy microbes present on the surface of non - living objets.

(b) Antacids are weak acids used to neutralize the acid present in the stomach to form salt and water.

Antihistamines reduces the allergic effect of histamine that act as gastric irritant. Antihistamine binds to the receptors of histamine present in the stomach.

(c) Soaps are sodium or potassium salts of long chain fatty acids used to remove dirt by using only soft water.

Detergents are the sodium salts of long chain benzene sulphuric acid or long chain alkyl hydrogen sulphates used to remove the dirt using both soft and hard water.

Q. 590 Using valence bond theroy predict the hybridization and magnetic character of the following:

(a) $[CoF_6]^{3-}$

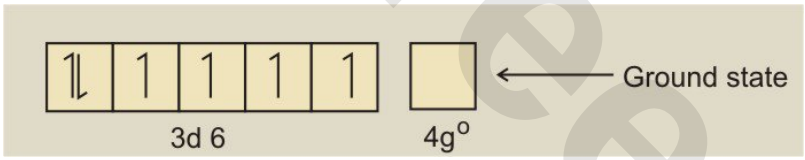
(b) $[Ni(CN)_4]^{2-}$

Solution:

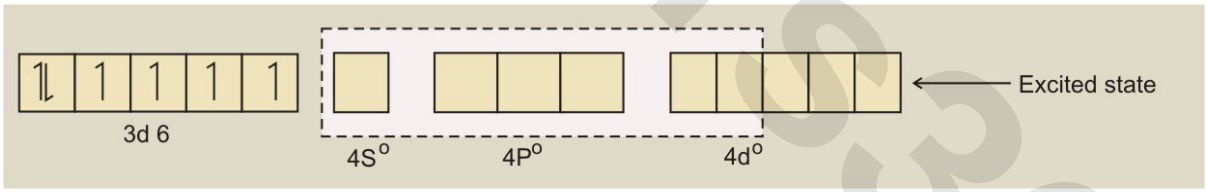
(a) $[CoF_6]^{3-}$

Oxidation number of Co is +3.

Electronic configuration of $Co^{3+} = [Ar]3d^6 4s^0$



F^- has a weak ligand and hence forms high spin complex.

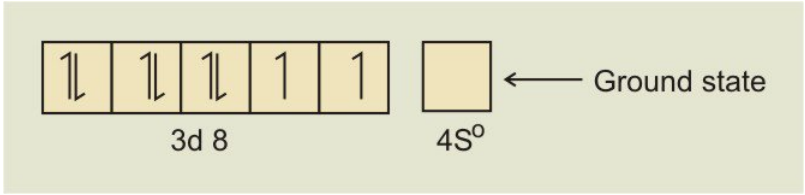


Hence it undergoes d^2sp^3 hybridization. Since there are unpaired electrons present it shows paramagentism.

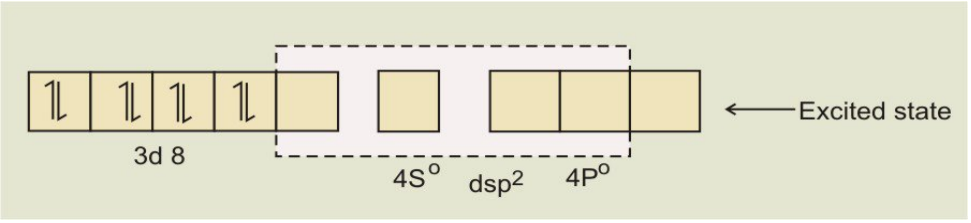
(b) $[Ni(CN)_4]^{2-}$

Oxidation state of Ni in $[Ni(CN)_4]^{2-}$ is +2.

Electronic configuration of $Ni^{2+} = [Ar]3d^8 4s^0$

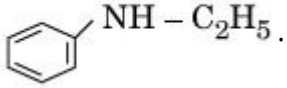


CN^- is a strong field ligand and hence, it forms low soin complex.

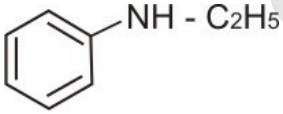


excited state

Hence, $[Ni(CN)_4]^{2-}$ undergoes dsp^2 hybridization. Since there is no unpaired electrons, it shows dimagnetism.

Q. 591 Write the IUPAC name of  .

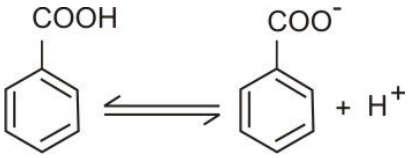
Solution:



N-ethylaniline or N- ethylbenzamine.

Q. 592 p-Nitrobenzoic acid has lower pK_a value than benzoic acid. Why?

Solution:
Nitro group being electron donating generates electron deficiency at para position and hence stabilizes benzoate ion formed on donation of proton by benzoic acid. Hence, p-nitrobenzoic acid more acidic than benzoic acid and thus, the pK_a of p-nitrobenzoic acid is lower than that of benzoic acid.



Q. 593 A compound is formed by two elements X and Y. Atoms of the element Y (as anoins) make ccp and those of the elements X (as cations) occupy all octahedral voids. What is the formula of the compound?

Solution:
Octahedral voids = X ...(given)

X =Y

Molecular formula = XY

Q. 594 Differntiate between:

(a) Nucleotide and Nucleoside

(b) Amylose and Amylopectin

Solution:
(a) Nucleotide is a molecule that contains a pentose sugar, a nitrogen base and phosphate group.

Nucleoside is a molecule that consists of a pentose sugar and nitrogen base.

(b) Amylose is an unbranched chain of D-glucose whereas Amylopectin is a branched chain of D - glucose.

Q. 595 What happens when:

(a) PCl_5 is heated?

(b) XeF_2 reacts with PF_5?

Solution:
(a) PCl_5 on heating dissociates into $PCl_3 and Cl_2$ gas

$$PCl_5(g) \rightarrow PCl_3(g) + Cl_2(g)$$

(b) XeF_2 on reaction with PF_5 donate fluoride to PF_5 to generate $[XeF]^- and [PF_6]^-$

$$XeF_2 + PF_5 \rightarrow [XeF]^- + [PF_6]^-$$

Q. 596 Write the preparation of sodium dichromate from Chromite ore.

Solution:
Sodium chromate is formed from the fusion of chromite ore with $NaOH$ in air.

$$4FeCr_2O_4 + 16NaOH + 7O_2 \rightarrow 8NaCrO_4 + 2Fe_2O_3 + 8H_2O$$

Sodium chromate is acidified to form sodium dichromate.

$$Na_2CrO_4 + H_2SO_4 \rightarrow Na_2Cr_2O_7 + Na_2SO_4 + H_2O$$

Q. 597 (a) What type of stoichiometric defect is shown by AgCl and why?

(b) Calculate the efficiency of packing in case of a metal ceystal for simple cubic unit cell.

Solution:

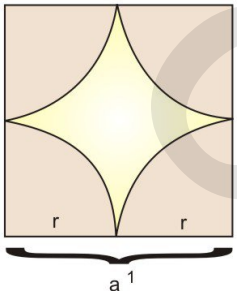
(a) The stiochiometric defect observed in AgCl crystal is Frenkel defcet since there is large difference in the size of $Ag^{+} and Cl^{-}$.

(b) Atoms per unit simple cubic unit cell is 1.

a = 2r

Packing efficiency = $\frac{Vol.of asphere}{Vol.of a unitcell}$

$$= \frac{\frac{4}{3}\pi r^3}{a^3} \times 100 = \frac{\frac{4}{3}\pi r^3}{(2r)^3} \times 100 = \frac{\frac{4}{3}\pi r^3}{8r^3} \times 100 = \frac{\pi}{6} \times 100 = 52.4\%$$



Q. 598 Define the following terms:

(a) Coagulation

(b) Associated colloids

(c) Brownian movement

Solution:
(a) Coagulation : The process of settling of the colloidal particles is called coagulation.

(b) Some substances behaves as strong electrolyte at low concentration and forms colloidal solution. At higgh tempertaure, aggregate particles formed such colloidal solution as assoiciated colloids.

(c) Browian movement : Observing under powerful microscope particles in the colloidal solution appears to be in the random zig - zag motion. Such motion is called as Brownian movement.

Q. 599 Using valence bond theory, predict the hybidization and magnetic character of the following:

(a) $[NiCl_4]^{2-}$

(b) $[Co(C_2O_4)_3]^{3-}$

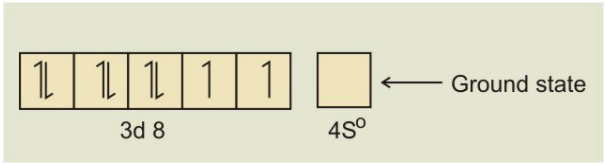
[At. no : Co=27, Ni=28]

Solution:

(a) $[NiCl_4]^{2-}$

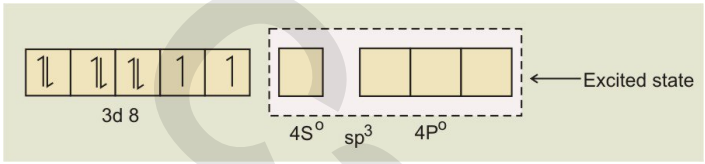
The oxidation state of Ni in $[NiCl_4]^{2-}$ is 2.

Electronic configuration of $Ni^{2+} = [Ar]3d^8 4s^0$



ground state

Cl^- is a weak field ligand and hence form outer spin complex or high spin complex.

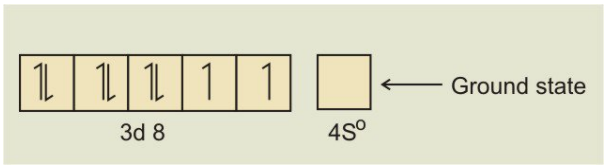


Hence it undergoes sp^3 hybridisation. Since unpaired electrons are present, it shows paramagnetism.

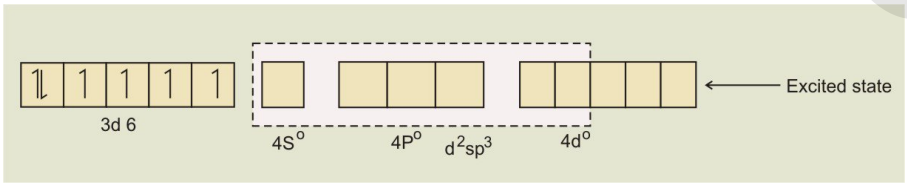
(b) $[Co(C_2O_4)_3]^{3-}$

Oxidation of Co is +3.

Electronic configuration of $Co^{3+} = [Ar]3d^6 4s^0$



$C_2O_4^{2-}$ is a weak field ligand and hence forms outer spin complex.



excited state

Hence Co^{3+} shows d^2sp^3 hybridisation and since there are unpaired electrons present, it exhibits paramagnetism.

Q. 600 (a) Which one of the following drugs is an antibiotic:

Equanil, Ofloxacin, Aspirin, Luminal

(b) Why is use of aspartame limited to cold food and drinks?

(c) Why do we require artifical sweeting agents?

Solution:
(a) Oflaxacin is an antibiotic.

(b) Aspartame becomes unstable at high temperature and hence gets converted into a harmful substance called phenylalanine. Thus, it is limited to cold food and drink.

(c) Artifical sweetner has zero calorific value and hence is used by diabetic patients.

Q. 601 What is tincture of iodine ? What is its use ?

Solution:
2 - 3% solution of iodine in alcohol-water mixture is known as tincture of iodine. It is applied on wounds to disinfect the area.

Q. 602 Predict the number of unpaired electrons in the square planar $[Pt(CN)_4]^{2-}$ ion.

Solution:
$[Pt(CN)_4]^{2-}$

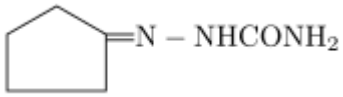
$Pt = +2;$ compound is square planar and CN is strong field ligand. Therefore it causes pairing. Hence there are no unpaired electrons.

Q. 603 Amongst $[Fe(C_2O_4)_2]^{3-}$ and $[Fe(NH_3)_6]^{3+}$ which is more stable and why ?

Solution:
$[Fe(C_2O_4)_3]^{3-}$ is more stable as it is a chelate complex, and it forms cyclic structure.

Q. 604 Draw the structure of semicarbazone of cyclopentanone.

Solution:
Semicarbazone of cyclopentanone.



Q. 605 Draw the structure of product formed when propanal is treated with zinc amalgam and concentrated hydrochloric acid.

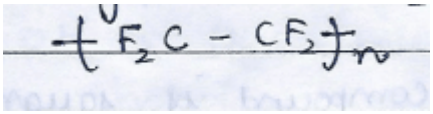
Solution:
Treatment of propanal with Zn-Hg / conc HCl will form $CH_3CH_2CH_3$ Propane.

Q. 606 Name a carbohydrate present in liver, muscles and brain.

Solution:
Glycogen is the carbohydrate present in liver, muscle and brain.

Q. 607 Draw structure for the polymer used for manufacture of non-stick utensils.

Solution:
Polymer used for manufacture of non-stick utensils is polytetrafluoroethylene (Teflon).



Q. 608 Define conductivity and molar conductivity for the solution of an electrolyte. Why does the conductivity of solution decrease with dilution ?

Solution:
Conductiivity :

Conductivity or specific conductance of an electrolyte solution is a measure of its ability to conduct electricity.

Molar conductivity:

Molar conductivity is conductance of all ions produced by 1 mole of electrolyte dissolved in $V\ cm^3$ of solution placed between two electrodes which are unit distance apart and have large are of cross section to hold the entire volume.

Conductivity of solution decreases with dilution because with dilution, concentration decreases due to which there is a decrease in number of ions/volume.

Q. 609 For a reaction, $C_2H_4(g) + H_2(g) \rightarrow C_2H_6(g),\ \text{rate } = 5 \cdot 5 \times 10^{-14}\,[C_2H_4]$.

(a) Write the unit of rate constant.

(b) Calculate its half-life $\left(t_{\frac{1}{2}}\right)$.

Solution:

$C_2H_4(g) + H_2(g) \rightarrow C_2H_6(g),\ \text{rate } = 5 \cdot 5 \times 10^{-14}\,[C_2H_4]$(a) Unit of rate constant $= s^{-1}$

(b) Half life $\left(t_{\frac{1}{2}}\right) = ?$

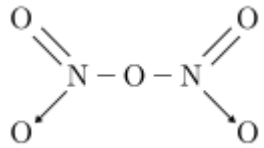
$$t_{1/2} = \frac{0.693}{k}$$
$$= \frac{0.693}{5.5 \times 10^{-14}} = 1.26 \times 10^{13}\text{s}$$

Q. 610 (a) Draw the structure of an oxide of nitrogen where the oxidation state of nitrogen is +5.

(b) With the help of a balanced chemical equation, suggest what happens when white phosphorus reacts with NaOH solution in an inert atmosphere.

Solution:

(a) Oxide of nitrogen where oxidation number of N is +5 is N_2O_5.



(b) Phosphine is formed. (PH_3)

$$P_4 + 3NaOH + 3H_2O \rightarrow PH_3 + 3NaH_2PO_2$$

Q. 611 (a) Actinoid contraction is greater than lanthanoid contraction. Give reason.

(b) Out of Fe and Cu, which has higher melting point and why ?

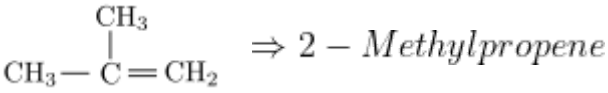
Solution:

(a) Actinoid contraction is more than lanthanoid contraction due to poor shielding effect of 5f electrons in comparision to 4f electrons.

(b) Fe has a higher melting point because of presence of more number of unpaired electrons than Cu.

Q. 612 Predict the major product obtained when t-butyl bromide reacts with sodium methoxide. Also, give its IUPAC name.

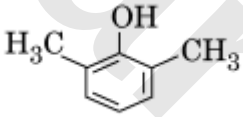
Solution:
Major product formed is



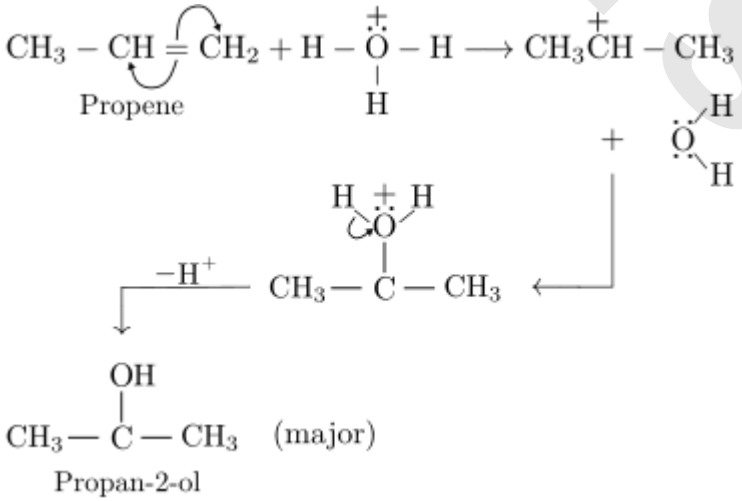
$\Rightarrow 2-Methylpropene$

Q. 613 (a) Show the chemical reaction with bond movements and arrows for the nucleophilic attack of water on carbocation in acid catalysed hydration of alkenes.

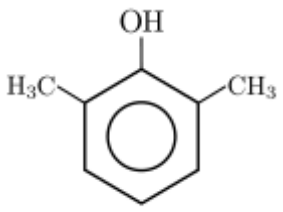
(b) Give IUPAC name for the following :



Solution:
(a) $H_2\ddot{O} + H^+ \rightarrow H_3O^+$



(b)



2,6 - Dimethylphenol

Q. 614 Aluminium crystallises in a fcc structure. Atomic radius of the metal is 125 pm. What is the length of the side of unit cell of the metal ?

Solution:
fcc structure.

Atomic radius = 125pm

edge length = ?

$$a = 2\sqrt{2}r$$
$$a = 2 \times 1.414 \times 125$$
$$= 353.5\text{pm}$$

Q. 615 The compound CuCl has fcc structure like ZnS. Its density is $3.04\, g\, cm^{-3}$. What is the volume of unit cell ?

Given : Atomic mass of Cu = 63·5 u; Cl = 35·5 u

$$N_A = 6.02 \times 10^{23}\, mol^{-1}$$

Solution:
Atomic mass of Cu = 63.5 u and Cl = 35.5 u.

$$N_A = 6.02 \times 10^{23} mol^{-1}$$

density $= 3.04\, gcm^{-3}$

$$d = \frac{n \times m}{a^3 \times N_A}$$
$$3.04 = \frac{4 \times 99}{V \times 6.02 \times 10^{23}}$$
$$V = \frac{4 \times 99}{3.04 \times 6.02 \times 10^{23}}$$
$$= 21.638 \times 10^{-23}\text{cm}^3$$

Q. 616 Answer the following :

(a) What is the formula of a compound in which element Y forms ccp lattice and atoms X occupy $\frac{1}{3}^{rd}$ of tetrahedral voids ?

(b) What type of non-stoichiometric point defect leads to colour in alkali metal halides ?

Solution:

(a) No. of atoms of Y in ccp = 4

No. of tetrahedral voids $= 2 \times 4 = 8$

No. of voids occupied by X $= \frac{1}{3} \times 8 = \frac{8}{3}$

Ratio of atoms X and Y $= \frac{8}{3} : 4 = 2 : 3$

Formula of compound $= X_2Y_3$

(b) Metal excess defect due to anionic vacancies which is a non - stoichiometric defect results in colour in alkali metal halide.

Q. 617 Zinc rod is dipped in 0·01 M solution of zinc sulphate when temperature is 298 K. Calculate the electrode potential of zinc. (Given :

$\mathrm{E}^0_{\mathrm{Zn}^{2+}/\mathrm{Zn}} = -0.76\mathrm{V}; \log 10 = 1$)

Solution:

$\mathrm{Zn}\,|Zn^{2+}(0.01M) \quad \Rightarrow n = 2$

$E^0_{Zn^{2+}|Zn} = -0.76V$

$E_{\text{cell}} = E^0_{Zn^{2+}/Zn} - \frac{RT}{nf} \ln\left(Zn^{2+}\right)$

$= 0.76 - \frac{2.303RT}{nf} \log(0.01M)$

$= 0.76 - \frac{0.059}{2} \log(0.01)$

$= 0.76 - \frac{0.059}{2} \log 10^{-2}$

$= 0.76 + 0.059$

$E_{cell} = 0.819V$

Q. 618 The rate constant of a first order reaction increases from 2×10^{-2} to 6×10^{-2} when the temperature changes from 300 K to 320 K. Calculate the energy of activation. (Given : log 2 = 0·3010, log 3 = 0·4771, log 4 = 0·6021)

Solution:

Order = 1

$E_a = ? \quad R = 8.314 \text{J/K}$

$T_1 = 300K \quad k_1 = 2 \times 10^{-2}$

$T_2 = 320K \quad k_2 = 6 \times 10^{-2}$

$$\log \frac{k_2}{k_1} = \frac{E_a}{2.303R}\left[\frac{T_2 - T_1}{T_1 T_2}\right]$$

$$\log \frac{6 \times 10^{-2}}{2 \times 10^{-2}} = \frac{E_a}{2.303 \times 8.314}\left[\frac{320 - 300}{320 \times 300}\right]$$

$$\log 3 = \frac{E_a}{2.303 \times 8.314}\left(\frac{20}{320 \times 300}\right)$$

$$\frac{0.4771 \times 2.303 \times 8.314 \times 320 \times 300}{20} = E_a$$

$$E_a = 43848.486 \text{J/mol}$$

Q. 619 Answer the following :

(a) Why is ester hydrolysis slow in the beginning and then becomes faster after some time ?

(b) In a solution of methylene blue, animal charcoal is added, the solution is then well shaken. What will be observed and why ?

(c) Give an example of oil in water emulsion.

Solution:
(a) Ester hydrolysis is slow in the begining and then becomes faster after some time because acid formed in the reaction releases H^+ lons which act as a catalyst and makes the reaction faster. These are known as autocatolysts.

(b) In a solution of methylene blue, animal charcoal is added, onshaking it, the solution turns colourless as the dye particles are absorbed on the surface of charcoal and gets accumulated.

(c) Example of oil in water emulsion is milk.

Q. 620 Define the following :

(a) Associated colloids

(b) Electrophoresis

(c) Zeta potential

Solution:
(a) **Associated colloids :**

Associated colloids are substances which act as electrolytes at low concentration but at high concentration associate with each other to particles having size in colloidal range.

(b) **Electrophoresis :**

Electrophoresis refers to migration of colloidal particles towards the oppositely charged electrode in the presence of electric field.

(c) **Zeta potential :**

Zeta potential or electokinetic potential is the potential difference between fixed layer and the diffused layer of opposite charges.

Q. 621

(a) What is the difference between calamine and malachite ?

(b) Why is zinc used instead of Cu for recovery of Ag from $[Ag(CN)_2]^-$?

(c) What is the role of cryolite in metallurgy of Al ?

Solution:
(a) Calamine $(ZnCO_3)$ is zinc ore whereas malachite $(CuCO_3 \cdot Cu(OH)_2)$ is a copper ore.

(b) Zinc is used instead of copper for recovery of Ag from $[Ag(CN)_2]^-$ as zinc is a powerful reducing agent and the product (zinc cyanide) formed is easily disposible.

(c) Cryolite (Na_3AlF_6) decreases the melting point and increases condectivity.

Q. 622

(a) Give two points of differences between pig iron and cast iron.

(b) Outline the principle of zone refining.

Solution:
(a) Pig iron :

(1) It is iron obtained from blast furnance.

(2) It contains 4% carbon and small amounts of S, P, Si and Mn and is impure.

Cast iron :

(1) It is obtained by melting pig iron with iron scrap.

(2) It contains 3% carbon.

(b) Zone refining is based on the principle that the impurities are more soluble in molten state than in solid state of metal.

Q. 623 (a) Complete the following chemical reactions :

$(i) \quad \mathrm{Na_2Cr_2O_7 + KCl \rightarrow}$

$(ii) \quad \mathrm{2\ MnO_4^- + 5SO_3^{2-} + 6H^+ \rightarrow}$

(b) How does the colour of $Cr_2O_7^{2-}$ change when treated with an alkali ?

Solution:
(a)

$(1)\ Na_2Cr_2O_7 + 2KCl \rightarrow K_2Cr_2O_7 + 2NaCl$

$(2)\ 2MnO_4^2 + 5So_3^{2-} + 6H^+ \rightarrow 2Mn^{2+} + 5SO_4^{2-} + 3H_2O$

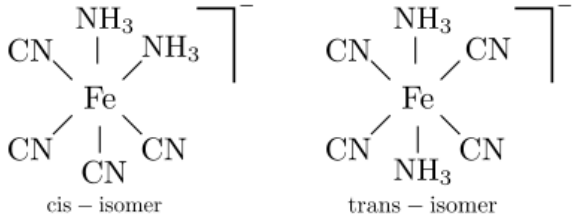
(b) Orange colour of $Cr_2O_7^{2-}$ changes to yellow due to formation of CrO_4^{2-} when treated with an alkali.

Q. 624 (a) Draw the structures of geometrical isomers of $[Fe(NH_3)_2(CN)_4]^-$.

(b) $[NiCl_4]^{2-}$ is paramagnetic while $[Ni(CO)_4]$ is diamagnetic though both are tetrahedral. Why ? [Atomic number of Ni = 28]

Solution:
(a)

Geometrical isomers of $[Fe(NH_3)_2(CN)_4]^-$.



(b)

$[NiCl_4]^{2-}$ is paramagnetic while $[Ni(CO)_4]$ is diamagnetic since Cl is a weak field ligand its $\Delta_0 < P$ because of this it cannot cause pairing of elections whereas CO is a strong field ligand its $\Delta_0 > P$ therefore causes pairing of electrons.

Q. 625 Define the following :

(a) Ambidentate ligands

(b) Spectro chemical series

(c) Heteroleptic complexes

Solution:
(a) Ambidentate Ligand :

Ambidentate ligand is a unidentate ligand containing more than one coordinating atoms. Eg: NO_2^-

(b) Spectrochemical series :

Spectrochemical series is a list of ligands arranged in order of their field strength i.e in increasing order of their crystal field splitting energy.

(c) Heteroceptic complexes :

Heteroceptic complexes are those in which metal atom is linked to more than one type of ligand. Eg : $[Co(NH_3)_4Cl_2]^+$

Q. 626 (a) Write the product formed when

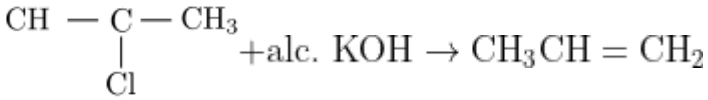
(i) 2-chloropropane is treated with alc. KOH.

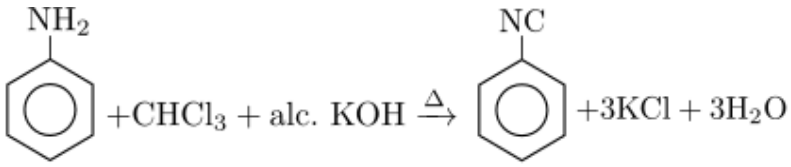
(ii) Aniline reacts with conc. H_2SO_4 at 453 – 473 K.

(b) When aniline is heated with $CHCl_3$ and alc. KOH, a foul smelling compound is formed. What is this compound ?

Solution:
(a)

(1) Propene id formed.



(2) 

Zwitter ion is formed.

(b) Phenylisocyanide is the compound formed which is bad smelling.

Q. 627 (a) How will you convert the following :

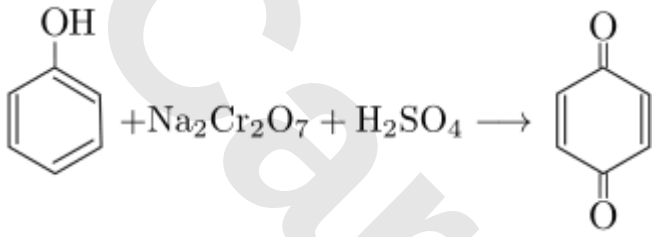
(i) Phenol to benzoquinone

(ii) Propanone to 2-methyl propan-2-ol

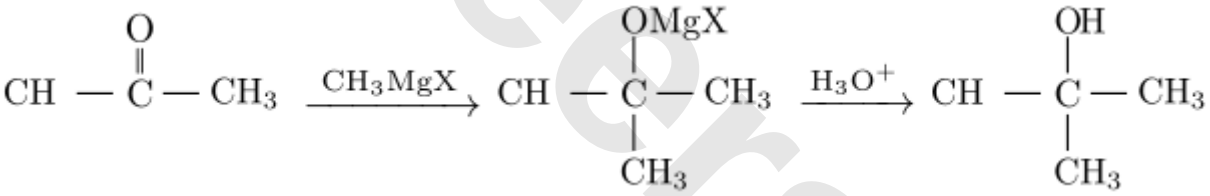
(b) Why does propanol have higher boiling point than that of butane ?

Solution:
(a)

(1) Phenol to benzoquinone.

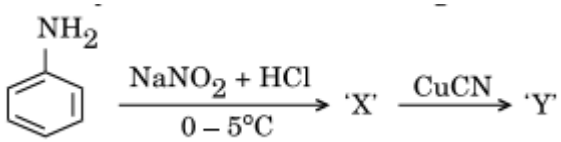


(2) Propanone to 2-methylpropan-2-ol



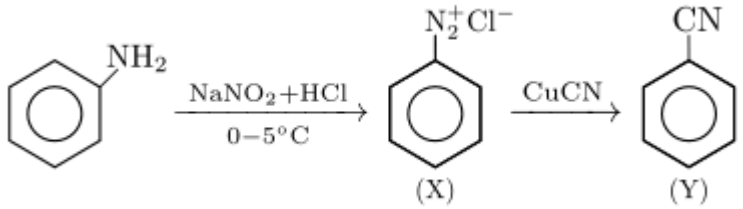
(b) Propanol have higher boiling point than that of butane because propanol is associated with each other through intermolecular hydrogen bonding which are stronger than vanderwaal forces.

Q. 628 (a) Identify X and Y in the following :



(b) Amino group is o, p-directing for aromatic electrophilic substitution reactions. Why does aniline on nitration give m-nitroaniline ?

Solution:
(a)



(b) Amino acids are o- and p- directing for aromatic electrophillic substitution reaction yet on nitration, it gives m- nitroaniline due to protonation of aniline in strongly acidic medium the resulting NH_3^+ group being deactivting directs the electrophille to m- position.

Q. 629 (a) What happens when D-glucose is treated with the following reagents :

(i) HI

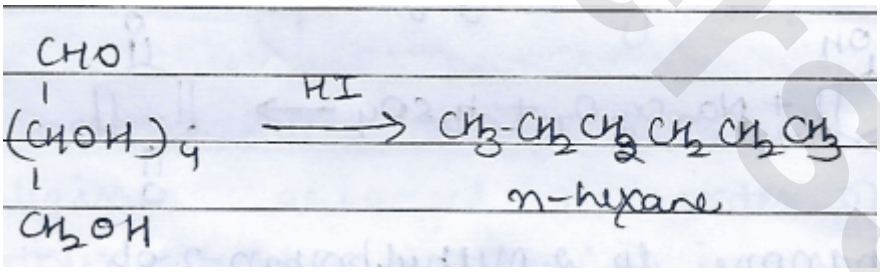
(ii) conc. HNO_3

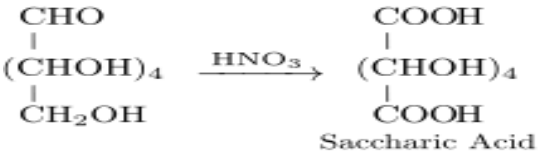
(b) What is the basic structural difference between starch and cellulose ?

Solution:
(a) D - glucose on reaction with

(i)

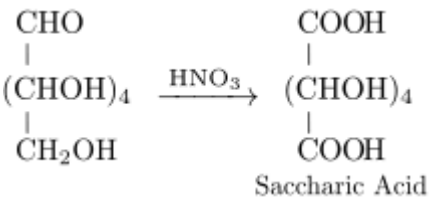
HI

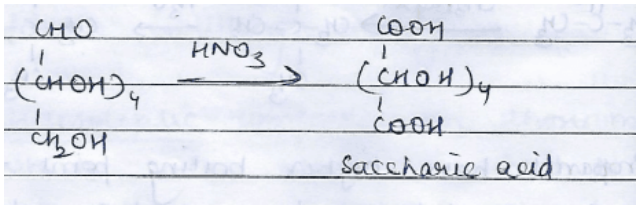




(ii)

Conc. HNO_3





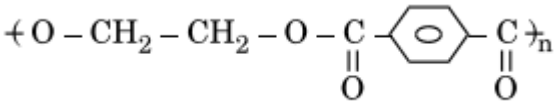
(b) Starch :

Starch is a mixture of two polysaccharides - amylose and amylopectin and is formed from alpha glucose.

Cellulose:

Cellulose is a linear polymer of β - D- glucose in which c_1 of one glucose unit and C_4 of next are linked by glycosidic linkages.

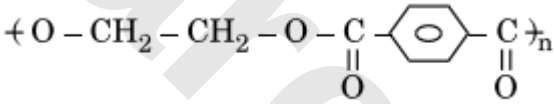
Q. 630 (a) Write the names of monomers of following polymer :



(b) What does part 6,6 mean in the polymer Nylon-6,6 ?

(c) Give an example of Biodegradable polymer.

Solution:
(a)

Monomers of 

Ethylene glycol and Pthalic acid

(b) 6,6 in nylon - 6,6 polymer represents the number of carbon atoms in its monomers.

(c) Example of biodegradable polymer is Nylon-2-Nylon-6.

Q. 631 (a) Differentiate between antiseptic and disinfectant. Give one example of each.

(b) Why do we require artificial sweetening agents ?

Solution:
(a) Antiseptics :

Antiseptics are chemical substances which prevent the growth of microorganisms and may even kill them. They are safe to be applied on living tissues.

Disinfectants :

Disinfectants are chemical substances which are used to kill microorganisms but they cannot be applied to living tissues. Example - Bleaching powder.

(b) We require artificial sweetening agents as they add sweet taste to food and sucrose and fructose add calorie and promote tooth decay.

Q. 632 Define the following terms :

(a) Tranquilizers

(b) Ant-acids

(c) Analgesics

Solution:
(a) Tranquilizers :

Tranquilizers are chemical substances used to cure mental diseases, reduce anxiety and are important constituent of sleeping pills.

(b) Antacids :

Antacids are substances which remove excess acid and raise the pH to appropriate level in stomach.

(c) Analgesics :

Analgesics are drugs which reduce or abolish pain without reducing consciousness, incoordination or other disturbances of the nervous system.

Q. 633 (a) A 5% solution (by mass) of cane sugar in water has a freezing point of 271 K. Calculate the freezing point of 5% solution (by mass) of glucose in water. The freezing point of pure water is 273·15 K.

(b) Why is osmotic pressure of 1 M KCl higher than 1 M urea solution ?

(c) What type of liquids form ideal solutions ?

Solution:
(a)

$$\begin{aligned}\Delta T_f &= T_f^o - I_f \\ &= 273.15 - 271 \\ &= 2.15\text{K}\end{aligned}$$

5% solution means = (100-5) g

= 95g of water

No. of moles of cane sugar $= \frac{5}{342} mol$

No. of moles of glucose $= \frac{5}{180} mol$

Molality of cane sugar $= \frac{5}{342} \times \frac{1}{0.095}$

$= 0.1537\ kg^{-1}mol^{-1}$

Molality of glucose $= \frac{5}{180} \times \frac{1}{0.095} = 0.2926\ molkg^{-1}mol^{-1}$

For cane sugar,

$$\Delta T_f = K_f \times m$$
$$K_f = \frac{\Delta T_f}{m} = \frac{2.15}{0.1537}$$
$$= 13.99\text{Kkg/mol}$$

For glucose,

$$\Delta T_f = K_f \times m$$
$$\Delta T_f = 13.99 \times 0.2926$$
$$= 4.09\text{K}$$

freezing point of glucose,

$$T_f = T_f^\circ - \Delta T_f$$
$$= 273.15 - 4.09$$
$$= 269.06K$$

(b) Osmotic pressure of 1M KCl is higher than 1M urea solution as KCl ionises into K^+ and Cl^- and osmotic pressure being colligative property depends on number of particles and urea does not ionise at all.

(c) A solution of two liquids behave as an ideal solution if unlike attractions in them are equal to like attractions.

Q. 634 (a) 1·0 g of a non-electrolyte solute dissolved in 50 g of benzene lowered the freezing point of benzene by 0·40 K. The freezing point depression constant of benzene is $5.12\ K\ kg\ mol^{-1}$. Find the molar mass of the solute.

(b) What is the significance of Henry's law constant, K_H ?

(c) What leads to anoxia ?

Solution:

(a)Mass of non - electrolyte solute = 1 g (W_2)

Mass of benzene = 50 g (W_1)

$\Delta T_f = 0.40K$

Molar mass of solute = ? (M_2)

$$\Delta T_f = \frac{K_f \times W_2 \times 1000}{M_2 \times W_1}$$
$$M_2 = \frac{K_f \times W_2 \times 1000}{\Delta T_f \times W_1}$$
$$= \frac{5.12 \times 1 \times 1000}{0.40 \times 50}$$
$$= 256\text{g/mol}$$

(b) Significance of Henry's constant. It increases with increase in temperature and more is the value of K_H, less is the solubility. So it tells about the solubility of gases in liquids depending on temperature.

(c) People living at high altitudes suffer from anoxia as they have low concentration of oxygen in their blood since pressure of air is less which makes them work.

Q. 635 A crystalline solid 'A' burns in air to form a gas 'B' which turns lime water milky. The gas is also produced as a by-product during roasting of sulphide ore. This gas decolourises acidified $KMnO_4$ (aq.) solution and reduces Fe^{3+} to Fe^{2+}. Identify 'A' and 'B' and write the reactions involved.

Solution:
A (solid) burns in air $\rightarrow$ B (gas)

B decolourises $KMnO_4$

turns lime water milky and reduces $Fe^{3+} \rightarrow Fe^{2+}$

$\therefore A = S_8; B = SO_2$

1. $S_8 + 8O_2 \rightarrow 8SO_2$

2. $5SO_2 + 2MnO_4^- + 2H_2O \rightarrow 5SO_4^{2-} + 2Mn^{2+} + 4H^+$

3. $SO_2 + 2Fe^{3+} + 2H_2O \rightarrow 2Fe^{2+} + SO_4^{2-} + 4H^+$

4. By product of roasting of sulphide ore

$FeS_2 + 11O_2 \rightarrow 2Fe_2O_3 + 8SO_2$

Q. 636 Answer the following :

(a) Arrange the following hydrides of Group 16 elements in the decreasing order of their acidic strength :

H_2O, H_2S, H_2Se, H_2Te

(b) Which one of PCl_4^+ and PCl_4^- is not likely to exist and why ?

(c) Which allotrope of sulphur is thermally stable at room temperature ?

(d) Write the formula of a compound of phosphorus which is obtained when conc. HNO_3 oxidises P_4.

(e) Why does PCl_3 fume in moisture ?

Solution:

(a)

$H_2Te > H_2Se > H_2S > H_2O$

(b)

$[PCl_4]^+$ is more likely to exist as P is in +5 oxidation state whereas in $[PCl_4]^-$, P is in +3 oxidation state and the group stability of +5 is more than +3 in upper elements.

(c) Rhombic sulphur is stable at room temperature.

(d)

H_3PO_4 is formed when conc. HNO_3 oxidises P_4.

(e)

PCl_3 fume in moisture due to liberation of HCl.

$PCl_3 + 3H_2O \rightarrow H_3PO_3 + 3HCL$

Q. 637 (a) An organic compound with the molecular formula C_7H_6O forms 2,4-DNP derivative, reduces Tollen's reagent and undergoes Cannizzaro reaction. On oxidation, it gives benzoic acid. Identify the compound and state the reactions involved.

(b) Give chemical tests to distinguish between the following pair of compounds :

(i) Phenol and propanol

(ii) Benzoic acid and benzene

Solution:

(a)

$C_7H_6O \rightarrow$ 2,4 DNP derivative (I)

$\rightarrow$ Tollen's reagent (II)

$\rightarrow$ Cannizzaro reaction (III)

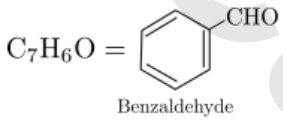
$\rightarrow$ On exidation gives benzoic acid (IV)

I shows presence of carbonyl group -CO-

II shows aldehyde group -CHO

III means no $\alpha - H$ atom

on oxidation gives benzoic acid.

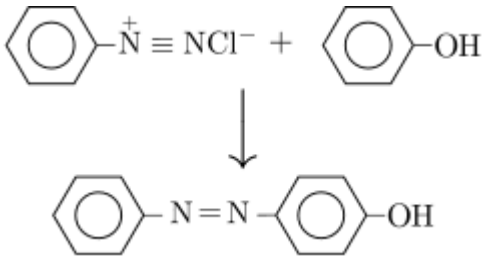


Benzaldehyde

(b)

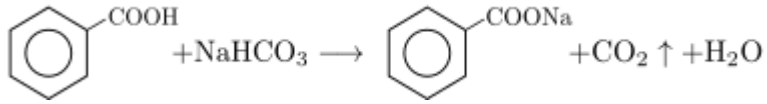
(i) Phenol and propanol

Phenol on reaction with Benzene diazonium chloride gives azo dye which is orange coloured but propanol does not give this test.

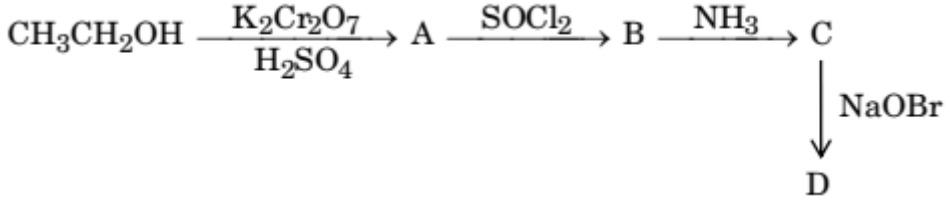


(ii) Benzoic acid and Benzene

Benzoic acid on reaction with $NaHCO_3$ fives effervesence of CO_2 but benzene does not gives this test.



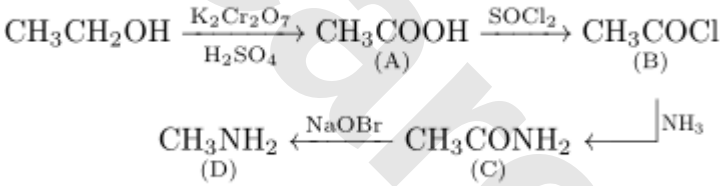
Q. 638 (a) Predict the products of the following:



(b) Arrange the following in increasing order of acidic character :

$HCOOH, CF_3COOH, ClCH_2COOH, CCl_3COOH$

Solution:
(a)



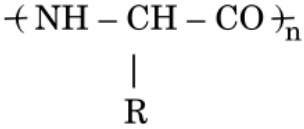
(b) Increasing order of acidic strength :

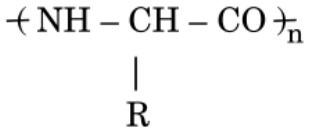
$HCOOH < ClCH_2COOH < CCl_3COOH < CF_3COOH$

Q. 639 What are food preservatives ? Give an example.

Solution:
Food Preservatives are substances which are used to protect food against harmful substances like bacteria, yeast etc.

Example - Sodium Benzoate

Q. 640 Is  a homopolymer or copolymer?

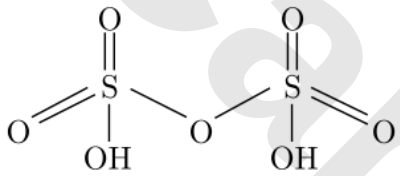
Solution:
 is a homopolymer as it is derived from a single type of monomer.

Q. 641 What are the hydrolysis products of sucrose?

Solution:
Hydrolysis product of sucrose is glucose and fructose.

Q. 642 (a) Draw the structure of H_2SO_7.
(b) What happens when carbon reacts with conc. H_2SO_4? Write a balanced chemical equation.

Solution:
a) H_2SO_7



b) $C + (conc.)2H_2SO_4 \longrightarrow CO_2 + 2SO_2 + 2H_2O$

H_2SO_4 oxidizes Carbon.

Q. 643 Give reasons:

(a) Of the d^4 species, Cr^{2+} is strongly reducing while Mn^{3+} is strongly oxidizing.

(b) The d^1configuration is very unstable in ions.

Solution:
(a) Of the d^4 species, Cr^{2+} is strongly reducing while Mn^{3+} is strongly oxidizing. For Manganese Mn^{2+} is more stable than Mn^{3+} due to extra stable half-filled configuration in Mn^{2+}. $\therefore Mn^{3+}$ gets reduced easily to Mn^{2+} and hence is strongly oxidizing.

For Chromium, Cr^{3+} is more stable than Cr^{2+} due to extra stable half-filled t_2g level $(t_2g^3eg^0)$ in Cr^{3+} $\therefore Cr^{2+}$ gets oxidized easily to Cr^{3+} and hence strongly reducing.

(b) d^1 is very unstable in ions. since these have a strong tendecy to lose the remaining d electron and acquire noble gas configuration.

Q. 644 (a) Atoms of element B form hcp lattice and those of the element A occupy $\frac{2}{3}^{rd}$ of octahedral voids. What is the formula of the compound formed by the elements A and B?

(b) What type of stoichiometric defect is shown by ZnS and why?

Solution:

(a) Total atoms in hcp = 6

octahedral voids = no. of atoms

= 6

$$B = 6$$

$$A = \frac{2}{3} \times 6$$

$$= 4$$

$$\underset{4}{A}\underset{6}{B} \Rightarrow A_4B_6$$

formula of compound A_2B_3

(b) ZnS shows Frenkel defect because Zn and S have large difference in the size of ions.

Q. 645

(a) Complete the following chemical reactions:

(i) $2MnO_4^- + 5NO_2^- + 6H^+ \rightarrow$

(ii) $3MnO_4^{2-} + 4H^+ \rightarrow$

(b) Name a member of the lanthanoid series which shows +4 oxidation state.

Solution:

(a) (i) $2MnO_4^- + 5NO_2^- + 6H^+ \rightarrow 2Mn^{2+} + 5NO_3^- + 3H_2O$

(ii) $3MnO_4^{2-} + 4H^+ \rightarrow 2MnO_4^- + MnO_2 + 2H_2O$

(b) Cerium (Ce) shows +4 oxidation state.

Q. 646

(a) How will you convert the following :

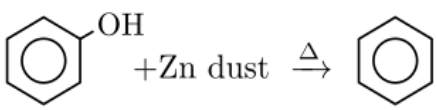
(i) Phenol to benzene

(ii) Propene to propanol

(b) Why is ortho-nitrophenol more acidic than ortho-methoxyphenol?

Solution:

(a) (i) Phenol to Benzene

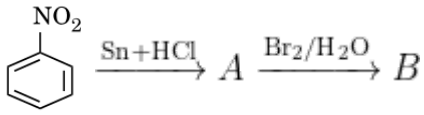


(ii) Propene to Propanol

$$CH_3 = CH_2 + HCl \xrightarrow{\text{peroxide}} CH_3CH_2Cl \xrightarrow{aq.\ KOH} CH_3CH_2CH_2OH$$

(b) O-nitrophenol is more acidic than o-methoxyphenol since $-NO_2$ is an electron withdrawing group, it increases acidic strenth by stablising the phenoxide ion due to dispersal of negative charge whereas $-OCH_3$ being an electron releasing group decreases the acidic strength of phenol by destabilizing the phenoxide ion due to increase of negative charge.

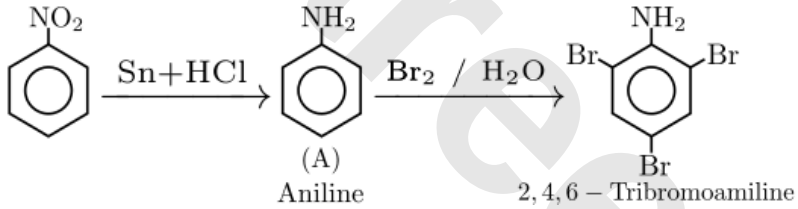
Q. 647 (a) Identify 'A' and 'B' in the following reaction:



(b) Why is ethylamine soluble in water whereas aniline is not?

Solution:

(a)



Aniline 2,4,6-tribromoaniline

(b) Ethylamine is soluble in water due to the formation of hydrogen bonds with water but aniline is insoluble since the large hydrophobic phenyl group does not allow the formation of Hydrogen-bonds.

Q. 648 Write the names and structures of the monomers of the following polymers :

(a) Neoprene

(b) Bakelite

(c) PVC

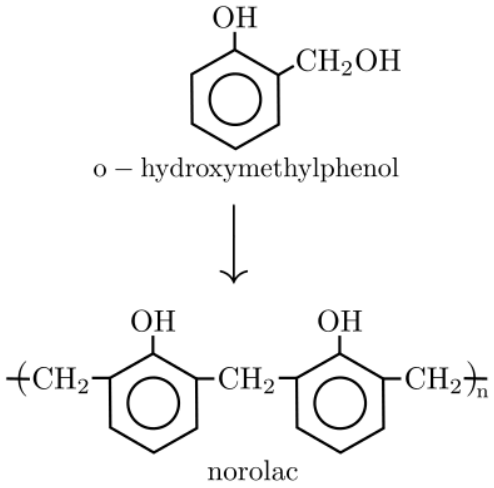
Solution:

(a) Neoprene

$$CH_2 = \underset{\displaystyle Cl}{\overset{|}{C}} - CH = CH_2$$

2-chlorobuta-1,3-diene

(b) Beklite



(c) PVC

$$CH_2 = CH - Cl$$

Vinylchloride

Q. 649 Identify the monomers of the following polymer :

Solution:
Monomers are

$$\underset{\text{Buta-1,3-diene}}{CH_2 = CH - CH = CH_2} + \underset{\text{Styrene}}{C_6H_5CH = CH}$$

Q. 650 What are the hydrolysis products of lactose ?

Solution:
Hydrolysis products of lactose are $\beta - D - \text{glucose}$ and $\beta - D - \text{galactose}$

Q. 651 Name a substance which can be used as an antiseptic as well as a disinfectant.

Solution:
Phenol is the substance that can be used as an antiseptic as well as a disinfectant.

Q. 652 (a) Atoms of element Q form ccp lattice and those of the element P $\frac{2}{3}\text{rd}$ of tetrahedral voids. What is the formula of the compound formed by the elements P and Q?

(b) What type of stoichiometric defect is shown by KCl and why?

Solution:

(a) No. of Q atoms per unit in ccp lettice (N) = 4

No. of tetrahedral voids = 2N

$$= 2 \times 4 = 8$$

Voids occupied by P $= \frac{2}{3} \times 8 = \frac{16}{3}$

formula

$$= P_{\frac{16}{3}}Q_4$$
$$= P_{16}O_{12}$$
$$= P_4Q_3$$

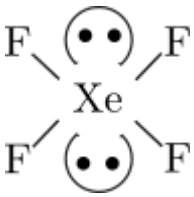
(b) KCl will show Schottky deflect because the size of the cation (K^+) and anion (Cl^-) is almost similar.

Q. 653 (a) Draw the structure of XeF_4.

(b) What happens when CaF_2 reacts with conc. H_2SO_4? Write balanced chemical equation.

Solution:

(a) XeF_4



Square Planar

(b)

$$\text{CaF}_2 + \text{H}_2\text{SO}_4(\text{conc}) \rightarrow 2\text{HF} + \text{CaSO}_4$$

CaSO_4 and HF is formed.

Q. 654 (a) Write chemical equations involved in the preparation of $\mathrm{KMnO_4}$ from $\mathrm{MnO_2}$.
(b) Actinoids show a wide range of oxidation states. Why?

Solution:
(a) Preparation of $\mathrm{KMnO_4}$ from $\mathrm{MnO_2}$.

$$2\mathrm{MnO_2} + 4\mathrm{KoH} + \mathrm{O_2} \rightarrow 2\mathrm{K_2MnO_4} + 2\mathrm{H_2O}$$
$$3\mathrm{MnO_4^2} + 4\mathrm{H^+} \rightarrow 2\mathrm{MnO_4^-} + \mathrm{MnO_2} + 2\mathrm{H_2O}$$

(b) Actinoids show wide range of oxidation states due to small energy difference between $5f, 6d$ and $7s$ subshells. They can show oxidation states of +3 and higher as well like +4, +5, +6 +7.

Q. 655 Write the names and structures of the monomers of the following polymers:
(a) Teflon
(b) Terylene
(c) Buna-N

Solution:
(a) Teflon

$$\underset{\text{tetrafluoroethylene}}{CF_2 = CF_2}$$

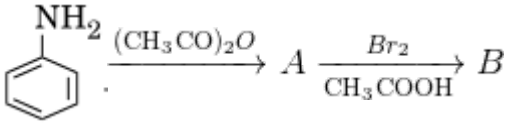
(b) Terylene

$$\underset{\text{Ethyleneglycol}}{OH - CH_2 - CH_2 - OH} \text{ and } \underset{\text{Terephthalic Acid}}{\mathrm{HOOC}\text{–}C_6H_4\text{–}\mathrm{COOH}}$$

(c) Buna-N

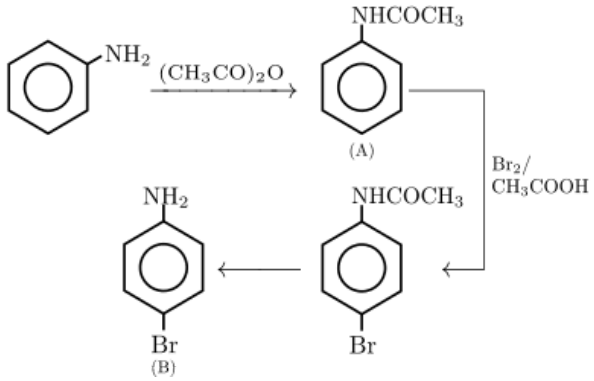
$$\underset{\text{Buta-1,3-diene}}{CH_2 = CH - CH = CH_2} \text{ and } \underset{\text{Aerylnitrile}}{CH_2 = CH - CN}$$

Q. 656 (a) Identify 'A' and 'B' in the following reaction:



(b) Why does aniline not undergo Friedel-Crafts reaction?

Solution:
(a)



(b) Aniline does not undergo Friedel Crafts reactions due to salt formation between aniline and the catalyst anhydrous $AlCl_3$ (Lewis Acid) as a result nitrogen acquired positive charge group for further reaction.

Q. 657 (a) How will you convert the following:

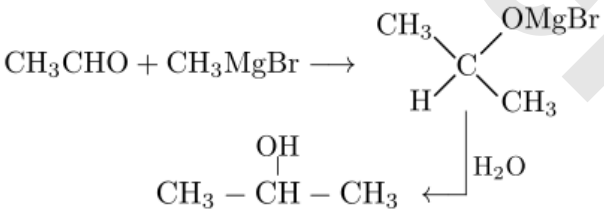
(i) Ethanal to propan-2-ol

(ii) Phenol to 2-hydroxyacetophenone

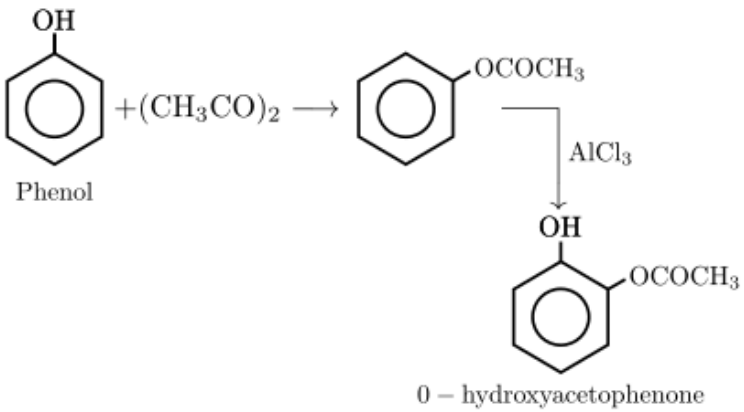
(b) Why is phenol more acidic than ethanol?Why is phenol more acidic than ethanol?

Solution:

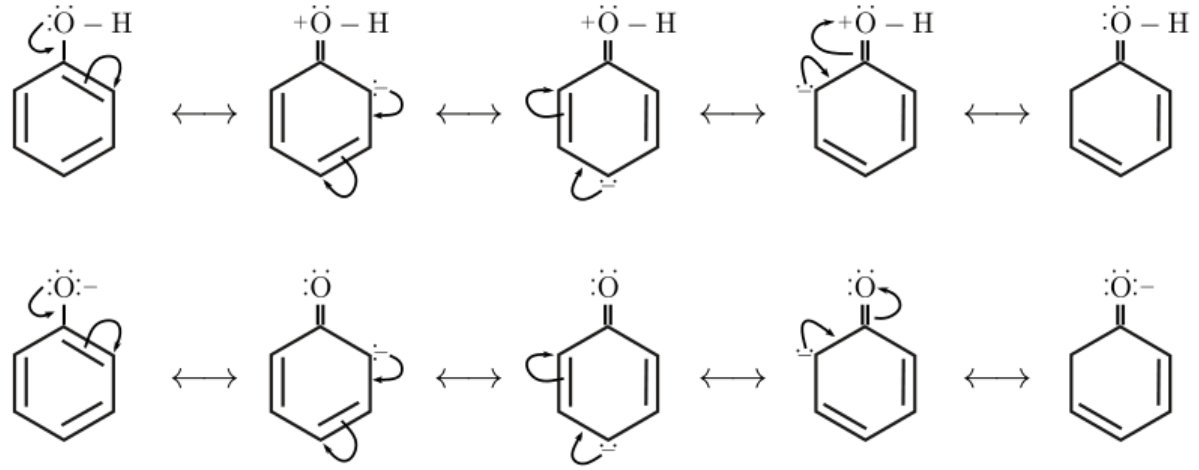
(a) (i) Ethanal to Propan-2-ol



(ii) Phenol to 2-hydroxyacetophenone



(b) Phenol is more acidic than ethanol due to resonance in phenol, o atom of OH bond becomes electron deficient which makes the release of H^+easier. And stronger acid has a more stable conjugate base. Phenoxide ion is resonance stabilized but alkoxide ion is not



Q. 658

Read the given passage and answer the questions number that follow :

The substitution reaction of alkyl halide mainly occurs by S_N1 or S_N2 mechanism. Whatever mechanism alkyl halides follow for the substitution reaction to occur, the polarity of the carbon halogen bond is responsible for these substitution reactions. The rate of SN1 reactions are governed by the stability of carbocation whereas for SN2 reactions steric factor is the deciding factor. If the starting material is a chiral compound, we may end up with an inverted product or racemic mixture depending upon the type of mechanism followed by alkyl halide. Cleavage of ethers with HI is also governed by steric factor and stability of carbocation, which indicates that in organic chemistry, these two major factors help us in deciding the kind of product formed.

Predict the stereochemistry of the product formed if an optically active alkyl halide undergoes substitution reaction by $S_N1$mechanism.

Solution:
Racemic mixture will be obtained as in SN1 mechanism, carbocation is formed.

Q. 659

The substitution reaction of alkyl halide mainly occurs by S_N1 or $S_N2$mechanism. Whatever mechanism alkyl halides follow for the substitution reaction to occur, the polarity of the carbon halogen bond is responsible for these substitution reactions. The rate of S_N1 reactions are governed by the stability of carbocation whereas for SN2 reactions steric factor is the deciding factor. If the starting material is a chiral compound, we may end up with an inverted product or racemic mixture depending upon the type of mechanism followed by alkyl halide. Cleavage of ethers with HI is also governed by steric factor and stability of carbocation, which indicates that in organic chemistry, these two major factors help us in deciding the kind of product formed.

Name the instrument used for measuring the angle by which the plane polarised light is rotated

Solution:
Polarimeter is the instrument used for measuring the angle by which the plane polarised light is rotated

---

Q. 660

The substitution reaction of alkyl halide mainly occurs by S_N1 or $S_N2$mechanism. Whatever mechanism alkyl halides follow for the substitution reaction to occur, the polarity of the carbon halogen bond is responsible for these substitution reactions. The rate of S_N1 reactions are governed by the stability of carbocation whereas for SN2 reactions steric factor is the deciding factor. If the starting material is a chiral compound, we may end up with an inverted product or racemic mixture depending upon the type of mechanism followed by alkyl halide. Cleavage of ethers with HI is also governed by steric factor and stability of carbocation, which indicates that in organic chemistry, these two major factors help us in deciding the kind of product formed.

Predict the major product formed when 2-Bromopentane reacts with alcoholic KOH.

Solution:
Pent-2-ene will be the major product formed when 2-Bromopentane reacts with alcoholic KOH.

Q. 661

The substitution reaction of alkyl halide mainly occurs by S_N1 or $S_N2$mechanism. Whatever mechanism alkyl halides follow for the substitution reaction to occur, the polarity of the carbon halogen bond is responsible for these substitution reactions. The rate of S_N1 reactions are governed by the stability of carbocation whereas for S_N2 reactions steric factor is the deciding factor. If the starting material is a chiral compound, we may end up with an inverted product or racemic mixture depending upon the type of mechanism followed by alkyl halide. Cleavage of ethers with HI is also governed by steric factor and stability of carbocation, which indicates that in organic chemistry, these two major factors help us in deciding the kind of product formed.

Give one use of CHI_3 .

Solution:
It can be used as Antiseptic

Q. 662

The substitution reaction of alkyl halide mainly occurs by S_N1 or $S_N2$mechanism. Whatever mechanism alkyl halides follow for the substitution reaction to occur, the polarity of the carbon halogen bond is responsible for these substitution reactions. The rate of S_N1 reactions are governed by the stability of carbocation whereas for S_N2 reactions steric factor is the deciding factor. If the starting material is a chiral compound, we may end up with an inverted product or racemic mixture depending upon the type of mechanism followed by alkyl halide. Cleavage of ethers with HI is also governed by steric factor and stability of carbocation, which indicates that in organic chemistry, these two major factors help us in deciding the kind of product formed.

Write the structures of the products formed when anisole is treated with HI.

Solution:
CH_3I + C_6H_5OH are the products formed when anisole is treated with HI.

Q. 663 Identify which liquid will have a higher vapour pressure at $90^{\circ}C$ if the boiling points of two liquids A and B are $140^{\circ}C$ and $180^{\circ}C$, respectively.

Solution:
Liquid A will be having higher vapour pressure as it has low boiling point

Q. 664 Out of zinc and tin, whose coating is better to protect iron objects ?

Solution:
Zinc coating is better for protecting iron as its reduction potential is very low

Q. 665 Will the rate constant of the reaction depend upon T if the E_{act} (activation energy) of the reaction is zero ?

Solution:
No, it will not depend upon T

Q. 666 Give the structure of the monomer of PVC

Solution:
CH_2=CH-Cl is monomer of PVC

Q. 667 Which structural unit present in a detergent makes it non-biodegradable ?

Solution:
Branched hydrocarbon part present in a detergent makes it non-biodegradable

Q. 668 Out of the following, the strongest base in aqueous solution is

Option 1:
Methylamine

Option 2:
Dimethylamine

Option 3:
Trimethylamine

Option 4:
Aniline

Correct Answer:
Dimethylamine

Solution:
The strongest base in aqueous solution is Dimethylamine, hence option B is correct

---

Q. 669 Iodoform test is not given by

Option 1:
Ethanol

Option 2:
Ethanal

Option 3:
Pentan-2-one

Option 4:
Pentan-3-one

Correct Answer:
Pentan-3-one

Solution:
Iodoform test is not given by Pentan-3-one

Q. 670 Out of the following transition elements, the maximum number of oxidation states are shown by

Option 1:
Sc (Z = 21)

Option 2:
Cr (Z = 24)

Option 3:
Mn (Z = 25)

Option 4:
Fe (Z = 26)

Correct Answer:
Mn (Z = 25)

Solution:
The maximum number of oxidation states are shown by Mn.

Hence option C is correct

Q. 671 Hardening of leather in tanning industry is based on

Option 1:
Electrophoresis

Option 2:
Electro-osmosis

Option 3:
Mutual coagulation

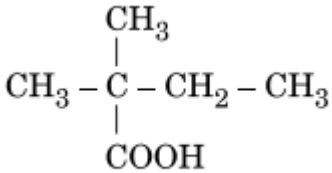
Option 4:
Tyndall effect

Correct Answer:
Mutual coagulation

Solution:
Hardening of leather in tanning industry is based on Mutual coagulation.

Hence option C is correct

Q. 672 What is the correct IUPAC name of the given compound ?



Option 1:
2,2-Dimethylbutanoic acid

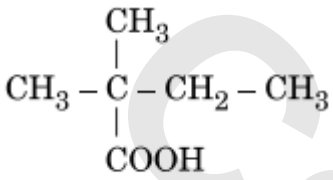
Option 2:
2-Carboxyl-2-methylbutane

Option 3:
2-Ethyl-2-methylpropanoic acid

Option 4:
3-Methylbutane carboxylic acid

Correct Answer:
2,2-Dimethylbutanoic acid

Solution:
IUPAC name of the compound:



2,2-Dimethylbutanoic acid

Q. 673 Assertaion and Reasoning question:

(i) Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is the correct explanation of the Assertion (A).

(ii) Both Assertion (A) and Reason (R) are correct statements, but Reason (R) is not the correct explanation of the Assertion (A).

(iii) Assertion (A) is correct, but Reason (R) is incorrect statement.

(iv) Assertion (A) is incorrect, but Reason (R) is correct statement.

Assertion (A) : Au and Ag are extracted by leaching their ores with a dil. solution of NaCN.

Reason (R) : Impurities associated with these ores dissolve in NaCN.

Correct Answer:

Solution:
(iii) Assertion (A) is correct, but Reason (R) is incorrect statement.

Q. 674 Assertaion and Reasoning question:

(i) Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is the correct explanation of the Assertion (A).

(ii) Both Assertion (A) and Reason (R) are correct statements, but Reason (R) is not the correct explanation of the Assertion (A).

(iii) Assertion (A) is correct, but Reason (R) is incorrect statement.

(iv) Assertion (A) is incorrect, but Reason (R) is correct statement.

Assertion (A) : F – F bond in F_2 molecule is weak.

Reason (R) : F atom is small in size

Solution:
(ii) Both Assertion (A) and Reason (R) are correct statements, but Reason (R) is not the correct explanation of the Assertion (A).

Q. 675 Asseration and Reasoning qustion:

(i) Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is the correct explanation of the Assertion (A).

(ii) Both Assertion (A) and Reason (R) are correct statements, but Reason (R) is not the correct explanation of the Assertion (A).

(iii) Assertion (A) is correct, but Reason (R) is incorrect statement.

(iv) Assertion (A) is incorrect, but Reason (R) is correct statement.

Assertion (A) : Linkage isomerism arises in coordination compounds because of ambidentate ligand.

Reason (R) : Ambidentate ligand like NO_2 has two different donor atoms i.e., N and O.

Solution:
(i) Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is the correct explanation of the Assertion (A).

Q. 676 Asseration and Reasoning qustion:

(i) Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is the correct explanation of the Assertion (A).

(ii) Both Assertion (A) and Reason (R) are correct statements, but Reason (R) is not the correct explanation of the Assertion (A).

(iii) Assertion (A) is correct, but Reason (R) is incorrect statement.

(iv) Assertion (A) is incorrect, but Reason (R) is correct statement.

Assertion (A) : Sucrose is a non-reducing sugar.

Reason (R) : Sucrose has glycosidic linkage.

Solution:
(ii) Both Assertion (A) and Reason (R) are correct statements, but Reason (R) is not the correct explanation of the Assertion (A).

Q. 677 Asseration and Reasoning question:

(i) Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is the correct explanation of the Assertion (A).

(ii) Both Assertion (A) and Reason (R) are correct statements, but Reason (R) is not the correct explanation of the Assertion (A).

(iii) Assertion (A) is correct, but Reason (R) is incorrect statement.

(iv) Assertion (A) is incorrect, but Reason (R) is correct statement.

Assertion (A) : The molecularity of the reaction $H_2 + Br_2 \rightarrow 2HBr$ appears to be 2.

Reason (R) : Two molecules of the reactants are involved in the given elementary reaction.

Solution:
Both Assertion (A) and Reason (R) are correct statements, but Reason (R) is not the correct explanation of the Assertion (A).

Q. 678 Define the following terms :
(a) Tranquilizers
(b) Antiseptic

Solution:
(a) The drugs which are used to control stress, tension are known as tranquilizers

(b) Antiseptics are the drugs which are used to kill or to prevent the growth of micro-organism, applied externally on living tissues.

Q. 679 Explain the cleansing action of soaps.

Solution:
Soap molecules clean by the formation of micelle around the dirt in a way that hydrophobic part interacts with the oil droplet and hydrophilic part projects out.

Micelles are washed away on rinsing with water.

Hence, this way, soap helps in emulsification and washing away of oil and fats.

Q. 680 For a 5% solution of urea (Molar mass = 60 g/mol), calculate the osmotic pressure at 300 K. [R = 0·0821 L atm K^{-1} mol^{-1}]

Solution:
Given,

5% urea solution means 5g urea is present in 100ml of solution.

moles of urea present =weight given/Molecular weight of urea

$=5g / 60gmol^{-1}=112$

Hence Concentration of urea = (moles of urea(n) /volume of solution) ×1000

$=\{(112)/100\}*1000$

=1012

Hence Osmotic pressure =1×(10/20)×0.082×300 atm

=20.52atm

Q. 681 Visha took two aqueous solutions — one containing 7·5 g of urea (Molar mass = 60 g/mol) and the other containing 42·75 g of substance Z in 100 g of water, respectively. It was observed that both the solutions froze at the same temperature. Calculate the molar mass of Z.

Solution:
Given,

The mass of water (w2) = 100 g

The mass of urea (w1) = 7.5 g

The mass of Z (w2) = 42.75 g

The molar mass of urea (Mm1) = 60 g/mol

Both the solutions have same freezing point

Since both the solutions have the same freezing point the change in freezing points (ΔTf) for both the solutions is same.

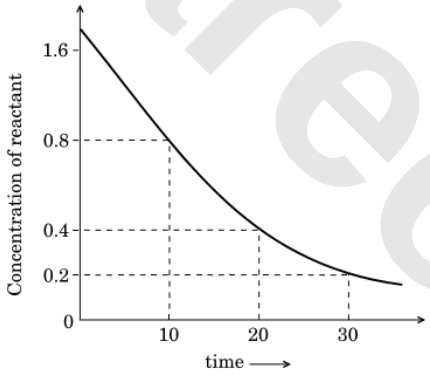
ΔTf = Kf*m, hence both the solutions should have the same molality.

molality = moles of solute/ weight of solvent(in Kg)

Therefore, (w1*1000)/(Mm1*w2) = (w3*1000)/(Mm*w2) ⇒ Mm = w3*Mm1/w1 = 42.75*60/7.5 = 342 g/mol

Hence, The molar mass (Mm) of Z = 342 g/mol

Q. 682 Analyse the given graph, drawn between concentration of reactant vs. time.



(a) Predict the order of reaction.

(b) Theoretically, can the concentration of the reactant reduce to zero after infinite time ? Explain.

Solution:
(a) Given graph is of 1st order reaction

(b) No, due to exponential relation, the curve never touches the x-axis. hence it doesnot become zero

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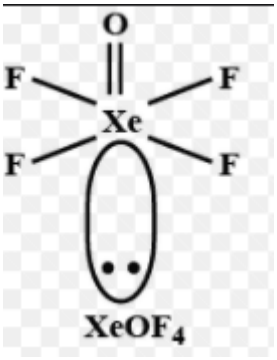
Q. 683 Draw the shape of the following molecules :

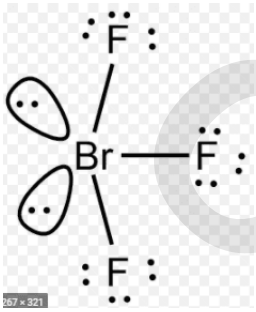
(a) $XeOF_4$

(b) BrF_3

Solution:
(a) $XeOF_4$



(b) BrF_3



Q. 684 Give the formulae of the following compounds :

(a) Potassium tetrahydroxidozincate (II)

(b) Hexaammineplatinum (IV) chloride

Solution:
(a) Potassium tetrahydroxidozincate (II) is $K_2[Zn(OH)_4]$

(b) Hexaammineplatinum (IV) chloride is $[Pt(NH_3)_6]Cl_4$

Q. 685 What happens when

(a) Propanone is treated with methylmagnesium iodide and then hydrolysed, and

(b) Benzene is treated with CH_3COCl in presence of anhydrous $AlCl_3$?

Solution:

(a) When Propanone is treated with methylmagnesium iodide and then hydrolysed, tertiary butyl alcohol is formed

(b) When Benzene is treated with CH_3COCl in presence of anhydrous $AlCl_3$, acetophenone is formed

Q. 686 Write the names and structures of monomers in the following polymers :

(a) Bakelite

(b) Neoprene

Solution:
(a) Bakelite- C_6H_5OH + HCHO , Phenol + formaldehyde

(b) Neoprene - CH_2= C(Cl) – CH=CH_2, Chloroprene

Q. 687 Give the structures of A and B in the following sequence of reactions :

(a) $CH_3COOH \xrightarrow[\Delta]{NH_3} A \overset{NaoBr}{\rightarrow} B$

(b) $C_6H_5NO_2 \overset{Fe/HCl}{\rightarrow} A \xrightarrow[0^o-5^oC]{NaNO_2+HCl} B$

(c) $C_6H_5N_2^+Cl^- \xrightarrow[\Delta]{CuCN} A \overset{H_2O/H^+}{\rightarrow} B$

Solution:
(a)

(A) CH_3CONH_2 (B) CH_3NH_2

(b)

(A) $C_6H_5NH_2$ (B) $C_6H_5N_2Cl$

(c)

(A) C_6H_5CN (B) C_6H_5COOH

Q. 688 (a) How will you distinguish between the following pairs of compounds :

(i) Aniline and Ethanamine

(ii) Aniline and N-methylaniline

(b) Arrange the following compounds in decreasing order of their boiling points :

Butanol, Butanamine, Butane

Solution:
a) (i) Aniline and Ethanamine can be distinguished by Adding Ice cold (NaNO2 + HCl) followed by phenol or β-Naphthol to both the compounds. Aniline forms orange red dye while ethylamine doesn't.

ii) Aniline and N-methylaniline can be distinguished by Adding $CHCl_3$ and KOH (alc.) to both the compounds. Aniline gives foul smelling isocyanide while N-Methylaniline doesn't.

b) Butanol > Butanmine > Butane

Q. 689 Give the plausible explanation for the following :

(a) Glucose doesn't give 2,4-DNP test.

(b) The two strands in DNA are not identical but are complementary.

(c) Starch and cellulose both contain glucose unit as monomer, yet they are structurally different.

Solution:
(a) Glucose doesn't give 2,4-DNP test because the – CHO group in glucose is involved in hemiacetal formation and thus it is not free.

(b) The two strands in DNA are not identical but are complementary because the hydrogen bonds are formed between specific pairs of bases.

(c) Starch and cellulose both contain glucose unit as monomer, yet they are structurally different because Starch is a polymer of α- glucose while cellulose is a polymer of β - glucose.

Q. 690 Account for the following :

(a) Sulphurous acid is a reducing agent.

(b) Fluorine forms only one oxoacid.

(c) Boiling point of noble gases increases from He to Rn.

Solution:
(a) Sulphurous acid is a reducing agent because sulphur readily gets oxidized itself to more stable +6 state.

(b) Fluorine forms only one oxoacid Because of absence of d-orbital in Fluorine.

(c) Boiling point of noble gases increases from He to Rn because size increases from Helium to Radon and hence, dispersion or van der Waal forces increase from Helium to Radon.

Q. 691 Complete the following chemical reactions :

(a) $MnO_2 + 4HCl \rightarrow$

(b) $XeF_6 + KF \rightarrow$

(c) $I^-(aq) + H^+(aq) + O_2(g) \rightarrow$

Solution:
(a) $MnO_2 + 4HCl \rightarrow MnCl_2 + Cl_2 + 2H_2O$

(b) $XeF_6 + KF \rightarrow K^+[XeF7]^-$

(c) $4I^-(aq.) + 4H^+(aq.) + O_2(g) \rightarrow 2I_2(s) + 2H_2O_{(l)}$

Q. 692 Explain the role of the following :

(a) NaCN in the separation of ZnS and PbS.

(b) SiO_2 in the metallurgy of Cu containing Fe as impurity.

(c) Iodine in the refining of Ti.

Solution:
(a) NaCN act as a depressant the separation of ZnS and PbS

(b) SiO2 act as a flux in the metallurgy of Cu containing Fe as impurity.

(c) Iodine is used to convert Ti into volatile compound (TiI4) in the refining of Ti

Q. 693 Give three points of difference between physisorption and chemisorption

Solution:
Physisorption

- It is reversible in nature
- Physisorption decreases with increase in temperature
- It is not specific in nature

Chemisorption

- It is irreversible in nature
- Chemisorption increases with increase in temperature
- It is highly specific

Q. 694 How will the rate of the reaction be affected when

(a) Surface area of the reactant is reduced,

(b) Catalyst is added in a reversible reaction, and

(c) Temperature of the reaction is increased ?

Solution:
Rate of the reaction-

(a) Decreases when surface area of the reactant is reduced.

(b) Increases when catalyst is added in a reversible reaction

(c) Increases when temperature of the reaction is increased

Q. 695 Calculate the mass of ascorbic acid (Molar mass = 176 g mol^{-1}) to be dissolved in 75 g of acetic acid, to lower its freezing point by x$1.5^{\circ}C.(Kf = 3.9Kkgmol^{-1})$

Solution:
Mass of acetic acid, w_1= 75 g Molar mass of ascorbic acid ($C_6H_8O_6$),

M_2=6×12+8×1+6×16 = 176$gmol^{-1}$

Lowering of melting point, $\Delta T_b = 1.5K$

We know that:

$$\Delta T_b = \frac{K_b \times 1000 \times w_2}{M_2 \times w_1}$$

$$w_2 = \frac{M_2 \times w_1 \times \Delta T_b}{K_b \times 1000}$$

$$w_2 = \frac{1.5 \times 176 \times 75}{3.9 \times 1000}$$

$$w_2 = 5.08g$$

Hence, 5.08 g of ascorbic acid is needed to be dissolved.

Q. 696 (a) Calculate ΔG° for the reaction $Zn(s) + Cu_2 + (aq) \rightarrow Zn^{2+}(aq) + Cu(s).$

Given : E° for $Zn^{2+}/Zn = -076V$ and

E° for $Cu^{2+}/Cu = +0.34V$

$R = 8314JK^{-1}mol^{-1}$

$F = 96500Cmol^{-1}.$

(b) Give two advantages of fuel cells.

Solution:
(a) E^{o} cell = $E^{o}_{C} - E^{o}_{A}$ = 0.34 – (- 0.76) = 1.10V

Hence, ΔG° = -nFE° = -2 * 1.10 * 96500 = -212300 J/mol or -212.3 kJ/mol

(b) Two advantages of fuel cells are-

(i) Pollution free (ii) High efficiency

Q. 697 (a) Out of the following pairs, predict with reason which pair will allow greater conduction of electricity :

(i) Silver wire at $30^{\circ}C$ or silver wire at $60^{\circ}C$.

(ii) 0·1 M CH_3COOH solution or 1 M CH_3COOH solution.

(iii) KCl solution at $20^{\circ}C$ or KCl solution at $50^{\circ}C$.

(b) Give two points of differences between electrochemical and electrolytic cells

Solution:
(a) (i) Silver wire at $30^{\circ}C$ will allow greater conduction of electricity because as temperature decreases, resistance decreases Hence, conduction increases.

(ii) 0.1 M CH3COOH will allow greater conduction of electricity, because on dilution degree of ionization increases hence conduction increases

(iii) KCl solution at $50^{\circ}C$ will allow greater conduction of electricity, because at high temperature mobility of ions increases and hence conductance increases

(b)

Electrochemical Cell

(1) Anode -ve Cathode +ve (2) Convert chemical Energy to electrical energy

Electrolytic Cell

(1) Anode +ve Cathode -ve

(2) Convert electrical Energy to chemical energy

Q. 698

(a) Account for the following :

(i) Copper (I) compounds are white whereas Copper (II) compounds are coloured.

(ii) Chromates change their colour when kept in an acidic solution.

(iii) Zn, Cd, Hg are considered as d-block elements but not as transition elements.

(b) Calculate the spin-only moment of Co^{2+} (Z = 27) by writing the electronic configuration of Co and Co^{2+}.

Solution:

(a)

(i) Copper (I) compounds are white whereas Copper (II) compounds are coloured because, in Cu^{+1}(3d10) there is absence of unpaired electrons while in Cu+2 ($3d^9$) compounds are coloured due to unpaired e^- shows d-d transition.

(ii) chromate (CrO_4^{2-}) changes to dichromate ($Cr_2O_7^{2-}$) ion in acidic medium, hence color is changed.

(iii) Due to completely filled d-orbitals in their ground state as well as in oxidized state, Zn, Cd, Hg are considered as d-block elements but not as transition elements.

(b) Co = [Ar]4s2 3d7 , Co^{2+} =[Ar] 3d7

$$\mu = \sqrt{n(n+2)} = \sqrt{3(3+2)} = \sqrt{15}$$

= 3.2 BM

Q. 699 (a) Give three points of difference between lanthanoids and actinoids.

(b) Give reason and select one atom/ion which will exhibit asked property :

(i) Sc^{3+} or Cr^{3+} (Exhibit diamagnetic behaviour)

(ii) Cr or Cu (High melting and boiling point)

Solution:

(a) **Lanthanoids**

- Most of them are not radioactive
- Don't show a wide range of oxidation state
- Most of their ions are colourless

Actinoids

- All are radioactive
- Show a wide range of oxidation states
- Most of their ions are coloured

(b)

(i) Sc^{3+} Exhibit diamagnetic behaviour, because of absence of unpaired electron.

(ii) Cr has High melting and boiling point, because of presence of strong intermetallic bonding than Cu.

Q. 700 (a) Out of t-butyl alcohol and n-butanol, which one will undergo acid catalyzed dehydration faster and why ?

(b) Carry out the following conversions :

(i) Phenol to Salicylaldehyde

(ii) t-butylchloride to t-butyl ethyl ether

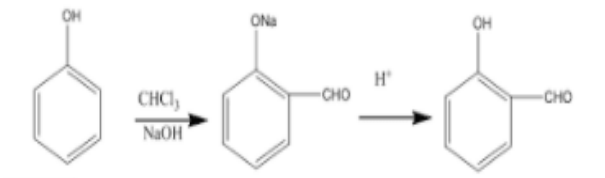
(iii) Propene to Propanol

Solution:

(a) Tert-butyl alcohol will undergo acid catalyzed dehydration faster, because it forms more stable 3^o carbocation than 1^o carbocation.

(b)

(i) Phenol to Salicylaldehyde



(ii) t-butylchloride to t-butyl ethyl ether

$$(CH_3)_3CCl + NaOH(aq.) \rightarrow (CH_3)_3COH \overset{Na}{\rightarrow} (CH_3)_3CONa \overset{C_2H_5Cl}{\rightarrow} (CH_3)_3COC_2H_5$$

(iii) Propene to Propanol

$$CH_3CH = CH_2 \xrightarrow[B_2H_6]{H_2O_2/OH^-} CH_3CH_2CH_2OH$$

Q. 701 (a) Give the mechanism for the formation of ethanol from ethene.

(b) Predict the reagent for carrying out the following conversions :

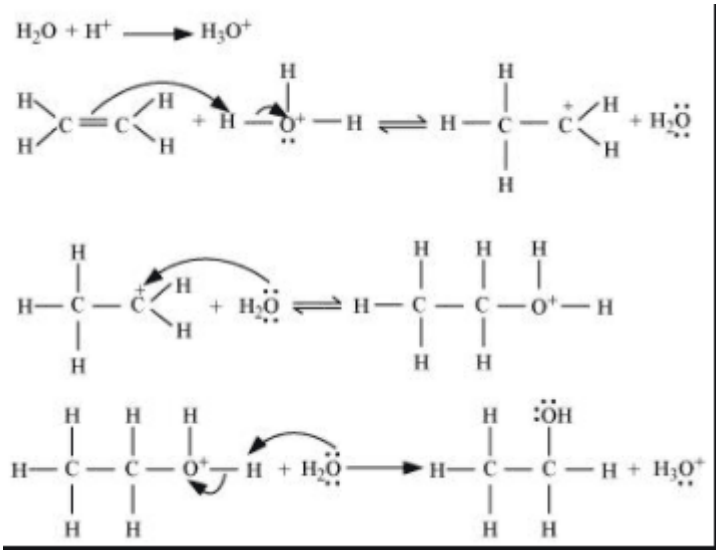
(i) Phenol to benzoquinone

(ii) Anisole to p-bromoanisole

(iii) Phenol to 2,4,6-tribromophenol

Solution:

(a) Mechanism for the formation of ethanol from ethene-



(b) Reagent for carrying out the following conversions :

(i) Phenol to benzoquinone

- K2Cr2O7 + H2SO4

(ii) Anisole to p-bromoanisole

- Br2 in CH3COOH

(iii) Phenol to 2,4,6-tribromophenol

- Br2 aq. / Bromine water

Q. 702 Iodoform test is **not** given by

Option 1:
Hexan-2-one

Option 2:
Hexan-3-one

Option 3:
Ethanol

Option 4:
Ethanal

Correct Answer:
Hexan-3-one

Solution:
Iodoform test is **not** given by Hexan-3-one, since it is not methyl ketone

Hence option B is correct

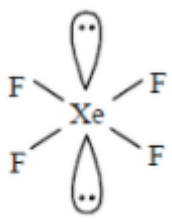
Q. 703 Draw the shape of the following molecules :

(a) XeF_4

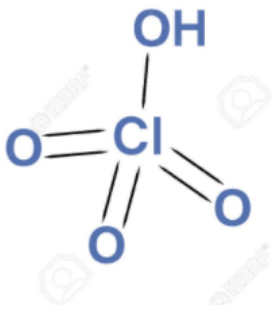
(b) $HClO_4$

Solution:

(a) XeF_4



(b) $HClO_4$



Q. 704 Give the formulae of the following compounds :

(a) Potassium trioxalatoaluminate (III)

(b) Tetraammineaquachloridocobalt (III) chloride

Solution:
(a) Potassium trioxalatoaluminate (III)

$K_3[Al(C_2O_4)_3]$

(b) Tetraammineaquachloridocobalt (III) chloride

$[Co(NH_3)_4(H_2O)Cl]Cl_2$

Q. 705 Write the names and structures of monomers in the following polymers :

(a) Nylon-6,6

(b) Buna-S

Solution:
(a) Nylon-6,6

$NH_2(CH_2)6NH_2 + HOOC(CH_2)_4COOH$

(b) Buna-S

$CH2=CH-CH=CH_2 + C_6H_5CH=CH_2$

Q. 706 What happens when

(a) Butanone is treated with methylmagnesium bromide and then hydrolysed, and

(b) Sodium benzoate is heated with soda lime ?

Solution:

(a) Butanone is treated with methylmagnesium bromide and then hydrolysed, and

$$CH_3COCH_2CH_3 \xrightarrow[H_2O]{CH_3MgBr} (CH_3)_2C(OH)CH_2CH_3$$

(b) Sodium benzoate is heated with soda lime ?

$$C_6H_5COONa \xrightarrow[\Delta]{NaOH+CaO} C_6H_6$$

Q. 707 How will the rate of the reaction be affected when

(a) surface area of the reactant is increased,

(b) temperature of the reaction is decreased, and

(c) catalyst is added in a reversible reaction ?

Solution:

(a) Rate of the reaction Increases when the surface area of the reactant is increased,

(b) Rate of the reaction decreases when the temperature of the reaction is decreased, and

(c) Rate of the reaction Increases when catalyst is added in a reversible reaction

Q. 708 (a) Compare physisorption and chemisorption on the basis of

(i) specificity, and

(ii) enthalpy of adsorption.

(b) Differentiate between adsorption and absorption.

Solution:
(a)

Physiorption

- Not specific
- Low enthalpy of adsorption

Chemisorption

- Highly specific
- high enthalpy of adsorption

(b) In adsorption, the substance is concentrated only at the surface while in absorption, the substance is uniformly distributed throughout the bulk of the solid

hence, adsorption is a surface phenomenon while absorption is a bulk phenomenon

---

Q. 709 Explain the role of the following :

(a) CO in the refining of Ni.

(b) Limestone in the metallurgy of Fe.

(c) Depressant in the froth floatation method

Solution:
(a) CO converts Ni into its volatile compound, $Ni(CO)_4$ in the refining of Ni.

(b) Limestone in the metallurgy of Fe provides flux to remove impurities

(c) Depressant in the froth floatation method selectively prevents one of the sulphide ore from coming to the froth

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Q. 710 Give the structure of the monomer of polypropene.

Solution:
Structure of the monomer of polypropene-

$CH_3CH=CH_2$

Q. 711 Read the given passage and answer the questions that follow :

The substitution reaction of alkyl halide mainly occurs by S_N1 or S_N2 mechanism. Whatever mechanism alkyl halides follow for the substitution reaction to occur, the polarity of the carbon halogen bond is responsible for these substitution reactions. The rate of S_N1 reactions are governed by the stability of carbocation whereas for S_N2 reactions steric factor is the deciding factor. If the starting material is a chiral compound, we may end up with an inverted product or racemic mixture depending upon the type of mechanism followed by alkyl halide. Cleavage of ethers with HI is also governed by steric factor and stability of carbocation, which indicates that in organic chemistry, these two major factors help us in deciding the kind of product formed.

What is plane polarised light ?

Solution:
Plane polarised light is the Monochromatic Light vibrating in one plane.

Q. 712 Read the given passage and answer the questions that follow :

The substitution reaction of alkyl halide mainly occurs by S_N1 or S_N2 mechanism. Whatever mechanism alkyl halides follow for the substitution reaction to occur, the polarity of the carbon halogen bond is responsible for these substitution reactions. The rate of S_N1 reactions are governed by the stability of carbocation whereas for S_N2 reactions steric factor is the deciding factor. If the starting material is a chiral compound, we may end up with an inverted product or racemic mixture depending upon the type of mechanism followed by alkyl halide. Cleavage of ethers with HI is also governed by steric factor and stability of carbocation, which indicates that in organic chemistry, these two major factors help us in deciding the kind of product formed.

Write the structures of the products formed when ethoxybenzene is treated with HI.

Solution:
Products formed when ethoxybenzene is treated with HI are

$C_2H_5I + C_6H_5OH$

Q. 713 Give the structure of the monomer of Teflon.

Solution:
Monomer of teflon $CF_2=CF_2$

Q. 714 Iodoform test is given by

Option 1:
Pentan-2-one

Option 2:
Ethanoic acid

Option 3:
Pentan-3-one

Option 4:
Methoxymethane

Correct Answer:
Pentan-2-one

Solution:
Pentan-2-one gives Iodoform Test

Q. 715

(i) Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is the correct explanation of the Assertion (A).

(ii) Both Assertion (A) and Reason (R) are correct statements, but Reason (R) is not the correct explanation of the Assertion (A).

(iii) Assertion (A) is correct, but Reason (R) is incorrect statement.

(iv) Assertion (A) is incorrect, but Reason (R) is correct statement

Assertion (A) : Sucrose is a non-reducing sugar.

Reason (R) : Reducing groups of glucose and fructose are involved in glycosidic bond formation.

Solution:
Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is the correct explanation of the Assertion (A).

Q. 716

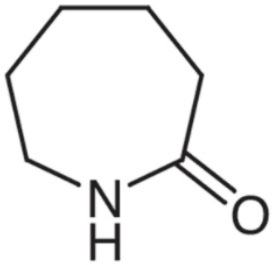
Write the names and structures of monomers in the following polymers :

(a) Buna-N

(b) Nylon 6

Solution:
(i) CH_2=CH-CH=CH_2 (Butadiene) and CH_2=CH–CN (Acrylonitrile)

(ii) caprolactum



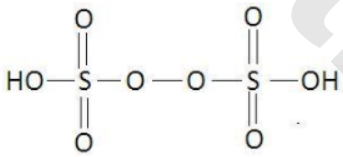
Q. 717 Draw the shape of the following molecules :

(a) $H_2S_2O_8$

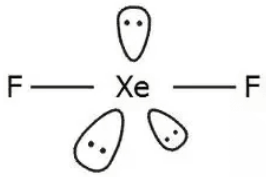
(b) XeF_2

Solution:

(a) $H_2S_2O_8$



(b) XeF_2



Q. 718 Give the formulae of the following compounds :

(a) Pentaamminecarbonatocobalt (III) chloride

(b) Potassium tetracyanidonickelate (II)

Solution:

(a) Pentaamminecarbonatocobalt (III) chloride

- $[Co(NH_3)_5(CO_3)]Cl$

(b) Potassium tetracyanidonickelate (II)

- $K_2[Ni(CN)_4]$

Q. 719 What happens when

(a) Acetone is treated with Zn(Hg) / Conc. HCl, and

(b) Ethanal is treated with methylmagnesium bromide and then hydrolysed ?

Solution:
What happens when

(a) When Acetone is treated with Zn(Hg) / Conc. HCl

$$CH_3COCH_3 \xrightarrow{Zn-Hg,Hcl} CH_3CH_2CH_3$$

(b) Ethanal is treated with methylmagnesium bromide and then hydrolysed,

$$CH_3CHO \xrightarrow{CH_3MgBr,H_2O} (CH_3)_2CHOH$$

Q. 720 Explain the role of the following :

(a) NaCN in froth floatation process.

(b) I_2 in the metallurgy of Zr.

(c) Limestone in the metallurgy of Fe.

Solution:
(a) NaCN selectively prevents one of the sulphide ore from coming to the froth.

(b) I_2 in the metallurgy of Zr, Helps in converting Zr into its volatile compound ZrI_4.

(c) Limestone in the metallurgy of Fe, Provides flux to remove impurities.

Q. 721 Distinguish between physisorption and chemisorption on the basis of

(a) Force of attraction,

(b) Temperature, and

(c) Enthalpy of adsorption.

Solution:

Physiorption

- Weak van der Waal forces
- It is Favourable at low temperature
- low ΔHadsorption

Chemisorption

- Strong chemical bonds
- Chemisorption Increases till a certain temperature and then decreases afterwards.
- High ΔHadsorption

Q. 722 Read the given passage and answer the question :

Organic compounds containing amine as functional group are present in a vivid variety of compounds, namely amino acids, hormones, neurotransmitters, DNA, alkaloids, dyes, etc. Drugs including nicotine, morphine, codeine and heroin, etc. which have physiological effects on humans also contain amino group in one form or another. Amines are basic because of the presence of lone pair of electrons on nitrogen. Addition of nitrogen into an organic framework leads to the formation of two families of molecules, namely amines and amides. As chemistry students, we must appreciate the versatility of nitrogen.

What are amino acids ?

Solution:
Amino acids are organic compounds containing both carboxyl (—COOH) and amino (—NH2) group.

Q. 723 Read the given passage and answer the question :

Organic compounds containing amine as functional group are present in a vivid variety of compounds, namely amino acids, hormones, neurotransmitters, DNA, alkaloids, dyes, etc. Drugs including nicotine, morphine, codeine and heroin, etc. which have physiological effects on humans also contain amino group in one form or another. Amines are basic because of the presence of lone pair of electrons on nitrogen. Addition of nitrogen into an organic framework leads to the formation of two families of molecules, namely amines and amides. As chemistry students, we must appreciate the versatility of nitrogen.

Why are amino acids amphoteric ?

Solution:
Amino acids are amphoteric because they can react with both acids and bases

Q. 724 Read the given passage and answer the question :

Organic compounds containing amine as functional group are present in a vivid variety of compounds, namely amino acids, hormones, neurotransmitters, DNA, alkaloids, dyes, etc. Drugs including nicotine, morphine, codeine and heroin, etc. which have physiological effects on humans also contain amino group in one form or another. Amines are basic because of the presence of lone pair of electrons on nitrogen. Addition of nitrogen into an organic framework leads to the formation of two families of molecules, namely amines and amides. As chemistry students, we must appreciate the versatility of nitrogen.

Give one point of difference between acidic and basic amino acid.

Solution:
Acidic amino acids- They have more number of carboxyl groups than amino groups. whereas

Basic amino acids- have more number of amino groups than carboxyl groups.

Q. 725 Read the given passage and answer the question :

Organic compounds containing amine as functional group are present in a vivid variety of compounds, namely amino acids, hormones, neurotransmitters, DNA, alkaloids, dyes, etc. Drugs including nicotine, morphine, codeine and heroin, etc. which have physiological effects on humans also contain amino group in one form or another. Amines are basic because of the presence of lone pair of electrons on nitrogen. Addition of nitrogen into an organic framework leads to the formation of two families of molecules, namely amines and amides. As chemistry students, we must appreciate the versatility of nitrogen.

What are essential amino acids ?

Solution:
Essential amino acids are those which are not synthesized in our body and must be supplied through diet.

Q. 726 Read the given passage and answer the question :

Organic compounds containing amine as functional group are present in a vivid variety of compounds, namely amino acids, hormones, neurotransmitters, DNA, alkaloids, dyes, etc. Drugs including nicotine, morphine, codeine and heroin, etc. which have physiological effects on humans also contain amino group in one form or another. Amines are basic because of the presence of lone pair of electrons on nitrogen. Addition of nitrogen into an organic framework leads to the formation of two families of molecules, namely amines and amides. As chemistry students, we must appreciate the versatility of nitrogen.

Name the linkage formed when carboxyl end of one amino acid condenses with amino end of other amino acid.

Solution:
Peptide linkage is formed when carboxyl end of one amino acid condenses with amino end of other amino acid

Q. 727 Name the process used for the benefaction of ores if the ore is soluble in some suitable solvent.

Solution:
Leaching is the process which is used for the benefaction of ores if the ore is soluble in some suitable solvent.

Q. 728 Give an example of a metal which can be purified by the process of distillation.

Solution:
Zinc is purified by the process of distillation.

Q. 729 What type of isomerism is shown by the complex $[Co(NH_3)_5NO_2]\,Cl_2$?

Solution:
Linkage isomerism is shown by $[Co(NH_3)_5NO_2]\,Cl_2$

Q. 730 An organic compound is adsorbed on the surface of silica gel. Name the process of removing the organic compound from silica gel.

Solution:
Name of the process is Desorption

Q. 731 Calculate the overall order of the reaction whose rate law expression was predicted as :

$$Rate = k\,[NO]^{3/2}\,[O_2]^{1/2}$$

Solution:
Overall order of the reaction whose rate law expression is- :

$$Rate = k\,[NO]^{3/2}\,[O_2]^{1/2}$$

= 2

Q. 732 $50\ mL$ of an aqueous solution of glucose $C_6H_{12}O_6$ (Molar mass : $180\ g/mol$) contains 6.02×10^{22} molecules. The concentration of the solution will be

Option 1:
$0.1\ M$

Option 2:
$0.2\ M$

Option 3:
$1.0\ M$

Option 4:
$2.0\ M$

Correct Answer:
$2.0\ M$

Solution:
The concentration of the solution will be 2 molar

Hence option D is correct

Q. 733 If the standard electrode potential of an electrode is greater than zero, then we can infer that its

Option 1:
reduced form is more stable compared to hydrogen gas.

Option 2:
oxidised form is more stable compared to hydrogen gas.

Option 3:
reduced and oxidised forms are equally stable.

Option 4:
reduced form is less stable than the hydrogen gas.

Correct Answer:
reduced form is more stable compared to hydrogen gas.

Solution:
If the standard electrode potential of an electrode is greater than zero, then we can infer that its reduced form is more stable compared to hydrogen gas.

Hence option A is correct

Q. 734 Total number of unpaired electrons present in Co^{3+} (Atomic number = 27) is

Option 1:
2

Option 2:
7

Option 3:
3

Option 4:
5

Solution:
Total number of unpaired electrons present in Co^{3+} (Atomic number = 27) is 4

Q. 735 The incorrect statement about interstitial compounds is

Option 1:
They are chemically reactive.

Option 2:
They are very hard.

Option 3:
They retain metallic conductivity.

Option 4:
They have high melting point.

Correct Answer:
They are chemically reactive.

Solution:
The incorrect statement about interstitial compounds is that they are chemically reactive

Hence option A is correct

Q. 736 The correct IUPAC name of $\mathrm{CH_3-\overset{\mathrm{CH_3}}{\overset{|}{C}}(\mathrm{OH})-CH_2CH_3}$ is

Option 1:
tert-butyl alcohol

Option 2:
$2, 2$-Dimethylpropanol

Option 3:
2-Methylbutan-2-ol

Option 4:
3-Methylbutan-3-ol

Correct Answer:
2-Methylbutan-2-ol

Solution:
2-Methylbutan-2-ol is correct IUPAC name

Q. 737 In the following, two statement are given one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these question from the codes (i), (ii), (iii) and (iv) as given below :

Assertion (A) : Boiling points of alkyl halides decrease in the order

$$R-I > R-Br > R-Cl > R-F$$

Reason (R) : Van der Waals forces decrease with increase in the size of halogen atom.

Option 1:
Both assertion (A) and reason (R) are correct statements, and reason (R) is the correct explanation of the assertion (A).

Option 2:
Both assertion (A) and reason (R) are correct statements, but reason (R) is not the correct explanation of the assertion (A).

Option 3:
Assertion (A) is correct, but reason (R) is incorrect statement.

Option 4:
Assertion (A) is incorrect, but reason (R) is correct statement.

Correct Answer:
Assertion (A) is correct, but reason (R) is incorrect statement.

Solution:
Assertion (A) is correct, but reason (R) is incorrect statement.

Q. 738 In the following, two statement are given one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these question from the codes (i), (ii), (iii) and (iv) as given below :

Assertion (A) : Low spin tetrahedral complexes are rarely observed.

Reason (R) : The orbital splitting energies are not sufficiently large to forcing pairing.

Option 1:
Both assertion (A) and reason (R) are correct statements, and reason (R) is the correct explanation of the assertion (A).

Option 2:
Both assertion (A) and reason (R) are correct statements, but reason (R) is not the correct explanation of the assertion (A).

Option 3:
Assertion (A) is correct, but reason (R) is incorrect statement.

Option 4:
Assertion (A) is incorrect, but reason (R) is correct statement.

Correct Answer:
Both assertion (A) and reason (R) are correct statements, and reason (R) is the correct explanation of the assertion (A).

Solution:
Both assertion (A) and reason (R) are correct statements, and reason (R) is the correct explanation of the assertion (A).

Q. 739 In the following, two statement are given one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these question from the codes (i), (ii), (iii) and (iv) as given below :

Assertion (A) : Albumin is a globular protein.

Reason (R) : Polypeptide chain coils around to give a straight chain.

Option 1:
Both assertion (A) and reason (R) are correct statements, and reason (R) is the correct explanation of the assertion (A).

Option 2:
Both assertion (A) and reason (R) are correct statements, but reason (R) is not the correct explanation of the assertion (A).

Option 3:
Assertion (A) is correct, but reason (R) is incorrect statement.

Option 4:
Assertion (A) is incorrect, but reason (R) is correct statement.

Correct Answer:
Assertion (A) is correct, but reason (R) is incorrect statement.

Solution:
Assertion (A) is correct, but reason (R) is incorrect statement.

Q. 740 In the following, two statement are given one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these question from the codes (i), (ii), (iii) and (iv) as given below :

Assertion (A) : Bakelite is a thermosetting polymer.

Reason (R) : On heating, polymeric chain becomes a long and straight chain.

Option 1:
Both assertion (A) and reason (R) are correct statements, and reason (R) is the correct explanation of the assertion (A).

Option 2:
Both assertion (A) and reason (R) are correct statements, but reason (R) is not the correct explanation of the assertion (A).

Option 3:
Assertion (A) is correct, but reason (R) is incorrect statement.

Option 4:
Assertion (A) is incorrect, but reason (R) is correct statement.

Correct Answer:
Assertion (A) is correct, but reason (R) is incorrect statement.

Solution:
Assertion (A) is correct, but reason (R) is incorrect statement.

Q. 741 In the following, two statement are given one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these question from the codes (i), (ii), (iii) and (iv) as given below :

Assertion (A) : $o-nitrophenol$ is a weaker acid than $p-nitrophenol$.

Reason (R) : Intramolecular hydrogen bonding makes ortho isomer weaker than para isomer.

Option 1:
Both assertion (A) and reason (R) are correct statements, and reason (R) is the correct explanation of the assertion (A).

Option 2:
Both assertion (A) and reason (R) are correct statements, but reason (R) is not the correct explanation of the assertion (A).

Option 3:
Assertion (A) is correct, but reason (R) is incorrect statement.

Option 4:
Assertion (A) is incorrect, but reason (R) is correct statement.

Correct Answer:
Both assertion (A) and reason (R) are correct statements, and reason (R) is the correct explanation of the assertion (A).

Solution:
Both assertion (A) and reason (R) are correct statements, and reason (R) is the correct explanation of the assertion (A).

Q. 742 Give one point of difference between the following :

(a) Tranquilizers and Analgesics

(b) Antiseptics and Disinfectants

Solution:
(a) Tranquilizers are used to treat mild to severe mental diseases whereas Analgesics are used to reduce pain.

(b) Antiseptics are applied to living tissues whereas Disinfectants are applied to inanimate objects or non living objects

Q. 743 Differentiate on the basis of chemical composition between cationic and anionic detergents. Also give one example of each category.

Solution:
Cationic detergents are quartenary ammonium salts of amines with acetates, chlorides or bromides as anions.e.g. cetyltrimethyl ammonium bromide

Anionic detergents are sodium salts of sulphonated long chain alcohols or or hydrocarbons.e.g. Sodium lauryl sulphate

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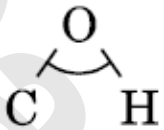
Q. 744 Give reasons for the following :

(a) Bond angle  in alcohol is slightly less than the tetrahedral angle.

(b) $C-OH$ bond length in CH_3OH is slightly more than the $C-OH$ bond length in phenol.

Solution:
(a) Because of lone pair -lone pair repulsion on oxygen

(b) Due to resonance in phenol $C-OH$ bond length in phenol is slightly shorter.

Q. 745 Complete and balance the following chemical equations :

(a) $MnO_4^- + H_2O + I^- \rightarrow$

(b) $MnO_4^- + H^+ + I^- \rightarrow$

Solution:
(a)

$$2MnO_4^- + H_2O + I^- \rightarrow 2MnO_2 + 2OH^- + IO_3^-$$

(b)

$$2MnO_4^- + 10I^- + 16H^+ \rightarrow 2Mn^{+2} + 8H_2O + 5I_2$$

Q. 746 Define adsorption isotherm. Give the empirical relationship between the quantity of gas adsorbed by unit mass of solid absorbent and pressure at a particular temperature.

Solution:
The curve obtained by plotting the amount of gas adsorbed by the adsorbent with pressure at constant temperature is known as adsorption isotherm.

The empirical relationship between the quantity of gas adsorbed by unit mass of solid absorbent and pressure at a particular temperature is given by

$x/m = kp^{1/n}$

Q. 747 Define shape-selective catalysis. Name the process by which alcohols convert directly into gasoline and give a variety of hydrocarbons.

Solution:
Shape-selective catalysis are the catalytic reaction that depends upon the pore structure of the catalyst and the size of the reactant and product molecules. The process by which alcohols convert directly into gasoline and give a variety of hydrocarbons is known as shape selective catalysis.

Q. 748 A reaction is first order w.r.t. reactant A as well as w.r.t. reactant b. Give the rate law. Also give one point of difference between average rate and instantaneous rate.

Solution:
Rate = k[A][B]

Average rate is the rate of a reaction for a particular period or interval of time. Instantaneous rate is the rate of a reaction at a particular instant of time.

Q. 749 For an electrochemical cell

$$Mg(s) + Ag^{+}(aq) \rightarrow Ag(s) + Mg^{2+}(aq),$$

give the cell representation. Also write the Nernst equation for the above cell at $25^{\circ}C$.

Solution:
Cell representation-

Mg(s) |Mg2+ (aq) || Ag+ (aq) |Ag(s)

Nernst equation for the above cell at $25^{\circ}C$ is

$E_{cell} = E^{0}_{cell} - (0.059/2) \log [Mg^{2+}] / [Ag^{+}]^{2}$

Q. 750 Predict the state of the solute in the solution in the following situations :

(a) When 'i' is found to be more than one.

(b) When 'i' is found to be less than one.

Solution:
(a) When 'i' is found to be more than one it is Dissociated.

(b) When 'i' is found to be less than one it is Associated

Q. 751 Give the structures of the monomers of the following polymers :

(a) Teflon

(b) Glyptal

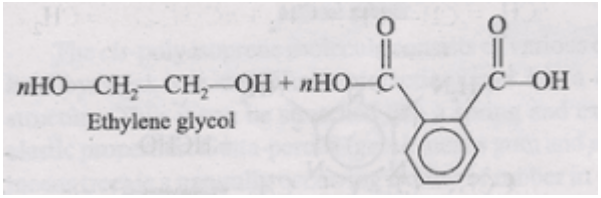
(c) Nylon-6

Solution:
Structures of the monomers of the following polymers-

(a) Teflon

$CF_2=CF_2$

(b) Glyptal-

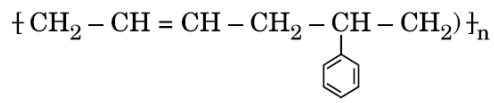


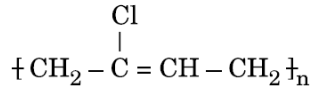
(c) Nylon-6

NH_2-$(CH_2)_5$-COOH

Q. 752 Write the names of monomers of the following polymers :

(i) $\dagger NH-(CH_2)_6-NH-CO-(CH_2)_4-CO\dagger_n$

(ii) 

(iii) 

Solution:
(i) Hexamethylene diamine and Adipic acid

(ii) 1,3-Butadiene and Styrene

(iii) Chloroprene

Q. 753 Account for the following :

(a) Aniline is a weaker base compared to ethanamine.

(b) Aniline does not undergo Friedel-Crafts reaction.

(c) Only aliphatic primary amines can be prepared by Gabriel Phthalimide synthesis.

Solution:
(a) Aniline is a weaker base compared to ethanamine because the lone pair of nitrogen in aniline is in resonance or conjugation with the benzene ring.

(b) Aniline does not undergo Friedel-Crafts reaction because Aniline forms salt with anhydrous $AlCl_3$.

(c) Only aliphatic primary amines can be prepared by Gabriel Phthalimide synthesis as only alkyl halides undergo nucleophilic substitution.

Q. 754 Justify and arrange the following compounds of each set in increasing order of reactivity towards the asked displacement :

(a) $1-Bromobutane, 2-Bromobutane, 2Bromo-2-Methylpropane$
(S_N1 reaction)

(b) $1-Bromobutane, 2-Bromobutane, 2-Bromo-2-Methylpropane$
(S_N2 reaction)

Solution:
(a) 1-bromobutane< 2-bromobutane< 2-bromo-2-methylpropane.

Because Tertiary carbo cation is more stable than secondary than primary.

(b) 2-bromo-2-methyl propane < 2-bromobutane< 1-bromobutane.

Due to decrease in steric hindrance.

Q. 755 (a) Give the IUPAC name and electronic configuration of central metal atom in terms of t_{2g} and e_g of$K_4\ [Mn(CN)_6]$.

(b) What is meant by 'Chelate effect' ? Give an example.

Solution:
(a) Potassiumhexacyanomanganate(II)

Electronic configuration of central metal atom is $t_{2g}^5eg^0$

(b) Chelate effect refers to the Increased stability of the complex due to presence of chelating or didentate or polydentate ligands. e.g.$[Cr(en)_3]^{3+}$

Q. 756 Write the hybridisation and magnetic characters of the following complexes :

(i) $[Fe(CN)_6]^{4-}$

(ii) $[CoF_6]^{3-}$

(iii) $[Ni(CO)_4]$

[Atomic number : $Fe = 26, Co = 27, Ni = 28$]

Solution:
(i) d^2sp^3 and diamagnetic

(ii) sp^3d^2 and paramagnetic

(iii) sp^3 and diamagnetic

Q. 757 Give the chemical reactions involved in the leaching of alumina from bauxite.

Solution:
Chemical reactions involved in the leaching of alumina from bauxite is as follows-

Al_2O_3 + 2NaOH +3$H_2O \rightarrow$ 2Na[Al(OH)$_4$]

2Na[Al(OH)$_4$] + $CO_2 \rightarrow$ Al_2O_3.xH_2O + 2$NaHCO_3$

Al_2O_3.x$H_2O \rightarrow$ Al_2O_3 + xH_2O

Q. 758 Conductivity of $2 \times 10^{-3} M$ methanoic acid is $8 \times 10^{-5} S\ cm^{-1}$. Calculate its molar conductivity and degree of dissociation if $\wedge^{\circ} m$ for methanoic acid is $404\ S\ cm^2\ mol^{-1}$

Solution:
Λ_m = k x 1000/ M = 8 x 10^{-5} x 1000 / 2 x 10^{-3} = 40 Scm2mol-1

α= Λ_m / Λ_m^o = 40/ 404 = 0.099

Q. 759 An antifreeze solution is prepared by dissolving 31 g of ethylene glycol (Molar mass $= 62\ g\ mol^{-1}$) in $600\ g$ of water. Calculate the freezing point of the solution. (Kf for water $= 1.86\ K\ kg\ mol^{-1}$)

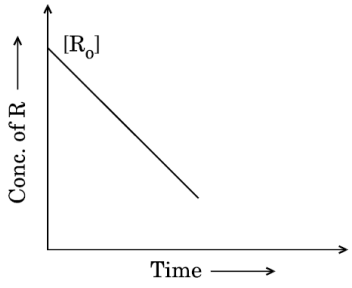
Solution:
$\Delta T_f = K_f$ m =1.86 x 31x 1000/ 62 x 600 = 1.55 ^oC

$\Delta T_f = T_f^o - T_f$

T_f = -1.55 ^oC

T_f = 271.45K

Q. 760 (a) Visha plotted a graph between concentration of r and time for a reaction $R \rightarrow P$. On the basis of this graph, answer the following questions :



(i) Predict the order of reaction.

(ii) What does the slope of the line indicate ?

(iii) What are the units of rate constant ?

(b) A first order reaction takes 25 minutes for $20\ ^o/_o$ decomposition. Calculate $t_{1/2}$
[Given :$log\ 2 = 0.3010,\ log\ 3 = 0.4771,\ log\ 4 = 0.6021$]

Solution:

(a)

(i) Order of reaction is zero order

(ii) slope = - k, concentration decreases linearly

(iii) Units of rate constant are $molL^{-1}s^{-1}$

(b) k = 2.303/t

log $[A_0]/[A]$ = (2.303/25) log 100/75 = (2.303/25) log4/3 = 2.303/25(0.6021 – 0.4771) = 0.0115 $min^{-1}t^{1/2}$ = 0.693/k = 0.693/0.0115 = 60.26 min

Q. 761

(a) The rate constant for a first order reaction is $60\ s^{-1}$. How much time will it take to reduce the initial concentration of the reactant to its $\frac{1}{16}th$ value ?

(b) Write two factors that affect the rate of a chemical reaction.

(c) Write two conditions for the collisions to be effective collisions.

Solution:

(a) t = (2.303/k) log $[A_0]/[A]$ = (2.303/ 60) log 1/(1/16) = 0.046 s

(b) Two factors that affect the rate of a chemical reaction are Concentration of reactants and Temperature

(c) Two conditions for the collisions to be effective collisions are Proper orientation and energy of colliding particles should be equal to or greater than threshold energy.

Q. 762 An amorphous solid 'A' which has a crown shaped structure, burns in air to form a gas 'B' which turns lime water milky. 'B' is also produced by roasting of sulphide ores. 'B' undergoes oxidation in the presence of V_2O_5 to give 'C' and to carry out this oxidation low temperature and high pressure is mandatory to get a good yield of 'C'. 'C' is then absorbed in H_2SO_4 to give 'D'. 'D' is then diluted to give a very important compound 'E'. 'E' is largely responsible for the manufacture of variety of compounds
in industry. 'E' in concentrated form, when combined with Cu metal, gives compound 'F'. From this description:

(a) Elucidate the structure of 'A' to 'F'.

(b) Give a balanced chemical equation for the conversion of 'E' to 'F'.

(c) Give two important functions of 'E' in the chemical industry.

Solution:
a) A= S_8 B= SO_2, C= SO_3, D= $H_2S_2O_7$, E= H_2SO_4, F=$CuSO_4$

b) $Cu + 2H_2SO_4 \rightarrow CuSO_4 + SO_2 + 2H_2O$

c) Two important functions of 'E' in the chemical industry is of dehydrating agent and oxidising agent

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Q. 763 (a) Give reasons for the following observations :

(i) Halogens are strong oxidising agents.

(ii) Noble gases have very low boiling points.

(iii) O and Cl have nearly same electronegativity, yet oxygen forms h bond while Cl doesn't.

(b) Complete and balance the following chemical equations :

(i) $\underset{(cold+dil.)}{NaOH} + Cl_2 \rightarrow$

(ii) $I^-(aq) + H_2O(l) + O_3(g) \rightarrow$

Solution:
(a)

(i) Halogens are strong oxidising agents because they readily accept one electron to attain noble gas configuration

(ii) Noble gases have very low boiling points due to weak dispersion forces

(iii) O and Cl have nearly same electronegativity, yet oxygen forms h bond while Cl doesn't due to smaller size of oxygen as compared to chlorine

(b) (i) $2NaOH + Cl_2 \rightarrow NaCl + NaOCl + H_2O$

(ii) $2I^-(aq.) + H_2O(l) + O_3(g) \rightarrow I_2(s) + O_2(g) + 2OH^-(aq.)$

Q. 764

(a) An organic compound 'A' having molecular formula $C_5H_{10}O$ gives negative Tollens' test, forms n-pentane on Clemmensen reduction but doesn't give iodoform test. Identify 'A' and give all the reactions involved.

(b) Carry out the following conversions :

(i) Propanoic acid to $2-Bromopropanoic$ acid

(ii) Benzoyl chloride to benzaldehyde

(c) How will you distinguish between benzaldehyde and acetaldehyde ?

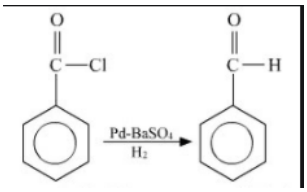
Solution:

(a) A= pentan-3-one

$CH_3CH_2COCH_2CH_3 \xrightarrow{Zn-Hg, HCl(conc.)} CH_3CH_2CH_2CH_2CH_3$

(b) i) $CH_3CH_2COOH + Br_2 \xrightarrow{RedP} CH_3CHBrCOOH$

(ii) Benzoyl chloride to benzaldehyde



(c) On heating with NaOH / I_2, acetaldehyde will give yellow ppt of CHI_3, while benzaldehyde doesn't. Hence we can distinguish between benzaldehyde and acetaldehyde

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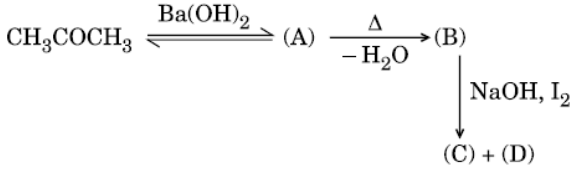
Q. 765

(a) Complete the following sequence of reactions :



(i) Identify (A) to (D).

(ii) Give the IUPAC name of (A).

(b) How can you distinguish between :

(i) Ethanol and Propanone, and

(ii) Benzoic acid and Phenol

Solution:

a) i) A = $(CH_3)_2CH(OH)CH_2COCH_3$,

B = $(CH_3)_2CH=CHCOCH_3$,

C and D = CHI_3 and $(CH_3)_2CH=CHCOONa$

ii) IUPAC name of (A) is 4-Hydroxy-4-methylpentan-2-one

b) i) Propanone will give yellow coloured solution with 2,4-DNP but ethanol doesn't.

ii) benzoic acid will give brisk effervescence with NaHCO3 but phenol doesn't.

Q. 766 Name the process where the metal is converted into a volatile compound and is collected elsewhere.

Solution:

Process where the metal is converted into a volatile compound and is collected elsewhere is known as Vapour phase refining

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Q. 767 Total number of unpaired electrons present in Mn^{2+} (Atomic number = 25) is

Option 1:

2

Option 2:

7

Option 3:

3

Option 4:

5

Correct Answer:

5

Solution:

Total number of unpaired electrons present in Mn^{2+} (Atomic number = 25) is 5.

Q. 768 Complete and balance the following chemical equations :

(a) $MnO_4^- + S_2O_3^{2-} + H_2O \rightarrow$

(b) $MnO_4^- + C_2O_4^{2-} + H^+ \rightarrow$

Solution:
(a)

$$8MnO_4^- + 3S_2O_3^{-2} + H_2O \rightarrow 8MnO_2 + 6SO_4^{-2} + 2OH^-$$

(b)

$$2MnO_4^- + 5C_2O_4^{2-} + 16H^+ \rightarrow 2Mn^{+2} + 8H_2O + CO_2$$

Q. 769 For an electrochemical cell

$$Cu^{2+}(aq) + Ni(s) \rightarrow Ni^{2+}(aq) + Cu(s),$$

give the cell representation. Also write the Nernst equation for the above cell at $25^\circ C$.

Solution:

Ni (s) | Ni2+ (aq) || Cu2+ (aq) | Cu (s)

Nernst equation for the above cell at $25^\circ C$ is

$E_{cell} = E^0_{cell} - (0.059/2) \log [Ni^{2+}] / [Cu^{2+}]$

Q. 770 Predict the state of the solute in the solution in the following situations :

(a) When 'i' is found to be 0·3.

(b) When 'i' is found to be 4.

Solution:
a) Associated

b) Dissociated

Q. 771 Give the structures of the monomers of the following polymers :

(a) Neoprene

(b) Nylon-6,6

(c) Dacron

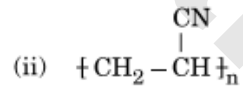
Solution:
a) $CH_2 = C(Cl) - CH = CH_2$

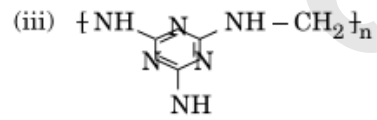
b) $HOOC\text{-}(CH_2)_4 - COOH$ and $NH_2 - (CH_2)_6\text{-}NH_2$

c) $CH_2OH - CH_2OH$ and $HOOC - C_6H_4 - COOH$

Q. 772 Write the names of monomers in the following polymers :

(i) 

(ii) 

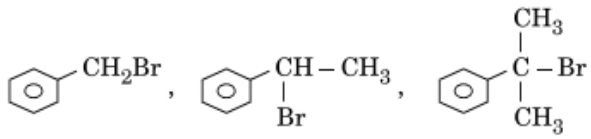
(iii) 

Solution:
i) Amino caproic acid

ii) Acrylonitrile

iii) Melamine and formaldehyde.

Q. 773 Justify and arrange the following compounds namely



in increasing order of reactivity towards the asked displacement namely :

(a) S_N1

(b) S_N2

Solution:

a) $C_6H_5CH_2Br < C_6H_5CH(Br)CH_3 < C_6H_5C(Br)(CH_3)_2$ due to increasing stability of carbocation

b) $C_6H_5C(Br)(CH_3)_2 < C_6H_5CH(Br)CH_3 < C_6H_5CH_2Br$ due to decreasing steric hindrance.

Q. 774 Give the chemical reactions involved in the leaching of gold. What is the role of Zn in this process ?

Solution:
Chemical reactions involved in the leaching of gold are-

$4\ Au + 8CN^- + 2H_2O + O_2 \longrightarrow 4[Au(CN)_2]^- + 4OH$

$2\ [Au(CN)_2]^- + Zn \longrightarrow [Zn(CN)_4]^{2-} + 2\ Au$

Zn acts as a reducing agent.

Q. 775 State Kohlrausch's law. Calculate the molar conductance of $Sr(NO_3)_2$. The molar ionic conductance of Sr^{2+} and NO_3^- ions are $119\ S\ cm^2\ mol^{-1}$ and $72\ S\ cm^2\ mol^{-1}$ respectively.

Solution:
Kohlrausch's law states that Limiting molar conductivity of an electrolyte can be represented as the sum of the individual contributions of the anion and cation of the electrolyte.

Molar conductivity of $Sr(NO_3)_2 = \lambda^0_{Sr^{+2}} + 2\ \lambda^0_{NO3^-} = 119 + (2 \times 72) = 263\ Scm^2/mol$

Q. 776 Name the process used for the benefaction of ores which is based on the difference in the gravities of ore and the gangue particles

Solution:
Process used for the benefaction of ores which is based on the difference in the gravities of ore and the gangue particles is Hydraulic washing.

Q. 777 Calculate the overall order of the reaction whose rate law is given by

$$Rate = k\,[SO_2]^{1/4}\,[O_2]^{3/4}$$

Solution:
Overall order of the reaction whose rate law is given by

$$Rate = k\,[SO_2]^{1/4}\,[O_2]^{3/4}$$

is 1

Q. 778 Total number of unpaired electrons present in Cr^{3+}(Atomic number $= 24$) is

Option 1:
2

Option 2:
7

Option 3:
3

Option 4:
5

Correct Answer:
3

Solution:
Total number of unpaired electrons present in Cr^{3+}(Atomic number $= 24$) is 3

Q. 779 Predict the state of the solute in the following situations :

(a) Experimentally determined molar mass is more than the true value.

(b) 'i' value is 0·4.

Solution:
(a) Associated (b) Associated

Q. 780 For an electrochemical cell

$$F_2(g) + 2I^-(aq) \rightarrow 2F^-(aq) + I_2(s),$$

give the cell representation. Also write the Nernst equation for the above cell at $25^\circ C$.

Solution:
For an electrochemical cell

$F_2(g) + 2I^-(aq) \rightarrow 2F^-(aq) + I_2(s),$

Cell representation -

Pt| $I^-_{(aq.)}$ | $I_{2(s)}$ || $F_{2(g)}$ | $F^-_{(aq.)}$ | Pt

Nernst equation for the above cell at $25^\circ C$ is

$E_{cell} = E^0_{cell} - 0.059 \log [F^-]^2 / [I^-]^2$

Q. 781 Complete and balance the following chemical equations :

(a) $MnO_4^- + Fe^{2+} + H^+ \rightarrow$

(b) $MnO_4^- + Mn^{2+} + H_2O \rightarrow$

Solution:

a)

$5Fe^{+2} + MnO^{-4} + 8H^+ \rightarrow Mn^{+2} + 4H_2O + 5Fe^{+3}$

b)

$2MnO_4^- + 3Mn^{+2} + 2H_2O \rightarrow 5MnO_2 + 4H^+$

Q. 782 Give the structures of the monomers of the following polymers :

(a) Natural rubber

(b) Buna-S

(c) Novolac

Solution:

(a) Natural rubber

$CH_2 = C(CH_3) - CH = CH_2$

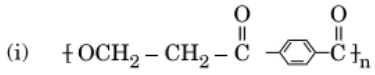
(b) Buna-S

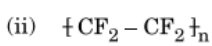
$CH_2 = CH - CH = CH_2$ and $C_6H_5 - CH = CH_2$

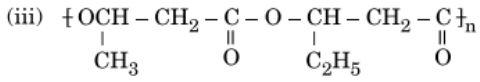
(c) Novolac

$C_6H_5 - OH$ and HCHO

Q. 783 Write the names of monomers in the following polymers :

(i) 

(ii) 

(iii) 

Solution:
i) Ethylene glycol and Terephthalic acid

ii) Tetrafluoro ethene

iii) 3-Hydroxybutanoic acid and 3- Hydroxypentanoic acid

Q. 784 Give the chemical reactions involved in the leaching of silver. What is the role of Zn in this process ?

Solution:
$4\ Ag + 8CN^- + 2H_2O + O_2 \longrightarrow 4[Ag\ (CN)_2]^- + 4OH^-$

$2[Ag\ (CN)_2]^- + Zn \longrightarrow [Zn\ (CN)_4]^{2-} + 2\ Ag$

Zn acts as a reducing agent.

Q. 785 State Kohlrausch's law. Calculate the molar conductance of $Ba(OH)_2$. The molar ionic conductance of Ba^{2+} and OH^- ions are 127 and $199\ S\ cm^2\ mol^{-1}$ respectively.

Solution:
Kohlrausch's law states that Limiting molar conductivity of an electrolyte can be represented as the sum of the individual contributions of the anion and cation of the electrolyte.

Molar conductivity of Ba(OH)2 = $\lambda^0_{Ba^{+2}} + 2\ \lambda^0_{OH^-}$ =127 + (2 x 199) = 525 Scm^2 /mol

Q. 786 Justify and arrange the following compounds namely, ethyl chloride, isopropyl chloride, tertiary butyl chloride in increasing order of reactivity towards the asked displacement namely :

(a) S_N1

(b) S_N2

Solution:
a) ethyl chloride $<$ isopropyl chloride $<$ tertiary butyl chloride

Due to increasing stability of carbocation

(b) tertiarybutylchloride $<$ isopropyl chloride $<$ ethyl chloride

Due to decreasing steric hindrance

Q. 787 Read the given passage and answer the question :

The d-block of the periodic table contains the elements of the groups 3 – 12 and are known as transition elements. In general, the electronic configuration of these elements is $(n-1)d^{1-10}ns^{1-2}$. The d-orbitals of the penultimate energy level in their atoms receive electrons giving rise to the three rows of the transition metals i.e., $3d,\ 4d$ and $5d$ series. However, $Zn,\ Cd$ and Hg are not regarded as transition elements. Transition elements exhibit certain characteristic properties like variable oxidation states, complex formation, formation of coloured ions and alloys, catalytic activity, etc. Transition metals are hard (except $Zn,\ Cd$and Hg) and have a high melting point.

Why are $Zn,\ Cd$ and Hg non-transition elements ?

Solution:
Zn , Cd and Hg have completely filled d^{10} configuration in their ground state as well as in their oxidized state. Hence $Zn,\ Cd$ and Hg are considered as non-transition elements.

Q. 788 Read the given passage and answer the question :

The d-block of the periodic table contains the elements of the groups 3 – 12 and are known as transition elements. In general, the electronic configuration of these elements is $(n-1)d^{1-10}ns^{1-2}$. The d-orbitals of the penultimate energy level in their atoms receive electrons giving rise to the three rows of the transition metals i.e., $3d.\ 4d$ and $5d$ series. However, $Zn,\ Cd$ and Hg are not regarded as transition elements. Transition elements exhibit certain characteristic properties like variable oxidation states, complex formation, formation of coloured ions and alloys, catalytic activity, etc. Transition metals are hard (except $Zn,\ Cd$and Hg) and have a high melting point.

Which transition metal of $3d$ series does not show variable oxidation states ?

Solution:
Scandium metal of $3d$ series does not show variable oxidation states

Q. 789 Read the given passage and answer the question :

The d-block of the periodic table contains the elements of the groups 3 – 12 and are known as transition elements. In general, the electronic configuration of these elements is $(n-1)d^{1-10}ns^{1-2}$. The d-orbitals of the penultimate energy level in their atoms receive electrons giving rise to the three rows of the transition metals i.e., $3d.\ 4d$ and $5d$ series. However, $Zn,\ Cd$ and Hg are not regarded as transition elements. Transition elements exhibit certain characteristic properties like variable oxidation states, complex formation, formation of coloured ions and alloys, catalytic activity, etc. Transition metals are hard (except $Zn,\ Cd$and Hg) and have a high melting point.

Why do transition metals and their compounds show catalytic activity ?

Solution:
Transition metals and their compounds show catalytic activity because of multiple oxidation states and ability to form complexes

Q. 790 Read the given passage and answer the question :

The d-block of the periodic table contains the elements of the groups 3 – 12 and are known as transition elements. In general, the electronic configuration of these elements is $(n-1)d^{1-10}ns^{1-2}$. The d-orbitals of the penultimate energy level in their atoms receive electrons giving rise to the three rows of the transition metals i.e., $3d.\ 4d$ and $5d$ series. However, $Zn,\ Cd$ and Hg are not regarded as transition elements. Transition elements exhibit certain characteristic properties like variable oxidation states, complex formation, formation of coloured ions and alloys, catalytic activity, etc. Transition metals are hard (except $Zn,\ Cd$and Hg) and have a high melting point.

Why are melting points of transition metals high ?

Solution:
Melting points of transition metals are high because of Involvement of (n-1)d and ns electrons in inter atomic metallic bonding

Q. 791 Read the given passage and answer the question :

The d-block of the periodic table contains the elements of the groups 3 – 12 and are known as transition elements. In general, the electronic configuration of these elements is $(n-1)d^{1-10}ns^{1-2}$. The d-orbitals of the penultimate energy level in their atoms receive electrons giving rise to the three rows of the transition metals i.e., $3d.\ 4d$ and $5d$ series. However, $Zn,\ Cd$ and Hg are not regarded as transition elements. Transition elements exhibit certain characteristic properties like variable oxidation states, complex formation, formation of coloured ions and alloys, catalytic activity, etc. Transition metals are hard (except $Zn,\ Cd$and Hg) and have a high melting point.

Why is Cu^{2+} ion coloured while Zn^{2+} ion is colourless in aqueous solution ?

Solution:
Because of Presence of unpaired e- showing d-d transition in Cu^{2+}, while in Zn^{2+} there is no unpaired electron. Hence, Zn^{2+} ion is colourless in aqueous solution.

Q. 792 Name the cell which was used in the Apollo Space Programme.

Solution:
Apollo Space Programme uses H_2 - O_2 Fuel cell

Q. 793 How many coulombs are required for the oxidation of$1\ mol$ of H_2O to O_2?

Solution:

193000 coulombs are required for the oxidation of $1\ mol$ of H_2O to O_2

Q. 794 Write the slope value obtained in the plot of $ln\ [R]$ vs. time for a first order reaction.

Solution:
Slope value obtained in the plot of $ln\ [R]$ vs. time for a first order reaction is -k

Q. 795 Name the disaccharide which on hydrolysis gives two molecules of glucose.

Solution:
The disaccharide which on hydrolysis gives two molecules of glucose is Maltose

Q. 796 Name the class of the synthetic detergent which is used in toothpaste.

Solution:
Anionic detergent is used in toothpaste

Q. 797 Which of the following is refined by the zone refining process ?

Option 1:
Cu

Option 2:
Zn

Option 3:
Ge

Option 4:
Sn

Correct Answer:
Ge

Solution:
Ge is refined by the zone refining process

Q. 798 Racemisation occurs in

Option 1:
S_N2 reaction

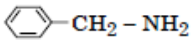
Option 2:
S_N1 reaction

Option 3:
Neither S_N2 nor S_N1 reactions

Option 4:
S_N2 reaction as well as S_N1 reaction

Correct Answer:
S_N1 reaction

Solution:
Racemisation occurs in S_N1 reaction

Q. 799  on heating with $CHCl_3$ and alcoholic KOH gives foul smell of

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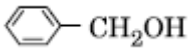

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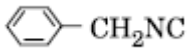

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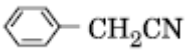

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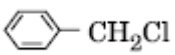
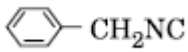
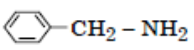
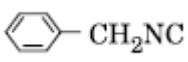


Correct Answer:


Solution:
 on heating with $CHCl_3$ and alcoholic KOH gives foul smell of 

Q. 800 One mole of $CrCl_3 \cdot 6H_2O$ compound reacts with excess $AgNO_3$ solution to yield two moles of $AgCl\ (s)$. The structural formula of the compound is

Option 1:
$[Cr(H_2O)_5Cl]\,Cl_2 \cdot H_2O$

Option 2:
$[Cr(H_2O)_3Cl_3] \cdot 3H_2O$

Option 3:
$[Cr(H_2O)_4Cl_2] \cdot 2H_2O$

Option 4:
$[Cr(H_2O)_6]\,Cl_3$

Correct Answer:
$[Cr(H_2O)_5Cl]\,Cl_2 \cdot H_2O$

Solution:
The structural formula of the compound is $[Cr(H_2O)_5Cl]\,Cl_2 \cdot H_2O$

Q. 801 Peptide linkage is present in

Option 1:
Carbohydrates

Option 2:
Vitamins

Option 3:
Proteins

Option 4:
Rubber

Correct Answer:
Proteins

Solution:
Peptide linkage is present in Proteins

Q. 802 two statements are given in the following question one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these question from the codes (i), (ii), (iii) and (iv) as given below :

Assertion (A) : Conductivity of an electrolyte decreases with decrease in concentration.

Reason (R) : Number of ions per unit volume increases on dilution.

Option 1:
Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is the correct explanation of the Assertion (A).

Option 2:
Both Assertion (A) and Reason (R) are correct statements, but Reason (R) is not the correct explanation of the Assertion (A).

Option 3:
Assertion (A) is correct, but Reason (R) is incorrect statement.

Option 4:
Assertion (A) is incorrect, but Reason (R) is correct statement.

Correct Answer:
Assertion (A) is correct, but Reason (R) is incorrect statement.

Solution:
Assertion (A) is correct, but Reason (R) is incorrect statement.

Q. 803 two statements are given in the following question one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these question from the codes (i), (ii), (iii) and (iv) as given below :

Assertion (A) : The $C-O-H$ bond angle in alcohols is slightly less than the tetrahedral angle.

Reason (R) : This is due to the repulsive interaction between the two lone electron pairs on oxygen.

Option 1:
Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is the correct explanation of the Assertion (A).

Option 2:
Both Assertion (A) and Reason (R) are correct statements, but Reason (R) is not the correct explanation of the Assertion (A).

Option 3:
Assertion (A) is correct, but Reason (R) is incorrect statement.

Option 4:
Assertion (A) is incorrect, but Reason (R) is correct statement.

Correct Answer:
Both Assertion (A) and Reason (R) are correct statements, and
Reason (R) is the correct explanation of the Assertion (A).

Solution:
Both Assertion (A) and Reason (R) are correct statements, and
Reason (R) is the correct explanation of the Assertion (A).

Q. 804 two statements are given in the following question one labelled Assertion (A) and the other labelled Reason (R). Select the correct
answer to these question from the codes (i), (ii), (iii) and (iv) as given below :

Assertion (A) : $[Pt(en)_2Cl_2]^{2+}$complex is less stable than [Pt(NH3)4 Cl2]2+ $[Pt(NH_3)_4Cl_2]^{2+}$ complex.

Reason (R) : $[Pt(en)_2Cl_2]^{2+}$complex shows chelate effect.

Option 1:
Both Assertion (A) and Reason (R) are correct statements, and
Reason (R) is the correct explanation of the Assertion (A).

Option 2:
Both Assertion (A) and Reason (R) are correct statements, but
Reason (R) is not the correct explanation of the Assertion (A).

Option 3:
Assertion (A) is correct, but Reason (R) is incorrect statement.

Option 4:
Assertion (A) is incorrect, but Reason (R) is correct statement.

Correct Answer:
Assertion (A) is incorrect, but Reason (R) is correct statement.

Solution:
Assertion (A) is incorrect, but Reason (R) is correct statement.

Q. 805 two statements are given in the following question one labelled Assertion (A) and the other labelled Reason (R). Select the correct
answer to these question from the codes (i), (ii), (iii) and (iv) as given below :

Assertion (A) : Osmotic pressure is a colligative property.

Reason (R) : Osmotic pressure is directly proportional to molarity.

Option 1:
Both Assertion (A) and Reason (R) are correct statements, and
Reason (R) is the correct explanation of the Assertion (A).

Option 2:
Both Assertion (A) and Reason (R) are correct statements, but
Reason (R) is not the correct explanation of the Assertion (A).

Option 3:
Assertion (A) is correct, but Reason (R) is incorrect statement.

Option 4:
Assertion (A) is incorrect, but Reason (R) is correct statement.

Correct Answer:
Both Assertion (A) and Reason (R) are correct statements, and
Reason (R) is the correct explanation of the Assertion (A).

Solution:
Both Assertion (A) and Reason (R) are correct statements, and
Reason (R) is the correct explanation of the Assertion (A).

Q. 806 two statements are given in the following question one labelled Assertion (A) and the other labelled Reason (R). Select the correct
answer to these question from the codes (i), (ii), (iii) and (iv) as given below :

Assertion (A) : Reactivity of ketones is more than aldehydes.

Reason (R) : The carbonyl carbon of ketones is less electrophilic as compared to aldehydes.

Option 1:
Both Assertion (A) and Reason (R) are correct statements, and
Reason (R) is the correct explanation of the Assertion (A).

Option 2:
Both Assertion (A) and Reason (R) are correct statements, but
Reason (R) is not the correct explanation of the Assertion (A).

Option 3:
Assertion (A) is correct, but Reason (R) is incorrect statement.

Option 4:
Assertion (A) is incorrect, but Reason (R) is correct statement.

Correct Answer:
Assertion (A) is incorrect, but Reason (R) is correct statement.

Solution:
Assertion (A) is incorrect, but Reason (R) is correct statement.

Q. 807 In the given reaction

$$A + 3B \rightarrow 2C,$$

the rate of formation of C is $2.5 \times 10^{-4} mol\ L^{-1}\ s^{-1}$.
Calculate the

(i) rate of reaction, and

(ii) rate of disappearance of b.

Solution:

$$-\Delta[A]/\Delta t = -1/3\Delta[B]/\Delta t = 1/2\Delta[C]/\Delta t$$

(i) Rate =

$= 1/2\Delta[C]/\Delta t$

= 2.4x 10^{-4}/2 = 1.25 x 10-4 mol l^{-1} s^{-1}

(ii) rate of disappearance of b = $-\Delta[B]/\Delta t$= 3 x 1.25 x 10^{-4} = 3.75 x 10^{-4} mol l^{-1} s^{-1}

Q. 808 Write the role of the following :

(i) $NaAI\,F_4$ in the extraction of Aluminium

(ii) CO in the refining of Ni

Solution:
i) $NaAI\,F_4$ Acts as solvent and lowers the melting point of the mixture

ii) CO forms a volatile compound $Ni(CO)_4$, which decomposes at higher temperature to give pure Nickel.

Q. 809 Write the chemical equations involved in the leaching of bauxite ore to prepare pure alumina.

Solution:
Chemical equations involved in the leaching of bauxite ore to prepare pure alumina are as follows-

$Al_2O_3 + 2\ NaOH + 3H_2O \rightarrow 2\ Na\ [Al(OH)_4]$

$2Na\ [Al(OH)_4] + CO_2 \rightarrow Al_2O_3\ xH_2O + 2\ NaHCO_3$

$Al_2O_3\ xH_2O \xrightarrow{\Delta} Al_2O_3 + xH_2O$

Q. 810 Write two differences between physisorption and chemisorption.

Solution:
Physisorption

1. Arises due to vanderwaal interaction

2. It is not specific in nature

Chemisorption.

1. Occure due to chemical bond formation

2. Highly specific in nature

Q. 811 Define the following terms with a suitable example of each :

(i) Associated colloids

(ii) O/W emulsion

Solution:
i) Associated colloids are substances which at low concentration behave as normal strong electrolytes, but at higher concentration exhibit colloidal behavior due to the formation of aggregates. Example: Micelles

ii) O/W emulsion refers to oil is dispersed phase and water is dispersion medium. Example : Milk

Q. 812 (a) Write the IUPAC name and hybridisation of the complex $[CoF_6]^{3-}$.
(Given : Atomic number of $Co = 27$)

(b) What type of isomerism is shown by the complex $[Co(en)_2Cl_2]^{2+}$?

Name the structure of an isomer of this complex which is optically active.

Solution:
a) IUPAC name and hybridisation of the complex $[CoF_6]^{3-}$ is

Hexafluoridocobaltate(III) and sp^3d^2

b) Geometrical isomerism is shown by the complex $[Co(en)_2Cl_2]^{2+}$ and cis isomer is optically active

Q. 813 Give reasons :

(i) Shaving soaps contain glycerol.

(ii) Antacids should not be used for longer time.

Solution:
(i) Shaving soaps contain glycerol to prevent rapid drying.

(ii) Antacids should not be used for longer time because antacids will make the stomach alkaline and trigger the production of more acid.

Q. 814 Define the following terms :

(i) Oligosaccharides

(ii) Invert sugar

Solution:

i) Carbohydrates that yield two to ten monosaccharides units on hydrolysis are known as Oligosaccharides

ii) Hydrolysis of sucrose brings about a change in the sign of rotation, from dextro (+) to laevo (-) and the product is named as invert sugar.

Q. 815 Write the products of the following reaction :

$$6\ XeF_4 + 12\ H_2O \rightarrow$$

Is this reaction a disproportionation reaction ? Give reasons in support of your answer.

Solution:

$6XeF_4 + 12\ H_2O \rightarrow 4Xe + 2XeO_3 + 24HF + 3O_2$

Yes, this reaction is a disproportionation reaction because Xe^{+4} changes to Xe (0) and Xe (+6) means Xe gets oxidized as well as reduced in the same reaction.

Q. 816 Calculate the maximum work and $log\ K_c$ for the given reaction at $298\ K$:

$$Ni\ (s) + 2\ Ag^{+}(aq) \rightleftharpoons Ni^{2+}\ (aq) + 2Ag\ (s)$$

Given :

$$E^{\circ}_{Ni^{2+}/Ni} = -0.25\ V,\ \ E^{\circ}_{Ag^{+}/Ag} = +0.80\ V$$

$$1\ F = 96500\ C\ mol^{-1}$$

Solution:

Given :

$$E^{\circ}_{Ni^{2+}/Ni} = -0.25\ V,\ \ E^{\circ}_{Ag^{+}/Ag} = +0.80\ V$$

$$1\ F = 96500\ C\ mol^{-1}$$

$$Ni\ (s) + 2\ Ag^{+}(aq) \rightleftharpoons Ni^{2+}\ (aq) + 2Ag\ (s)$$

$\Delta G^{o} = -nFE^{o}_{cell} = -2 \times 96500 \times \{0.80 - (-0.25)\} = -202650$ J/ mol

Maximum work = 202650 J/ mol

$E^{o}_{cell} = (0.059/2) \log K_c$

$\log K_c = 2 \times 1.15 \div 0.0591 = 35.6$

Q. 817 A first order reaction is $40\ ^{o}/_{o}$ complete in 80 minutes. Calculate the value of rate constant (k). In what time will the reaction be $90\ ^{o}/_{o}$ completed ?

[Given : $log\ 2 = 0.3010,\ log\ 3 = 0.4771,\ log\ 4 = 0.6021,\ log\ 5 = 0.6771,$ $log\ 6 = 0.7782,$

Solution:

Given : $log\ 2 = 0.3010,\ log\ 3 = 0.4771,\ log\ 4 = 0.6021,\ log\ 5 = 0.6771, log\ 6 = 0.7782,$

k = 2.303/t log $[A]_0/[A]$ = 2.303/80 log 100/60 = 2.303/80 (1-0.7782)

= 0.0064 min^{-1}

t = 2.303/k log $[A]_0/[A]$ = 2.303/0.0064 log 100/10

= 360 min

Q. 818 Write the names and structures of the monomers in the following polymers :

(i) Buna-S

(ii) Nylon-6,6

(iii) Bakelite

Solution:

(i) Buna-S

Styrene= $C_6H_5-CH=CH_2$ and

Butadiene= $CH_2=CH-CH=CH_2$

(ii) Nylon-6,6

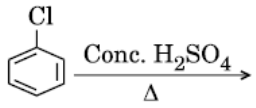
adipic acid = $HOOC-(CH_2)_4-COOH$ and hexamethylene diamine = $H_2N-(CH_2)_6-NH_2$

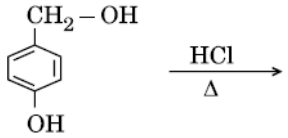
(iii) Bakelite

Bakelite is a condensation polymer of phenol = C_6H_5-OH and

formaldehyde = HCHO

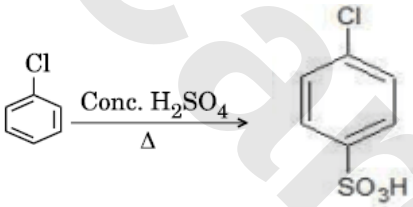
Q. 819 Write the major product(s) of the following reactions :

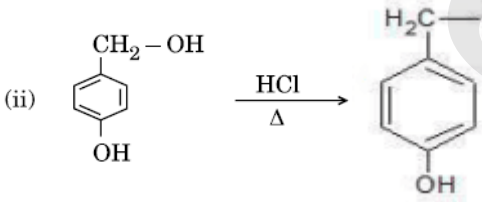
(i) 

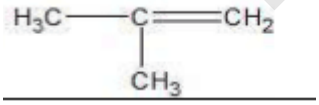
(ii) 

(iii) $(CH_3)_3C - OH \xrightarrow[573\ K]{Cu}$

Solution:

(i) 

(ii) 

(iii) $(CH_3)_3C - OH \xrightarrow[573\ K]{Cu}$ 

Q. 820 (a) Write the mechanism of the following reaction :

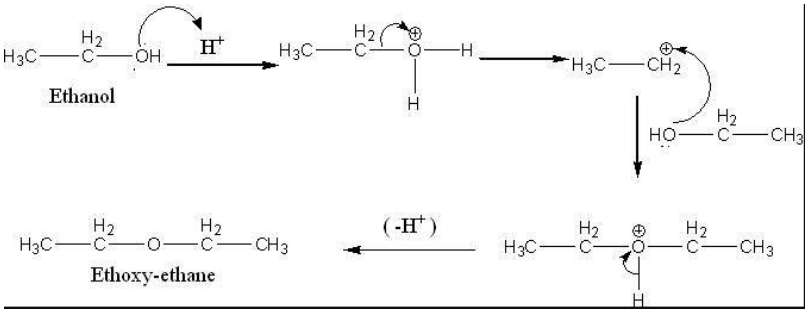
$$2\ CH_3CH_2OH \xrightarrow[413K]{H^+} CH_3CH_2OCH_2CH_3 + H_2O$$

(b) Write the preparation of phenol from cumene.

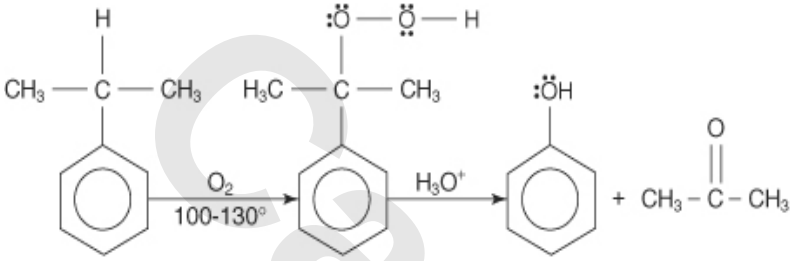
Solution:

(a)

$$2\ CH_3CH_2OH \xrightarrow[413K]{H^+} CH_3CH_2OCH_2CH_3 + H_2O$$



(b) Preparation of phenol from cumene



Q. 821 How can you convert the following :

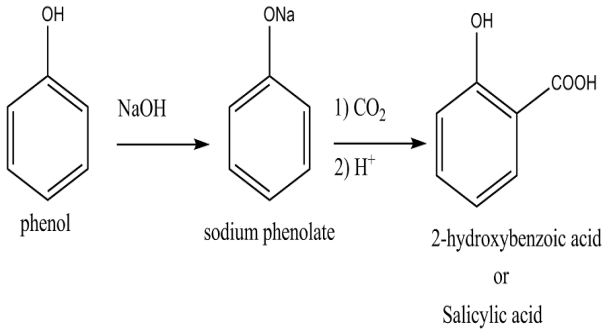
(i) Sodium phenoxide to o-hydroxybenzoic acid

(ii) Acetone to propene

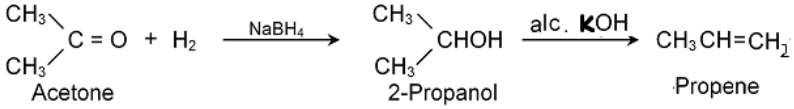
(iii) Phenol to chlorobenzene

Solution:

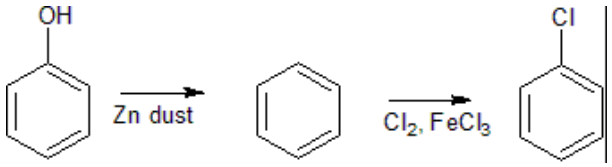
(i) Sodium phenoxide to o-hydroxybenzoic acid



(ii) Acetone to propene



(iii) Phenol to chlorobenzene



Q. 822 Write the products formed when $(CH_3)_3C-CHO$ reacts with the following reagents :

(i) CH_3COCH_3 in the presence of dilute $NaOH$

(ii) HCN

(iii) $Conc.NaOH$

Solution:
(i) CH_3COCH_3 in the presence of dilute $NaOH$ forms $(CH_3)_3CCH(OH)CH_2COCH_3$

(ii) HCN forms $(CH_3)_3CCH(OH)CN$

(iii) $Conc.NaOH$ forms $(CH_3)_3CCOONa + (CH_3)_3CCH_2OH$

Q. 823 Define Lyophobic and Lyophilic sol with a suitable example of each. Why is coagulation of Lyophilic sol difficult as compared to Lyophobic sol ?

Solution:
Lyophobic sol is liquid or water repelling sol . Example: Fe(OH)3 sol

Lyophilic sol is liquid or water attracting. Example: starch sol

Coagulation of Lyophilic sol difficult as compared to Lyophobic sol because of the charge and solvation of the colloidal particles.

Q. 824 Define the following terms :

(i) Shape-selective catalysis
(ii) Kraft temperature
(iii) Peptization

Solution:

i) Shape-selective catalysis are the catalytic reaction that depends upon the pore structure of the catalyst and the size of the reactant and product molecules.

ii) The formation of micelles takes place only above a particular temperature is called Kraft temperature (Tk)

iii) Process of converting a precipitate into colloidal sol by shaking it with dispersion medium in the presence of a small amount of electrolyte is known as Peptization.

Q. 825 (a) Give reasons :

(i) Helium does not form compounds like Xenon.

(ii) $HClO_4$ is a stronger acid than $HOCl$.

(iii) Sulphur is a polyatomic solid whereas Oxygen is a diatomic gas.

(b) Write one reaction as an example of each, to show that conc. H_2SO_4 acts as

(i) an oxidising agent, and

(ii) a dehydrating agent.

Solution:

a) i) Helium does not form compounds like Xenon due to high ionization enthalpy

ii) $HClO_4$ is a stronger acid than $HOCl$ because of higher oxidation state of Cl in $HClO_4$ than in HOCl

iii) Sulphur is a polyatomic solid whereas Oxygen is a diatomic gas because oxygen can form pπ- pπ multiple bond effectively but sulphur can not.

b)

i)

$$Cu + 2H_2SO_4 \rightarrow CuSO_4 + SO_2 + 2H_2O$$

ii)

$$C_{12}H_{22}O_{11} \overset{H_2So_4}{\rightarrow} 12C + 11H_2O$$

Q. 826 (a) Account for the following :

(i) Hydration enthalpy of F^- ion is more than Cl^- ion.

(ii) SO_2 is a reducing agent, whereas TeO_2 is an oxidising agent in group-16 oxides.

(b) Write the reaction of F_2 with water. Why does I_2 not react with water ?

(c) Draw the structure of XeF_2.

Solution:

a)

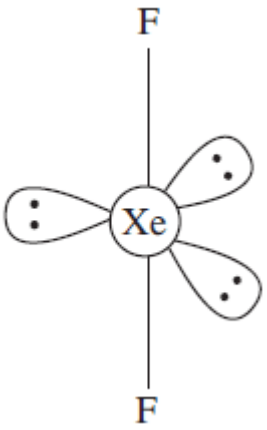
i) Hydration enthalpy of F^- ion is more than Cl^- ion because of smaller size of F – ion than Cl– ion

ii) SO_2 is a reducing agent, whereas TeO_2 is an oxidising agent in group-16 oxides because sulphur is more stable in +6 state and Tellurium is more stable in +4 state

b) $2F_2 + 2H_2O$ -------> $4HF + O_2$

I_2 doesnot react with water because I_2 is a weak oxidizing agent.

structure of XeF_2.



Q. 827 (a) Give reasons :

(i) Although $-NH_2$ group is o/p directing in electrophilic substitution reactions, yet aniline, on nitration gives good yield of m-nitroaniline.

(ii) $(CH_3)_2NH$ is more basic than $(CH_3)_3N$ in an aqueous solution.

(iii) Ammonolysis of alkyl halides is not a good method to prepare pure primary amines.

(b) Distinguish between the following :

(i) $CH_3CH_2NH_2$ and $(CH_3CH_2)_2NH$

(ii) Aniline and CH_3NH_2

Solution:
a) i) Because aniline gets protonated to give anilinium ion which is deactivating in nature and is meta directing.

ii) Because of combined factors of solvation and inductive effects.

iii) Because it gives a mixture of amines which is difficult to separate.

b) i) On heating with $CHCl_3$ and KOH (alcoholic) $CH_3CH_3NH_2$ gives a foul smelling isocyanide while $(CH_3CH_2)_2NH$ doesn't.

ii) On adding benzenediazonium chloride, aniline gives a yellow coloured dye while CH_3NH_2 doesn't.

Q. 828 (a) Write the structures of A and B in the following reactions :

(i) $C_6H_5N_2^+Cl^- \overset{CuCN}{\rightarrow} A \overset{H_2O/H^+}{\rightarrow} B$

(ii) $CH_3COOH \xrightarrow[\Delta]{NH_3} A \overset{NaBr}{\rightarrow} B$

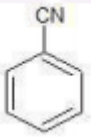
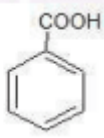
(b) Write the chemical reaction of methyl amine with benzoyl chloride and write the IUPAC name of the product obtained.

(c) Arrange the following in the increasing order of their pKb values :

$C_6H_5NH_2,\ NH_3,\ C_2H_5NH_2,\ (C_2H_5)_2NH$

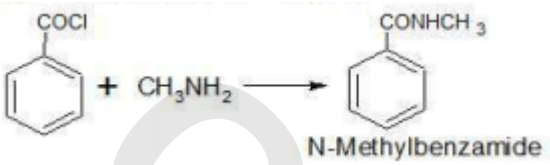
Solution:
(a)

(i) $C_6H_5N_2^+Cl^- \overset{CuCN}{\rightarrow} A \overset{H_2O/H^+}{\rightarrow} B$

A =  B = 

(ii) $CH_3COOH \xrightarrow[\Delta]{NH_3} A \overset{NaBr}{\rightarrow} B$

A = CH_3CONH_2 B = CH_3NH_2

(b) 

(c) $(C_2H_5)_2NH < C_2H_5NH_2 < NH_3 < C_6H_5NH_2$

Q. 829

(a) A solution contains $5.85\ g\ NaCl$ (Molar mass $58.5\ g\ mol^{-1}$) per litre of solution. It has an osmotic pressure of $4.75\ atm$ at $27^{\circ}C$. Calculate the degree of dissociation of $NaCl$ in this solution.
(Given : $R = 0.082\ L\ atm\ K^{-1}\ mol^{-1}$)

(b) State Henry's law. Why is air diluted with helium in the tanks used by scuba divers ?

Solution:
a) π = i CRT

4.75 = i x 5.85/58.5 x 0.082 x 300

i = 1.93

b) Partial pressure of gas in liquid is directly proportional to its solubility or mole fraction. Air is diluted with helium in the tanks used by scuba divers to prevent bends

Q. 830 (a) When $19.5\ g$ of $F-CH_2-COOH$ (Molar mass $= 78\ g\ mol^{-1}$) is dissolved in $500\ g$ of water, the depression in

freezing point is observed to be $1^{\circ}C$. Calculate the degree of dissociation of $F-CH_2-COOH$.

[Given : Kf for water $= 1.86\ K\ kg\ mol^{-1}$]

(b) Give reasons :

(i)$0.1\ M\ KCl$ has higher boiling point than $0.1\ M$ Glucose.

(ii) Meat is preserved for a longer time by salting.

Solution:
a) $\Delta T_f = i\ K_f\ m$

1 = i x 1.86 x 19.5/78 x 1000/500

i = 1.075

$$\alpha = \frac{i-1}{n-1} = \frac{1.075-1}{2-1} = 0.075$$

b)

i) Due to dissociation of KCl / number of particles in 0.1 M KCl is more

ii) Due to osmosis bacteria loses its water and dies which causes preservation.

Q. 831 Out of $o-dichlorobenzene$ and $p-dichlorobenzene$, which has higher melting point ?

Solution:
$p-dichlorobenzene$ has higher melting point

Q. 832 Write the product when benzene diazonium chloride reacts with ethanol.

Solution:
Benzene is formed

Q. 833 Write the product obtained at cathode on electrolysis of aqueous solution of $NaCl$.

Solution:
Hydrogen gas

Q. 834 Name the disaccharide which on hydrolysis gives glucose and galactose.

Solution:
Lactose

Q. 835 What type of chemical substances are used in sleeping pills ?

Solution:
Tranquilizers

Q. 836 Which of the following solutions of KCl will have the highest value of specific conductance ?

Option 1:
$0.5\ m$

Option 2:
$0.01\ M$

Option 3:
$0.1\ M$

Option 4:
$1.0\ M$

Correct Answer:
$1.0\ M$

Solution:
$1.0\ M$

Q. 837 The unit of the rate of reaction is the same as that of the rate constant for A :

Option 1:
first order reaction

Option 2:
zero order reaction

Option 3:
second order reaction

Option 4:
half-order reaction

Correct Answer:
zero order reaction

Solution:
The unit of the rate of reaction is the same as that of the rate constant for A in Zero order reaction

---

Q. 838 By which of the following reactions is blister copper obtained ?

Option 1:
$Cu^{2+} + Zn \rightarrow Zn^{2+} + Cu$

Option 2:
$Cu_2S + FeS \rightarrow 2\,Cu + FeS_2$

Option 3:
$Cu_2S + 2\,Cu_2O \rightarrow 6\,Cu + SO_2$

Option 4:
$Cu_2O + C \rightarrow 2\,Cu + Co$

Correct Answer:
$Cu_2S + 2\,Cu_2O \rightarrow 6\,Cu + SO_2$

Solution:
$Cu_2S + 2\,Cu_2O \rightarrow 6\,Cu + SO_2$

Q. 839 EDTA is a

Option 1:
monodentate ligand

Option 2:
bidentate ligand

Option 3:
ambidentate ligand

Option 4:
hexadentate ligand

Correct Answer:
hexadentate ligand

Solution:
EDTA is a hexadentate ligand

Q. 840 Which parts of amino acids molecules are linked through hydrogen bonds in the secondary structure of proteins ?

Option 1:
$NH_2\ group$

Option 2:
$COOH\ group$

Option 3:
$-\underset{\underset{\mathrm{O}}{||}}{\mathrm{C}}-$ and $-NH-\ group$

Option 4:
None of the above

Correct Answer:
$-\underset{\underset{\mathrm{O}}{||}}{\mathrm{C}}-$ and $-NH-\ group$

Solution:
$-\underset{\underset{\mathrm{O}}{||}}{\mathrm{C}}-$ and $-NH-\ group$ of amino acids molecules are linked through hydrogen bonds in the secondary structure of proteins

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Q. 841 Two statements are given one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these question from the codes (i), (ii), (iii) and (iv) as given below :

Assertion (A) : Acetic acid is stronger than formic acid.

Reason (R) : In acetic acid, the electron releasing methyl group makes it difficult to break the $O-H$ bond.

Option 1:
Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is the correct explanation of the Assertion (A).

Option 2:
Both Assertion (A) and Reason (R) are correct statements, but Reason (R) is not the correct explanation of the Assertion (A).

Option 3:
Assertion (A) is correct, but Reason (R) is incorrect statement.

Option 4:
Assertion (A) is incorrect, but Reason (R) is correct statement.

Correct Answer:
Assertion (A) is incorrect, but Reason (R) is correct statement.

Solution:
Assertion (A) is incorrect, but Reason (R) is correct statement.

Q. 842 Two statements are given one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these question from the codes (i), (ii), (iii) and (iv) as given below :

Assertion (A) : Phenol is more acidic than P-methylphenol.

Reason (R) : The presence of an electron releasing group in P-methylphenol makes it less acidic.

Option 1:
Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is the correct explanation of the Assertion (A).

Option 2:
Both Assertion (A) and Reason (R) are correct statements, but Reason (R) is not the correct explanation of the Assertion (A).

Option 3:
Assertion (A) is correct, but Reason (R) is incorrect statement.

Option 4:
Assertion (A) is incorrect, but Reason (R) is correct statement.

Correct Answer:
Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is the correct explanation of the Assertion (A).

Solution:

Both Assertion (A) and Reason (R) are correct statements, and
Reason (R) is the correct explanation of the Assertion (A).

Q. 843 Write the products of the following reaction :

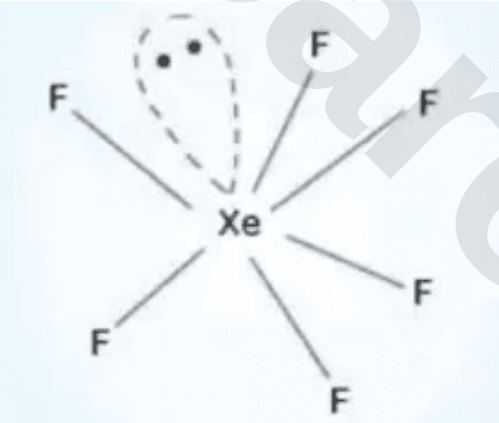
$XeF_6 + 2\ H_2O \rightarrow$

Is this reaction a redox reaction ? Draw the structure of XeF_6.

Solution:
$XeF_6 + 2H_2O \rightarrow XeO_2F_2 + 4HF$

No, this is not a reaction a redox reaction

Structure of XeF_6



Q. 844 Define the following terms :

(i) Glycosidic linkage

(ii) Native protein

Solution:
i) Glycosidic linkage is a linkage between two monosaccharide units through oxygen atom.

ii) Native protein is the protein having a unique three-dimensional structure and biological activity.

Q. 845 Give reasons :

(i) Unbranched chain detergents are preferred over branched chain detergents.

(ii) Aspartame is not used in cooking hot dishes.

Solution:
(i) Unbranched chain detergents are preferred over branched chain detergents because these are biodegradable

(ii) Aspartame is not used in cooking hot dishes because it is unstable at cooking temperature

Q. 846 Write the names and structures of the monomers in the following polymers :

(i) Buna-N

(ii) Natural rubber

(iii) Nylon-6

Solution:
Write the names and structures of the monomers in the following polymers :

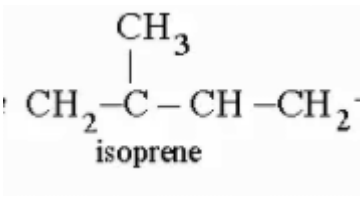
(i) Buna-N

a) $CH_2=CH-C=CH_2$

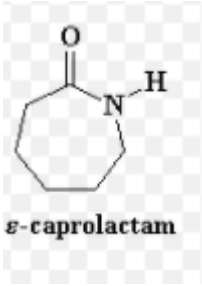
b) $CH=CH_2$ with CN below

1,3-butadiene & acrylonitrile

(ii) Natural rubber



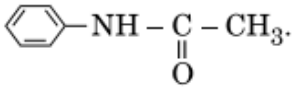
(iii) Nylon-6



ε-caprolactam

Q. 847 Write the name of the product when benzene diazonium chloride is treated with KI.

Solution:
Iodobenzene is formed

Q. 848 Write the IUPAC name of  .

Solution:
N-Phenylethanamide

Q. 849 Name the reducing agent used to obtain Ag from $[Ag(CN)_2]^-$ complex.

Solution:
Zinc is the reducing agent used to obtain Ag from $[Ag(CN)_2]^-$ complex.

Q. 850 Name the vitamin whose deficiency causes convulsions.

Solution:
Pyridoxine vitamin deficiency causes convulsions.

Q. 851 Pick out the odd one from among the following compounds on the basis of their medicinal properties :

Equanil, Luminal, Bithional, Seconal

Solution:
Bithional

Q. 852 In fuel cell

Option 1:
chemical energy is converted to electrical energy.

Option 2:
energy of combustion of fuel is converted to chemical energy.

Option 3:
energy of combustion of fuel is converted to electrical energy.

Option 4:
electrical energy is converted to chemical energy.

Correct Answer:
energy of combustion of fuel is converted to electrical energy.

Solution:
In fuel cell energy of combustion of fuel is converted to electrical energy.

Q. 853 In a Leclanche dry cell, the cathode is

Option 1:
Zn container

Option 2:
MnO_2

Option 3:
Graphite rod

Option 4:
NH_4Cl

Correct Answer:
Graphite rod

Solution:
In a Leclanche dry cell, the cathode is Graphite rod

Q. 854 The rate constant for a first order reaction is equal to the initial rate of reaction when the initial concentration of the reactant is

Option 1:
$1 \times 10^{-2} M$

Option 2:
$1\ M$

Option 3:
$10\ M$

Option 4:
$0.1\ M$

Correct Answer:
$1\ M$

Solution:
The rate constant for a first order reaction is equal to the initial rate of reaction when the initial concentration of the reactant is $1\ M$

Hence option B is correct

Q. 855 On the basis of crystal field theory, electronic configuration of d^4 complex when $\Delta_0 > P$ is

Option 1:
$t_{2g}3\ e_g1$

Option 2:
$t_{2g}2\ e_g2$

Option 3:
$t_{2g}1\ e_g3$

Option 4:
$t_{2g}4\ e_g0$

Correct Answer:
$t_{2g}4\ e_g0$

Solution:
On the basis of crystal field theory, electronic configuration of d^4 complex when $\Delta_0 > P$ is $t_{2g}4\ e_g0$

Q. 856 Which of the following is a non-reducing sugar ?

Option 1:
Sucrose

Option 2:
Maltose

Option 3:
Glucose

Option 4:
Lactose

Correct Answer:
Sucrose

Solution:
Sucrose is a non-reducing sugar

Q. 857 In the following question : two statements are given one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these question from the codes (i), (ii), (iii) and (iv) as given below :

Assertion (A) : Non-ideal solutions form azeotropic mixture.

Reason (R) : Maximum boiling azeotropes are formed by a solution showing negative deviation.

Option 1:
Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is the correct explanation of the Assertion (A).

Option 2:
Both Assertion (A) and Reason (R) are correct statements, but Reason (R) is not the correct explanation of the Assertion (A).

Option 3:
Assertion (A) is correct, but Reason (R) is incorrect statement.

Option 4:
Assertion (A) is incorrect, but Reason (R) is correct statement.

Correct Answer:
Both Assertion (A) and Reason (R) are correct statements, but Reason (R) is not the correct explanation of the Assertion (A).

Solution:
Both Assertion (A) and Reason (R) are correct statements, but Reason (R) is not the correct explanation of the Assertion (A).

Q. 858 In the following question : two statements are given one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these question from the codes (i), (ii), (iii) and (iv) as given below :

Assertion (A) : The complex $[Cr(H_2O)_3\ Cl_3]$ does not give precipitate with $AgNo_3$ solution.

Reason (R) : The complex $[Cr(H_2O)_3\ Cl_3]$ is non-ionizable.

Option 1:
Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is the correct explanation of the Assertion (A).

Option 2:
Both Assertion (A) and Reason (R) are correct statements, but Reason (R) is not the correct explanation of the Assertion (A).

Option 3:
Assertion (A) is correct, but Reason (R) is incorrect statement.

Option 4:
Assertion (A) is incorrect, but Reason (R) is correct statement.

Correct Answer:
Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is the correct explanation of the Assertion (A).

Solution:
Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is the correct explanation of the Assertion (A).

Q. 859 Define the following terms with a suitable example of each :

(i) Analgesics

(ii) Cationic detergent

Solution:
i) Analgesics are the chemical compounds which reduce pain

Example: aspirin

ii) Cationic detergents are quaternary ammonium salts with acetate

Example: cetyltrimethylammonium bromide.

Q. 860 (a) How can you show that complexes $[Co(NH_3)_5\ Cl]\ SO_4$ and $[Co(NH_3)_5SO_4]\ Cl$ are ionization isomers ?

(b) Write the formula of the following complex using IUPAC norms :

Potassium trioxalatochromate (iii)

Solution:
(a) On adding AgNO3, $[Co(NH_3)_5SO_4]\ Cl$ will give white ppt of AgCl but $[Co(NH_3)_5\ Cl]\ SO_4$ doesn't

(b) $K_3[Cr(C_2O_4)_3]$

Q. 861 (a) How can you explain the absence of an aldehyde group in the pentaacetate of D-glucose ?

(b) Name the bases present in RNA. Which one of these is not present in DNA ?

Solution:
a) The pentaacetate of glucose does not react with HCN or Schiff's reagent indicating the absence of an aldehyde group .

b) Bases present in RNA are Adenine, Guanine, Uracil and Cytosine

Uracil is not present in DNA.

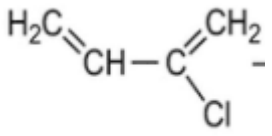
Q. 862 Write the names and structures of the monomers in the following polymers :

(i) Neoprene

(ii) Melamine-formaldehyde polymer

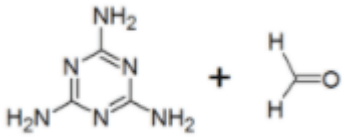
(iii) Teflon

Solution:
(i) Neoprene



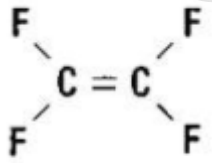
2-chlorobuta-1,3-diene

(ii) Melamine-formaldehyde polymer



Melamine and formaldehyde are monomers

(iii) Teflon



tetrafluoroethylene

Q. 863 Read the given passage and answer the question :

Colloidal particles always carry an electric charge which may be either positive or negative. For example, when $AgNO_3$ solution is added to KI solution, a negatively charged colloidal sol is obtained. The presence of equal and similar charges on colloidal particles provide stability to the colloidal sol and if, somehow, charge is removed, coagulation of sol occurs. Lyophobic sols are readily coagulated as compare to lyophilic sols.

What is the reason for the charge on sol particles ?

Solution:
Reason for the charge on sol particles is due to formulation of electrical double layer

Q. 864 Read the given passage and answer the question :

Colloidal particles always carry an electric charge which may be either positive or negative. For example, when $AgNO_3$ solution is added to KI solution, a negatively charged colloidal sol is obtained. The presence of equal and similar charges on colloidal particles provide stability to the colloidal sol and if, somehow, charge is removed, coagulation of sol occurs. Lyophobic sols are readily coagulated as compare to lyophilic sols.

Why the presence of equal and similar charges on colloidal particles provide stability ?

Solution:
The presence of equal and similar charges on colloidal particles is responsible in providing stability to the colloidal solution, because the repulsive forces between charged particles having same charge prevent them from coalescing or aggregating when they come closer to one another

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Q. 865 Read the given passage and answer the question :

Colloidal particles always carry an electric charge which may be either positive or negative. For example, when $AgNO_3$ solution is added to KI solution, a negatively charged colloidal sol is obtained. The presence of equal and similar charges on colloidal particles provide stability to the colloidal sol and if, somehow, charge is removed, coagulation of sol occurs. Lyophobic sols are readily coagulated as compare to lyophilic sols.

Why a negatively charged sol is obtained on adding $AgNO_3$ solution to KI solution ?

Solution:
A negatively charged sol is obtained on adding $AgNO_3$ solution to KI solution due to preferential adsorption of I^- from dispersion medium.

Q. 866 Read the given passage and answer the question :

Colloidal particles always carry an electric charge which may be either positive or negative. For example, when $AgNO_3$ solution is added to KI solution, a negatively charged colloidal sol is obtained. The presence of equal and similar charges on colloidal particles provide stability to the colloidal sol and if, somehow, charge is removed, coagulation of sol occurs. Lyophobic sols are readily coagulated as compare to lyophilic sols.

Name one method by which coagulation of lyophobic sol can be carried out.

Solution:
Coagulation of lyophobic sol can be carried out by electrophoresis.

Q. 867 Read the given passage and answer the question :

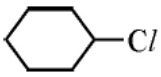
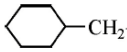
Colloidal particles always carry an electric charge which may be either positive or negative. For example, when $AgNO_3$ solution is added to KI solution, a negatively charged colloidal sol is obtained. The presence of equal and similar charges on colloidal particles provide stability to the colloidal sol and if, somehow, charge is removed, coagulation of sol occurs. Lyophobic sols are readily coagulated as compare to lyophilic sols.

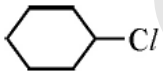
Out of KI or K_2SO_4, which electrolyte is better in the coagulation of positive sol ?

Solution:
K_2SO_4 is better in the coagulation of positive sol

Q. 868 Name the method applied for the concentration of Bauxite ore in the extraction of Aluminium.

Solution:
Baeyer's process is applied for the concentration of Bauxite ore in the extraction of Aluminium.

Q. 869 Out of  and  which one is more reactive towards S_N1 reaction ?

Solution:
 is more reactive towards S_N1 reaction

Q. 870 Write an isomer of C_3H_9N which gives foul smell of isocyanide when treated with chloroform and ethanolic $NaOH$.

Solution:
$CH_3–CH_2–CH_2–NH_2$

Q. 871 Which one of the following is an antidepressant drug ?
Chloramphenicol, Luminal, Bithional

Solution:
Luminal is an antidepressant drug

Q. 872 Write the name of component of starch which is water soluble.

Solution:
Amylose is water soluble.

Q. 873 How many ions are produced from the complex $[CO(NH_3)_5Cl]\quad Cl_2$ in solution ?

Option 1:
4

Option 2:
2

Option 3:
3

Option 4:
5

Correct Answer:
3

Solution:
$[CO(NH_3)_5Cl]\ \ Cl_2$ forms 3 ions

Q. 874 In a lead storage battery

Option 1:
PbO_2 is reduced to $PbSO_4$ at the cathode.

Option 2:
Pb is oxidised to $PbSO_4$ at the anode.

Option 3:
Both electrodes are immersed in the same aqueous solution of H_2SO_4.

Option 4:
All the above are true.

Correct Answer:
All the above are true.

Solution:
All the above are true for a lead storage battery.

Hence option D is correct

Q. 875 The slope in the plot of $ln\ \ [R]$ Vs. time gives

(where [R] is the final concentration of reactant.)

Option 1:
$+k$

Option 2:
$\frac{+k}{2.303}$

Option 3:
$-k$

Option 4:
$\frac{-k}{2.303}$

Correct Answer:
$-k$

Solution:
$-k$ is the slope

Hence option C is correct

Q. 876 The pair $[Co(NH_3)_4Cl_2]\,Br_2$ and $[Co(NH_3)_4Br_2]\,Cl_2$ will show

Option 1:
Linkage isomerism

Option 2:
Hydrate isomerism

Option 3:
Ionization isomerism

Option 4:
Coordinate isomerism

Correct Answer:
Ionization isomerism

Solution:
The pair $[Co(NH_3)_4Cl_2]\,Br_2$ and $[Co(NH_3)_4Br_2]\,Cl_2$ will show ionisation isomerism

Hence option C is correct

Q. 877 An α-helix is a structural feature of

Option 1:
Sucrose

Option 2:
Polypeptides

Option 3:
Nucleotides

Option 4:
Starch

Correct Answer:
Polypeptides

Solution:
An α-helix is a structural feature of Polypeptides

Q. 878

Assertion (A) : f_2 is a strong oxidising agent.

Reason (R) : Electron gain enthalpy of fluorine is less negative

Option 1:
Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is the correct explanation of the Assertion (A).

Option 2:
Both Assertion (A) and Reason (R) are correct statements, but Reason (R) is not the correct explanation of the Assertion (A).

Option 3:
Assertion (A) is correct, but Reason (R) is wrong statement.

Option 4:
Assertion (A) is wrong, but Reason (R) is correct statement.

Correct Answer:
Both Assertion (A) and Reason (R) are correct statements, but Reason (R) is not the correct explanation of the Assertion (A).

Solution:
Both Assertion (A) and Reason (R) are correct statements, but Reason (R) is not the correct explanation of the Assertion (A).

Q. 879

Assertion (A) : $(CH_3)_3\ C-O-CH_3$ gives $(CH_3)_3\ C-I$ and CH_3OH on treatment with HI.

Reason (R) : The reaction occurs by S_N1 mechanism.

Option 1:
Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is the correct explanation of the Assertion (A).

Option 2:
Both Assertion (A) and Reason (R) are correct statements, but Reason (R) is not the correct explanation of the Assertion (A).

Option 3:
Assertion (A) is correct, but Reason (R) is wrong statement.

Option 4:
Assertion (A) is wrong, but Reason (R) is correct statement.

Correct Answer:
Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is the correct explanation of the Assertion (A).

Solution:
Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is the correct explanation of the Assertion (A).

Q. 880

Assertion (A) : Transition metals have low melting points.

Reason (R) : The involvement of greater number of $(n-1)d$ and ns electrons in the interatomic metallic bonding.

Option 1:
Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is the correct explanation of the Assertion (A).

Option 2:
Both Assertion (A) and Reason (R) are correct statements, but Reason (R) is not the correct explanation of the Assertion (A).

Option 3:
Assertion (A) is correct, but Reason (R) is wrong statement.

Option 4:
Assertion (A) is wrong, but Reason (R) is correct statement.

Correct Answer:
Assertion (A) is wrong, but Reason (R) is correct statement.

Solution:
Assertion (A) is wrong, but Reason (R) is correct statement.

Q. 881

Assertion (A) : Hydrolysis of an ester follows first order kinetics.

Reason (R) : Concentration of water remains nearly constant during the course of the reaction.

Option 1:
Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is the correct explanation of the Assertion (A).

Option 2:
Both Assertion (A) and Reason (R) are correct statements, but Reason (R) is not the correct explanation of the Assertion (A).

Option 3:
Assertion (A) is correct, but Reason (R) is wrong statement.

Option 4:
Assertion (A) is wrong, but Reason (R) is correct statement.

Correct Answer:
Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is the correct explanation of the Assertion (A).

Solution:
Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is the correct explanation of the Assertion (A).

Q. 882

Assertion (A) : Benzoic acid does not undergo Friedal-Crafts reaction.

Reason (R) : The carboxyl group is activating and undergo electrophilic substitution reaction.

Option 1:
Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is the correct explanation of the Assertion (A).

Option 2:
Both Assertion (A) and Reason (R) are correct statements, but Reason (R) is not the correct explanation of the Assertion (A).

Option 3:
Assertion (A) is correct, but Reason (R) is wrong statement.

Option 4:
Assertion (A) is wrong, but Reason (R) is correct statement.

Correct Answer:
Assertion (A) is correct, but Reason (R) is wrong statement.

Solution:
Assertion (A) is correct, but Reason (R) is wrong statement.

Q. 883 What happens when

(i) a pressure greater than osmotic pressure is applied on the solution side separated from solvent by a semipermeable membrane ?
(ii) acetone is added to pure ethanol ?

Solution:
(i) When a pressure greater than osmotic pressure is applied on the solution side separated from solvent by a semipermeable membrane Reverse osmosis occurs
(ii) When acetone is added to pure ethanol Solution shows positive deviation from Raoult's Law

Q. 884 Write the principle of the following refining methods :

(a) vapour phase refining

(b) chromatography

Solution:
(a) In vapour phase refining metal is converted into its volatile compound which is collected and decomposed to give pure metal.

(b) In chromatography different components of a mixture are adsorbed to different extent on an adsorbent.

Q. 885 Write chemical equations involved to obtain :

(i) Cu from Cu_2S

(ii) Ag from $[Ag(CN)_2]^-$ complex

Solution:
(i) $2Cu_2S + 3O_2 \rightarrow 2Cu_2O + 2SO_2$

$2Cu_2O + Cu_2S \rightarrow 6Cu + SO_2 \rightarrow 2Cu + CO$

(ii) $2[Ag(CN)_2]^-_{(aq.)} + Zn_{(s)} \rightarrow 2Ag_{(s)} + [Zn(CN)_4]^{-2}_{(aq.)}$

Q. 886 Write the balanced chemical equations involved in the preparation of $KMnO_4$ from pyrolusite ore (MnO_2).

Solution:

$2MnO_2 + 4KOH + O_2 \rightarrow 2K_2MnO_4 + 2H_2O$

$3MnO_4^{-2} + 4H^+ \rightarrow 2MnO_4^{-2} + MnO_2 + 2H_2O$

$MnO_4^{-2} \overset{electrolysis}{\rightarrow} MnO_4^- + e^-$

Q. 887 Write the balanced ionic equations showing the oxidising action of acidified dichromate $(Cr_2O_7^{2-})$ solution with (i) Iron (II) Ion and (ii) tin (II) ion.

Solution:

$Cr_2O_7^{-2} + 16Fe^{+2} + 14H^+ \rightarrow 2Cr^{+3} + 6Fe^{+3} + 7H_2O$

$Cr_2O_7^{-2} + 3Sn^{+2} + 14H^+ \rightarrow 2Cr^{+3} + 3Sn^{+4} + 7H_2O$

Q. 888 Write the IUPAC names and hybridisation of the following complexes :

(i) $[Ni(CN)_4]^{2-}$ (ii) $[Fe(H_2O)_6]^{2+}$

(Given : Atomic number $Ni = 28,\ Fe = 26$)

Solution:

(i) Tetracyanidonickelate(II); dsp^2

(ii) Hexaaquairon(II); sp^3d

Q. 889 Define the following terms with a suitable example in each :

(i) Antibiotics (ii) Antiseptics

Solution:

(i) Antibiotics are chemical substance which in low concentrations inhibits the growth or destroys

microorganisms. eg: Pencillin

(ii) Antiseptics are the chemical substances applied to the living tissues which prevent the growth or kill the microorganisms. eg: Dettol

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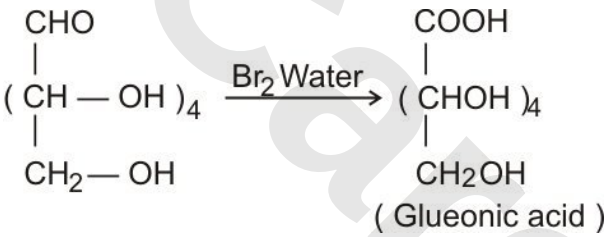
Q. 890 Write the reactions showing the presence of following in the open structure of glucose :

(i) a carbonyl group

(ii) Straight chain with six carbon atoms

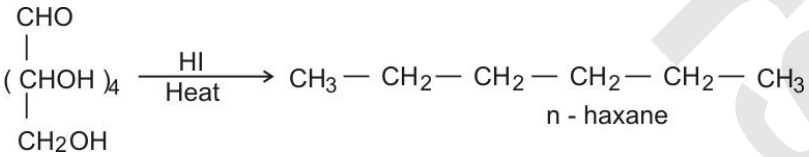
Solution:
(i) A carbonyl group



This indicates that the carbonyl group is present as an aldehyde group.

(ii) Straight chain with six carbon atoms

Glucose reacts with HI to form n - hexane indicating that the six carbons are linked in straight chain



Q. 891 State Henry's law. Calculate the solubility of CO_2 in water at $298\ K$ under $760\ mm\ Hg$. (K_H for CO_2 in water at $298\ K$ is $1.25 \times 106\ mm\ Hg$)

Solution:
Henry's law states that the partial pressure of the gas in vapour phase (p) is directly proportional to the mole fraction of gas(x) in the solution.

$p = K_H.x$

$x = p/K_H$

$x = 760/1.25 \times 10^6$

$= 6.08 \times 10^{-4}$

Q. 892 The freezing point of a solution containing $5g$ of benzoic acid $(M = 122\ g\ mol^{-1})$ in $35\ g$ of benzene is depressed by $2.94\ K$. What is the percentage association of benzoic acid if it forms a dimer in solution ?
(Kf for benzene $= 4.9\ K\ kg\ mol^{-1}$)

Solution:

$$\Delta T_f = iK_f m$$
$$2.94 = i \times 4.9 \times 5 \times 1000/122 \times 35$$
$$i = 0.512$$
$$\alpha = i - 1/\frac{1}{n} - 1$$
$$= 0.976$$
$$= 97.6percent$$

Q. 893 The rate constant for the first order decomposition of N_2O_5 is given by the following equation :

$$k = (2.5 \times 10^{14} s^{-1}) e^{(-25000K)/T}$$

Calculate Ea for this reaction and rate constant if its half-life period be 300 minutes

Solution:

$$k = (2.5 \times 10^{14} s^{-1}) e^{(-25000K)/T}$$
$$-E_a/RT = -25000K/T$$
$$E_a/R = 25000K E_a = 25000 \times R = 207850J/mol$$
$$t_{\frac{1}{2}} = 0.693/k$$
$$k = 0.693/300min$$
$$0.00231min^{-1}$$

Q. 894 Write the name and structures of monomer(s) in the following polymers :

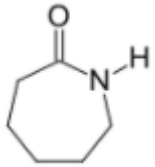
(i) Nylon-6

(ii) PVC

(iii) Neoprene

Solution:
(i) Nylon-6

Caprolactum



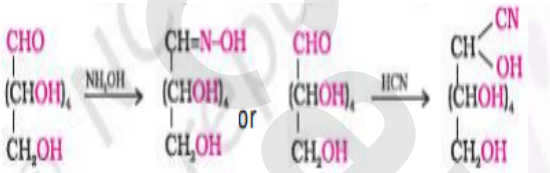
(ii) PVC

CH_2=CH-Cl

Vinyl Chloride

(iii) Neoprene

Chloroprene



Q. 895 Following ions are given :

$Cr^{2+}, Cu^{2+}, Cu^{+}, Fe^{2+}, Fe^{3+}, Mn^{3+}$

Identify the ion which is

(i) a strong reducing agent.

(ii) unstable in aqueous solution.

(iii) a strong oxiding agent.

Give suitable reason in each.

Solution:

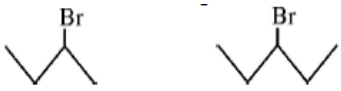
(i) Cr^{2+} is a strong reducing agent, because the stable state of chromium is +3 due to configuration.

(ii) $Cu^{+}_{(aq)}$ is unstable in aqueous solution due to more negative $\Delta_{hyd}H^{0}$ of $Cu^{2+}_{(aq)}$ than $Cu^{+}_{(aq)}$

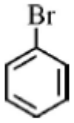
(iii) Mn^{3+} is a strong oxidising agent, because the most stable state of manganese is +2 due to half filled configuration i.e $3d^5$

Q. 896 (i) Write the structure of major alkene formed by β-elimination of $2,2,3-trimethyl-3-bromopentane$ with sodium ethoxide in ethanol.

(ii) Which one of the compounds in the following pairs is chiral ?



(iii) Identify (A) and (B) in the following :

$(A) \overset{Na/dry\ ether}{\leftarrow}$  $\overset{Mg/dry\ ether}{\rightarrow} (B)$

Solution:

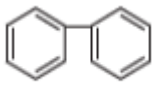
(i) $(CH_3)_3C\text{-}C(CH_3)=CHCH_3$

(ii)

 is chiral

(iii)

A=



B= C_6H_5MgBr

Q. 897 How can you convert the following ?

(i) $But-1-ene$ to $1-iodobutane$

(ii) Benzene to acetophenone

(iii) Ethanol to propanenitrile

Solution:

(i) $But-1-ene$ to $1-iodobutane$

$$CH_3CH_2CH=CH_2 \overset{HBr/peroxide}{\rightarrow} CH_3CH_2CH_2CH_2-Br \overset{NaI/acetone}{\rightarrow} CH_3CH_2CH_2CH_2-I$$

(ii) Benzene to acetophenone

$$C_6H_6 \xrightarrow[AlCl_3]{CH_3COCl} C_6H_5COCH_3$$

(iii) Ethanol to propanenitrile

$$CH_3CH_2OH \overset{PCl_5}{\rightarrow} CH_3CH_2Cl \overset{KCN}{\rightarrow} CH_3CH_2CN$$

Q. 898 Arrange the following compounds as directed :

(i) In increasing order of solubility in water :

$$(CH_3)_2NH,\ \ CH_3NH_2,\ \ C_6H_5NH_2$$

(ii) In decreasing order of basic strength in aqueous solution :

$$(CH_3)_3N,\ \ (CH_3)_2NH,\ \ CH_3NH_2$$

(iii) In increasing order of boiling point :

$$(C_2H_5)_2NH,\ \ (C_2H_5)_3N,\ \ C_2H_5NH_2$$

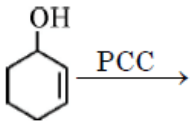
Solution:

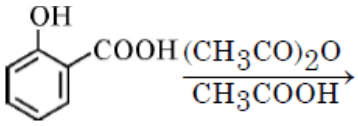
(i) $C_6H_5NH_2 < (CH_3)_2NH < CH_3NH_2$

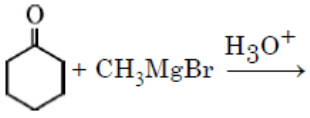
(ii) $(CH_3)_2NH > CH_3NH_2 > (CH_3)_3N$

(iii) $(C_2H_5)_3N < (C_2H_5)_2NH < C_2H_5NH_2$

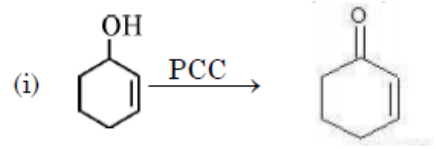
Q. 899 Write the product(s) of the following reactions :

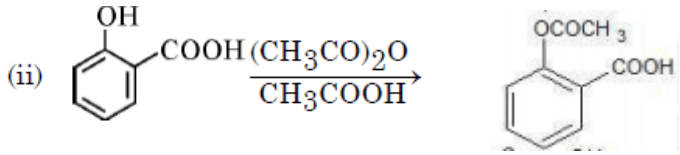
(i) 

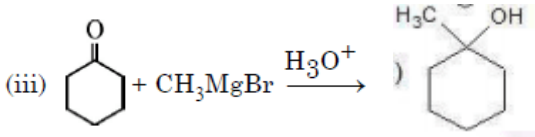
(ii) 

(iii) 

Solution:

(i) 

(ii) 

(iii) 

Q. 900 (a) Write the mechanism of the following S_N1 reaction :

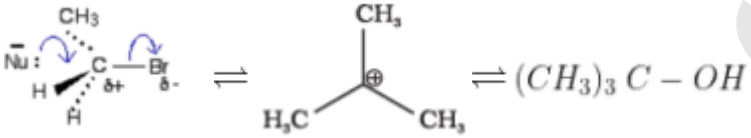
$$(CH_3)_3\,C-Br \overset{Aq.NaOH}{\rightarrow} (CH_3)_3\,C-OH+NaBr$$

(b) Write the equation for the preparation of $2-methyl-2-methoxypropane$ by Williamson synthesis.

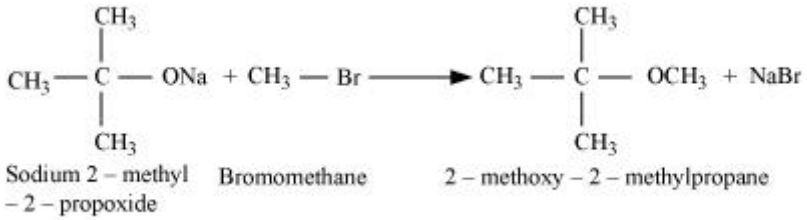
Solution:

(a)

$$(CH_3)_3\,C-Br \overset{Aq.NaOH}{\rightarrow} (CH_3)_3\,C-OH+NaBr$$



(b)



Q. 901 (a) The electrical resistance of a column of $0.05\ M\ KOH$ solution of length $50\ cm$ and area of cross-section $0.625\ cm^2$ is $5 \times 10^3\ ohm$. Calculate its resistivity, conductivity and molar conductivity.

(b) Predict the products of electrolysis of an aqueous solution of $CuCl_2$ with platinum electrodes.

(Given : $E^\circ_{Cu^{2+}/Cu} = +0.34\ V. E^\circ_{(\frac{1}{2}Cl_2/Cl^-)} = +1.36\ V$

$E^\circ_{H^+/H_2(g),Pt} = 0.00\ V. E^\circ_{(\frac{1}{2}O_2/H_2O)} = +1.23\ V$)

Solution:

(a)

$$R = \rho l/a = 5 \times 10^3 \times 0.625/50 = 62.5\Omega$$
$$Conductivity = \kappa = 1/\rho = 1/62.5 = 0.016\Omega^{-1}cm^{-1}$$
$$Molar - conductivity = \Lambda_m = \kappa \times 1000/c = 320\Omega^{-1}cm^2mol^{-1}$$

(b)

Given :

$$E^\circ_{Cu^{2+}/Cu} = +0.34\ V. E^\circ_{(\frac{1}{2}Cl_2/Cl^-)} = +1.36\ V$$

$$E^\circ_{H^+/H_2(g),Pt} = 0.00\ V. E^\circ_{(\frac{1}{2}O_2/H_2O)} = +1.23\ V$$

At cathode :

$Cu^{2+} + 2e^- \rightarrow Cu$

Because $E^0_{Cu^{2+}/Cu} > E^0_{H^+/H2}$

At anode:

$H_2O \rightarrow 1/2\ O_2 + 2H^+ + 2e^-$

This reaction should occur at anode but due to over-potential of O_2, oxidation of Cl^- is preferred.

Hence the reaction is

$2Cl^- \rightarrow Cl_2 + 2e^-$

Q. 902 (a) Calculate e.m.f. of the following cell :

$$Zn(s)/Zn^{2+}(0.1\ M)\,||\,(0.01\ M)\ Ag^{+}/Ag(s)$$

Given : $E^{\circ}_{Zn^{2+}/Zn} = -0.76\ V. E^{\circ}_{Ag^{+}/Ag} = +0.80\ V$

$[Given : log\ 10 = 1]$

(b) X and Y are two electrolytes. On dilution molar conductivity of $'X'$ increases 2.5 times while that Y increases 25 times. Which of the two is a weak electrolyte and why ?

Solution:
(a)

$$Zn(s)/Zn^{2+}(0.1\ M)\,||\,(0.01\ M)\ Ag^{+}/Ag(s)$$

Given : $E^{\circ}_{Zn^{2+}/Zn} = -0.76\ V. E^{\circ}_{Ag^{+}/Ag} = +0.80\ V$

$[Given : log\ 10 = 1]$

$E^0_{cell} = E^0_C - E^0_A$

= 0.80 – (-0.76) = 1.56 V

$E_{cell} = E^0_{cell} - 0.0591/n \log [Zn^{+2}]/[Ag^{+}]^2$

= 1.47 V

(b) Y is weak electrolyte , as molar conductivity increases with dilution due to increase in degree of dissociation.

Q. 903 (a) An organic compound (A) having molecular formula C_4H_8O gives orange red precipitate with $2,4-DNP$ reagent. It does not reduce Tollens' reagent but gives yellow precipitate of iodoform on heating with $NaOH$ and I_2. Compound (A) on reduction with $NaBH_4$ gives compound (B) which undergoes dehydration reaction on heating with conc. H_2SO_4 to form compound (C). Compound (C) on Ozonolysis gives two molecules of ethanal.

Identify (A), (B) and (C) and write their structures. Write the reactions of compound (A) with (i) $NaOH/I_2$ and (ii) $NaBH_4$.

(b) Give reasons :

(i) Oxidation of propanal is easier than propanone.

(ii) α-hydrogen of aldehydes and ketones is acidic in nature.

Solution:
(a) A = $CH_3COCH_2CH_3$

B = $CH_3CHOHCH_2CH_3$

C = $CH_3CH=CHCH_3$

CH3COCH2CH3 $\overset{NaOH+I_2}{\rightarrow}$ CHI_3 + CH_3CH_2COONa

$CH_3COCH_2CH_3$ $\overset{NaBH_4}{\rightarrow}$ $CH_3CHOHCH_2CH_3$

(b)

i) Oxidation of propanal is easier than propanone because cleavage of C-H bond in propanal is easier than C-C bond in propanone.

ii) α-hydrogen of aldehydes and ketones is acidic in nature due to resonance stabilization of conjugate base / enolate ion or structural representation.

Q. 904 (a) Draw structures of the following derivatives :

(i) Cyanohydrin of cyclobutanone

(ii) Hemiacetal of ethanal

(b) Write the major product(s) in the following :

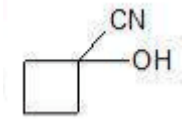
(i) $CH_3 - CH = CH - CH_2 - CN \xrightarrow[(ii)H_3O+]{(i)DIBAL-H}$

(ii) $CH_3 - CH_2 - OH \overset{CrO_3}{\rightarrow}$

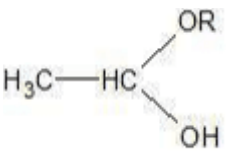
(c) How can you distinguish between propanal and propanone ?

Solution:
(a)

(i) Cyanohydrin of cyclobutanone



(ii) Hemiacetal of ethanal



(b)

(i)

$$CH_3 - CH = CH - CH_2 - CN \xrightarrow[(ii)H_3O^+]{(i)DIBAL-H} H_3C{-}CH{=}CH{-}CH_2{-}CHO$$

(ii)

$$CH_3 - CH_2 - OH \xrightarrow{CrO_3} CH_3CHO$$

(c) On heating with NaOH + I_2, propanone gives yellow ppt. of CHI_3 while propanal doesn't.

Q. 905 (a) Account for the following :

(i) Tendency to show -2 oxidation state decreases from oxygen to tellurium.

(ii) Acidic character increases from HF to HI.

(iii) Moist SO_2 gas acts as a reducing agent.

(b) Draw the structure of an oxoacid of sulphur containing $S - O - S$ linkage.

(c) Complete the following equation :

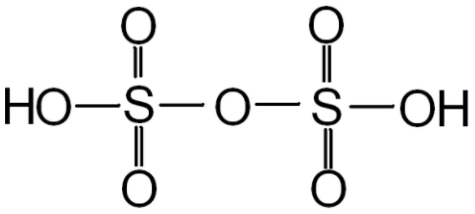
$$XeF_2 + H_2O \rightarrow$$

Solution:
(a)

(i) Tendency to show -2 oxidation state decreases from oxygen to tellurium because of decrease in electronegativity .

(ii) Acidic character increases from HF to HI.

(iii) Moist SO_2 gas acts as a reducing agent because of decrease in bond dissociation enthalpy from HF to HI.

(b) 

(c) $2XeF_2 + 2H_2O \rightarrow 2Xe + 4HF + O_2$

Q. 906 (a) Among the hydrides of group 16, write the hydride

(i) Which is a strong reducing agent.

(ii) Which has maximum bond angle.

(iii) Which is most thermally stable.

Give suitable reason in each.

(b) Complete the following equations :

$$S + H_2SO_4 \underset{(Conc.)}{\rightarrow}$$

$$Cl_2 + NaOH \underset{(Cold\ and\ dilute)}{\rightarrow}$$

Solution:
(a)

(i) H_2Te is a strong reducing agent because of low bond dissociation enthalpy

(ii) H_2O has maximum bond angle, because of small size and high electronegativity of oxygen, bond pair–bond pair repulsion is more.

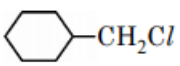
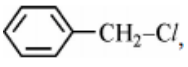
(iii) H_2O is most thermally stable, because of high bond dissociation enthalpy.

(b) $S + 2H_2SO_4 \rightarrow 3SO_2 + 2H_2O$

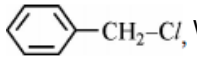
$Cl_2 + NaOH \rightarrow NaCl + NaOCl + H_2O$

Q. 907 Name the depressant which is used to separate PbS and ZnS containing ore in froth floatation process.

Solution:
NaCN

Q. 908 Out of  and  , which will react faster in S_N1 reaction with OH^-?

Solution:



will react faster in S_N1 reaction with OH^- as it forms more stable carbocation

Q. 909 Out of CH_3NH_2 and CH_3OH, which has higher boiling point ?

Solution:
CH_3OH has higher boiling point as it has more strong H bonding

Q. 910 Which one of the following is a narcotic analgesic ?

Penicillin, Codeine, Ranitidine

Solution:
Codeine is a narcotic analgesic

Q. 911 Write the name of linkage joining two monosaccharides.

Solution:
Glycosidic linkagejoins two monosaccharides.

Q. 912 The coordination number of $'Co'$ in the complex $[Co(en)_3]^{3+}$ is

Option 1:
3

Option 2:
6

Option 3:
4

Option 4:
5

Correct Answer:
6

Solution:
The coordination number of $'Co'$ in the complex $[Co(en)_3]^{3+}$ is 6

Q. 913 An electrochemical cell behaves like an electrolytic cell when

Option 1:
$E_{cell} = E_{external}$

Option 2:
$E_{cell} = 0$

Option 3:
$E_{external} > E_{cell}$

Option 4:
$E_{external} < E_{cell}$

Correct Answer:
$E_{external} > E_{cell}$

Solution:
An electrochemical cell behaves like an electrolytic cell when $E_{external} > E_{cell}$

Q. 914 The half-life period for a zero order reaction is equal to

(where $[R]_0$ is initial concentration of reactant and k is rate constant.)

Option 1:
$\frac{0.693}{k}$

Option 2:
$\frac{2k}{[R]_0}$

Option 3:
$\frac{2.303}{k}$

Option 4:
$\frac{[R]_0}{2k}$

Correct Answer:
$\frac{[R]_0}{2k}$

Solution:
The half-life period for a zero order reaction is equal to

$$\frac{[R]_0}{2k}$$

Q. 915 The crystal field splitting energy for octahedral (Δ_0) and tetrahedral (Δ_t) complexes is related as

Option 1:
$\Delta_t = \frac{2}{9}\ \Delta_0$

Option 2:
$\Delta_t = \frac{5}{9}\ \Delta_0$

Option 3:
$\Delta_t = \frac{4}{9}\ \Delta_0$

Option 4:
$\Delta_t = 2\ \Delta_0$

Correct Answer:
$\Delta_t = \frac{4}{9}\ \Delta_0$

Solution:
The crystal field splitting energy for octahedral (Δ_0) and tetrahedral (Δ_t) complexes is related as

$$\Delta_t = \frac{4}{9}\ \Delta_0$$

Q. 916 $\alpha - D(+)$ glucose and $\beta - D(+)$ glucose are

Option 1:
Geometrical isomers

Option 2:
Enantiomers

Option 3:
Anomers

Option 4:
Optical isomers

Correct Answer:
Anomers

Solution:
$\alpha - D(+)$ glucose and $\beta - D(+)$ glucose are Anomers

---

Q. 917

Assertion (A) : f_2 has lower bond dissociation enthalpy than Cl_2.

Reason (R) : Fluorine is more electronegative than chlorine.

Option 1:
Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is the correct explanation of the Assertion (A).

Option 2:
Both Assertion (A) and Reason (R) are correct statements, but Reason (R) is not the correct explanation of the Assertion (A).

Option 3:
Assertion (A) is correct, but Reason (R) is wrong statement.

Option 4:
Assertion (A) is wrong, but Reason (R) is correct statement.

Correct Answer:
Both Assertion (A) and Reason (R) are correct statements, but Reason (R) is not the correct explanation of the Assertion (A).

Solution:
Both Assertion (A) and Reason (R) are correct statements, but Reason (R) is not the correct explanation of the Assertion (A).

Q. 918

Assertion (A) : Transition metals have high melting point.

Reason (R) : Transition metals have completely filled d-orbitals.

Option 1:
Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is the correct explanation of the Assertion (A).

Option 2:
Both Assertion (A) and Reason (R) are correct statements, but Reason (R) is not the correct explanation of the Assertion (A).

Option 3:
Assertion (A) is correct, but Reason (R) is wrong statement.

Option 4:
Assertion (A) is wrong, but Reason (R) is correct statement.

Correct Answer:
Assertion (A) is correct, but Reason (R) is wrong statement.

Solution:
Assertion (A) is correct, but Reason (R) is wrong statement.

Q. 919 Define the following terms with a suitable example in each :

(i) Tranquilizers (ii) Anionic detergent

Solution:
(i) Tranquilizers are chemical compounds used for the treatment of stress, and mild or even severe mental diseases. Example : Equanil

(ii) Anionic detergents are sodium salts of sulphonated long chain alcohols or hydrocarbons. Example : Sodium Lauryl sulphate

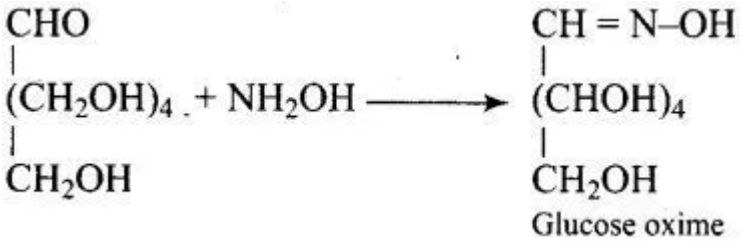
---

Q. 920 Write the reactions showing the presence of following in the open structure of glucose :

(i) an aldehyde group

(ii) a primary alcohol

Solution:
(i) an aldehyde group



Glucose oxime

(ii) a primary alcohol

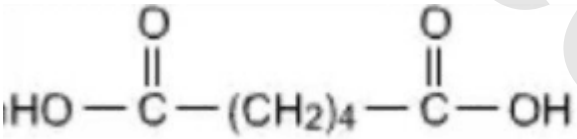
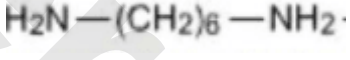
On oxidation with Nitric acid (HNO3),glucose as well as gluconic acid both yeild a dicarboxylic acid (saccharic acid). This indicates the presence of a primary alcoholic group in glucose.

Q. 921 Write the name and structures of monomers in the following polymers :

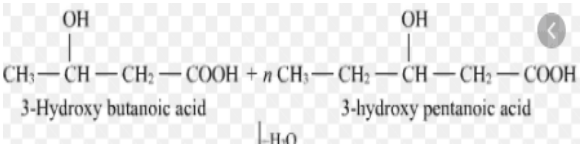
(i) Nylon 6, 6 (ii) Terylene (iii) PHBV

Solution:
(i) Nylon 6, 6

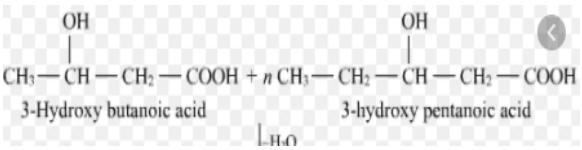
Adipic acid and Hexamethylene diamine


and 

(ii) Terylene



(iii) PHBV



Q. 922 Name the method used for the refining of Zinc.

Solution:
Electrolytic refining is used for the refining of Zinc.

Q. 923 Out of $CH_3CH_2CH_2Cl$ and$CH_2 = CH - CH_2 - Cl$, which one is more reactive towards S_N1 reaction ?

Solution:
$CH_2 = CH - CH_2 - Cl$ is more reactive towards S_N1 reaction

Q. 924 Write an isomer of C_3H_9N which does not react with Hinsberg reagent.

Solution:
$(CH_3)_3N$ isomer of C_3H_9N does not react with Hinsberg reagent.

Q. 925 What type of protein is present in keratin ?

Solution:
Fibrous Proteins

Q. 926 Name the compound which is added to soap to provide antiseptic properties.

Solution:
Bithional is added to soap to provide antiseptic properties.

Q. 927 Which of the following is the most stable complex ?

Option 1:
$[Fe(CO)_5]$

Option 2:
$[Fe(H_2O)_6]^{3+}$

Option 3:
$[Fe(C_2O_4)_3]^{3-}$

Option 4:
$[Fe(CN)_6]^{3-}$

Correct Answer:
$[Fe(C_2O_4)_3]^{3-}$

Solution:
$[Fe(C_2O_4)_3]^{3-}$ is the most stable complex due to chelation

Q. 928 Which of the following is correct for spontaneity of a cell ?

Option 1:
$\Delta G = -ve\ E^\circ = +ve$

Option 2:
$\Delta G = +ve\ E^\circ = 0$

Option 3:
$\Delta G = -ve\ E^\circ = 0$

Option 4:
$\Delta G = +ve\ E^\circ = -ve$

Correct Answer:
$\Delta G = -ve\ E^\circ = +ve$

Solution:
$\Delta G = -ve\ E^\circ = +ve$

Q. 929 For a zero order reaction, the slope in the plot of $[R]$ Vs. time is

(where $[R]$ is the final concentration of reactant)

Option 1:
$\frac{-k}{2.303}$

Option 2:
$-k$

Option 3:
$\frac{+k}{2.303}$

Option 4:
$+k$

Correct Answer:
$-k$

Solution:
For a zero order reaction, $-k$ is the slope in the plot of $[R]$ Vs. time

Q. 930 What type of isomerism is shown by the pair $[Cr(H_2O)_6]\ Cl_3$ and $[Cr(H_2O)_5]\ Cl_2 \cdot H_2O$?

Option 1:
Ionization isomerism

Option 2:
Coordination isomerism

Option 3:
Solvate isomerism

Option 4:
Linkage isomerism

Correct Answer:
Solvate isomerism

Solution:
Solvate isomerism is shown by the pair $[Cr(H_2O)_6]\ Cl_3$ and $[Cr(H_2O)_5]\ Cl_2 \cdot H_2O$

Q. 931 Which one is the complementary base of cytosine in one strand to that in other strand of DNA ?

Option 1:
Adenine

Option 2:
Guanine

Option 3:
Thymine

Option 4:
Uracil

Correct Answer:
Guanine

Solution:
Guanine is the complementary base of cytosine in one strand to that in other strand of DNA

Q. 932

Assertion (A) : f_2 has low reactivity.

Reason (R) : F-F bond has low $\Delta_{bond}H^{\circ}$

Option 1:
Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is the correct explanation of the Assertion (A).

Option 2:
Both Assertion (A) and Reason (R) are correct statements, but Reason (R) is not the correct explanation of the Assertion (A).

Option 3:
Assertion (A) is correct, but Reason (R) is wrong statement.

Option 4:
Assertion (A) is wrong, but Reason (R) is correct statement.

Correct Answer:
Assertion (A) is wrong, but Reason (R) is correct statement.

Solution:
Assertion (A) is wrong, but Reason (R) is correct statement.

Q. 933

Assertion (A) : For complex reactions molecularity and order are not same

Reason (R) : Order of reaction may be zero.

Option 1:
Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is the correct explanation of the Assertion (A).

Option 2:
Both Assertion (A) and Reason (R) are correct statements, but Reason (R) is not the correct explanation of the Assertion (A).

Option 3:
Assertion (A) is correct, but Reason (R) is wrong statement.

Option 4:
Assertion (A) is wrong, but Reason (R) is correct statement.

Correct Answer:
Both Assertion (A) and Reason (R) are correct statements, but Reason (R) is not the correct explanation of the Assertion (A).

Solution:
Both Assertion (A) and Reason (R) are correct statements, but Reason (R) is not the correct explanation of the Assertion (A).

Q. 934 Write the IUPAC name and hybridisation of the following complexes :

(i) $[Co(NH_3)_6]^{3+}$ (ii) $[NiCl_4]^{2-}$

(Given : Atomic number : $Ni = 28,\ Co = 27$)

Solution:
i) $[Co(NH_3)_6]^{3+}$= Hexaamminecobalt(III) d^2sp^3

ii) $[NiCl_4]^{2-}$ = Tetrachloridonickelate(II) sp^3

Q. 935 Write the balanced chemical equations involved in the preparation of $KMnO_4$ from pyrolusite ore (MnO_2).

Solution:
$2MnO_2 + 4KOH + O_2 \longrightarrow 2K_2MnO_4 + 2H_2O$

$3MnO_4^{2-} + 4H^+ \longrightarrow 2\ MnO_4^{2-} + MnO_2 + 2H_2O$

$MnO_4^{2-} \xrightarrow{electrolyticoxidation} MnO_4^- + e^-$

Q. 936 Write the balanced ionic equations showing the oxidising action of acidified dichromate $(Cr_2O_7^{2-})$ solution with (i) Iron (II) Ion and (ii) tin (II) ion.

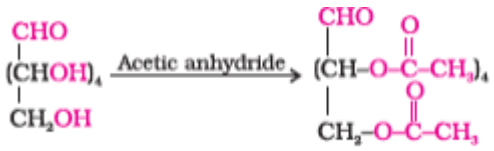
Solution:
$Cr_2O_7^{2-} + 6Fe^{2+} + 14H^+ \longrightarrow 2Cr^{3+} + 6Fe^{3+} + 7H_2O$
$Cr_2O_7^{2-} + 3Sn^{2+} + 14H^+ \longrightarrow 2Cr^{3+} + 3Sn^{4+} + 7H_2O$

Q. 937 Write the reactions showing the presence of following in the open structure of glucose :

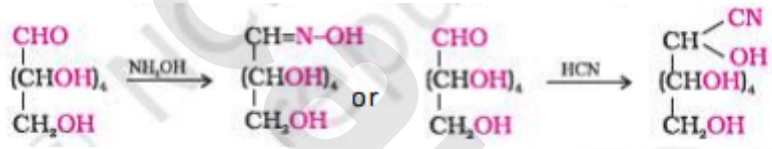
(i) five $-OH$ groups (ii) a carbonyl group

Solution:

(i) five $-OH$ groups



(ii) a carbonyl group



Q. 938 Define the following terms with a suitable example in each :

(i) Antacids (ii) Artificial Sweetener

Solution:

i) Chemical substances used for the treatment of hyperacidity in the stomach

Example: $Al(OH)_3$

ii) Chemical substances used to provide sweetness to food with low calories

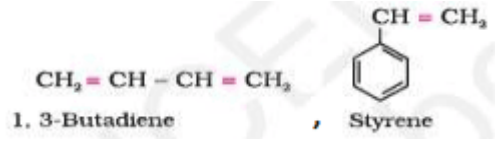
Example: Sucralose

Q. 939 Write the names and structures of monomers in the following polymers :

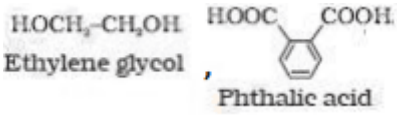
(a) $Buna-S$ (b) Glyptal (c) Bakelite

Solution:

(a) $Buna-S$



(b) Glyptal



(c) Bakelite

, HCHO ; Phenol and formaldehyde

Q. 940

Read the given passage and answer the question :

The halogens have the smallest atomic radii in their respective periods. The atomic radius of fluorine is extremely small. All halogens exhibit -1 oxidation state. They are strong oxidising agents and have maximum negative electron gain enthalpy. Among halogens, fluorine shows anomalous behaviour in many properties. For example electro negativity and ionisation enthalpy are higher for fluorine than expected whereas bond dissociation enthalpy, m.p. and b.p. and electron gain enthalpy are quite lower than expected. Halogens react with hydrogen to give hydrogen halides (HX) and combine amongst themselves to form a number of compounds of the type XX', XX_3', XX_5' and XX_7' called inter-halogens.

Why halogens have maximum negative electron gain enthalpy ?

Solution:
Halogens have maximum negative electron gain enthalpy because by gaining one electron they acquire noble gas configuration/ smallest size and high effective nuclear charge in their respective period.

Q. 941

Read the given passage and answer the question :

The halogens have the smallest atomic radii in their respective periods. The atomic radius of fluorine is extremely small. All halogens exhibit – 1 oxidation state. They are strong oxidising agents and have maximum negative electron gain enthalpy. Among halogens, fluorine shows anomalous behaviour in many properties. For example electro negativity and ionisation enthalpy are higher for fluorine than expected whereas bond dissociation enthalpy, m.p. and b.p. and electron gain enthalpy are quite lower than expected. Halogens react with hydrogen to give hydrogen halides (HX) and combine amongst themselves to form a number of compounds of the type XX', XX_3', XX_5' and XX_7' called inter-halogens.

Why fluorine shows anomalous behaviour as compared to other halogens ?

Solution:
Fluorine shows anomalous behaviour as compared to other halogens because of its extremely small size/

absence of d orbital/highest electronegativity / low bond dissociation enthalpy of F-F bond.

Q. 942

Read the given passage and answer the question:

The halogens have the smallest atomic radii in their respective periods. The atomic radius of fluorine is extremely small. All halogens exhibit – 1 oxidation state. They are strong oxidising agents and have maximum negative electron gain enthalpy. Among halogens, fluorine shows anomalous behaviour in many properties. For example electro negativity and ionisation enthalpy are higher for fluorine than expected whereas bond dissociation enthalpy, m.p. and b.p. and electron gain enthalpy are quite lower than expected. Halogens react with hydrogen to give hydrogen halides (HX) and combine amongst themselves to form a number of compounds of the type XX', XX_3', XX_5' and XX_7' called inter-halogens.

Arrange the hydrogen halides (HF to HI) in the decreasing order of their reducing character.

Solution:
Hydrogen halides (HF to HI) in the decreasing order of their reducing character are HI>HBr>HCl>HF

Q. 943

Read the given passage and answer the question:

The halogens have the smallest atomic radii in their respective periods. The atomic radius of fluorine is extremely small. All halogens exhibit – 1 oxidation state. They are strong oxidising agents and have maximum negative electron gain enthalpy. Among halogens, fluorine shows anomalous behaviour in many properties. For example electro negativity and ionisation enthalpy are higher for fluorine than expected whereas bond dissociation enthalpy, m.p. and b.p. and electron gain enthalpy are quite lower than expected. Halogens react with hydrogen to give hydrogen halides (HX) and combine amongst themselves to form a number of compounds of the type XX', XX_3', XX_5' and XX_7' called inter-halogens.

Why fluorine is a stronger oxidizing agent than chlorine ?

Solution:
Fluorine is a stronger oxidizing agent than chlorine because Low bond dissociation enthalpy and high hydration enthalpy.

Q. 944 Read the given passage and answer the questions.

The halogens have the smallest atomic radii in their respective periods. The atomic radius of fluorine is extremely small. All halogens exhibit – 1 oxidation state. They are strong oxidising agents and have maximum negative electron gain enthalpy. Among halogens, fluorine shows anomalous behaviour in many properties. For example electro negativity and ionisation enthalpy are higher for fluorine than expected whereas bond dissociation enthalpy, m.p. and b.p. and electron gain enthalpy are quite lower than expected. Halogens react with hydrogen to give hydrogen halides (HX) and combine amongst themselves to form a number of compounds of the type$XX',\ XX_3',\ XX_5'$ and XX_7' called inter-halogens.

What are the sizes of x and X' in the interhalogen compounds ?

Solution:
X is bigger in size and X' is smaller.

Q. 945 Name the cell used in hearing aids and watches.

Solution:
Mercury cell is used in hearing aids and watches.

Q. 946 How much charge in terms of Faraday is required to reduce one mol of MnO_4^- to Mn^{2+} ?

Solution:
It goes from +7 to +2 oxidization state, hence the change of 5 electronic charges is seen in one molecule, hence 5F of charge is required to reduce one mol of MnO_4^- to Mn^{2+}

Q. 947 Write the slope value obtained in the plot of $log\,[R_o]\,/\,[R]$Vs. time for a first order reaction.

Solution:
For first order reaction.

$\ln[R] = -kt + \ln[R]_0$

$\ln[R]_0 - \ln[R] = kt$

$\ln \{[R]_0/[R]\} = kt$

$2.303 \log \{[R]_0/[R]\} = kt$

$log\,[R_o]\,/\,[R]$ = kt/2.303

Hence slope is k/2.303

Q. 948 Name the sweetening agent used in the cooking of sweets for a diabetic patient.

Solution:
Saccharine is the sweetening agent used in the cooking of sweets for a diabetic patient.

Q. 949 Name the polymer which is used for making electrical switches and combs.

Solution:
Bakelite polymer which is used for making electrical switches and combs.

Q. 950 In the Mond's process the gas used for the refining of a metal is

Option 1:
H_2

Option 2:
CO_2

Option 3:
CO

Option 4:
N_2

Correct Answer:
CO

Solution:
In the Mond's process the gas used for the refining of a metal is CO.

Q. 951 The conversion of an alkyl halide into an alcohol by aqueous $NaOH$ is classified as

Option 1:
a dehydrohalogenation reaction

Option 2:
a substitution reaction

Option 3:
an addition reaction

Option 4:
a dehydration reaction

Correct Answer:
a substitution reaction

Solution:
The conversion of an alkyl halide into an alcohol by aqueous $NaOH$ is classified as substitution reaction.

Hence option B is correct

Q. 952 CH_3CONH_2 on reaction with $NaOH$ and Br_2 in alcoholic medium gives

Option 1:
$CH_3CH_2NH_2$

Option 2:
CH_3CH_2Br

Option 3:
CH_3NH_2

Option 4:
CH_3COONa

Correct Answer:
CH_3NH_2

Solution:
CH_3CONH_2 on reaction with $NaOH$ and Br_2 in alcoholic medium gives CH_3NH_2

Q. 953 The oxidation state of Ni in $[Ni(CO)_4]$ is

Option 1:
0

Option 2:
2

Option 3:
3

Option 4:
4

Correct Answer:
0

Solution:
The oxidation state of Ni in $[Ni(CO)_4]$ is Zero

Q. 954 Amino acids are

Option 1:
acidic

Option 2:
basic

Option 3:
amphoteric

Option 4:
neutral

Correct Answer:
acidic

Solution:
Amino acids are Acidic, basic, amphoteric as well as neutral, Hence all the options are correct

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Q. 955 **Assertion (A) :** Conductivity of an electrolyte increases with decrease in concentration.

Reason (R) : Number of ions per unit volume decreases on dilution.

Option 1:
Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is the correct explanation of the Assertion (A).

Option 2:
Both Assertion (A) and Reason (R) are correct statements, but Reason (R) is not the correct explanation of the Assertion (A).

Option 3:
Assertion (A) is correct, but Reason (R) is wrong statement.

Option 4:
Assertion (A) is wrong, but Reason (R) is correct statement.

Correct Answer:
Assertion (A) is wrong, but Reason (R) is correct statement.

Solution:
Conductivity of an electrolyte decreases with decrease in concentration

and Number of ions per unit volume decreases on dilution.

Hence, Assertion (A) is wrong, but Reason (R) is correct statement.

Option D is correct

Q. 956

Assertion (A) : The $C-O-C$ bond angle in ethers is slightly less than tetrahedral angle.

Reason (R) : Due to the repulsive interaction between the two alkyl groups in ethers.

Option 1:
Both Assertion (A) and Reason (R) are correct statements, and
Reason (R) is the correct explanation of the Assertion (A).

Option 2:
Both Assertion (A) and Reason (R) are correct statements, but
Reason (R) is not the correct explanation of the Assertion (A).

Option 3:
Assertion (A) is correct, but Reason (R) is wrong statement.

Option 4:
Assertion (A) is wrong, but Reason (R) is correct statement.

Solution:
Assertion (A) is wrong, but Reason (R) is correct statement.

Hence option D is correct

Q. 957

Assertion (A) : Low spin tetrahedral complexes are rarely observed.

Reason (R) : Crystal field splitting energy is less than pairing energy for tetrahedral complexes.

Option 1:
Both Assertion (A) and Reason (R) are correct statements, and
Reason (R) is the correct explanation of the Assertion (A).

Option 2:
Both Assertion (A) and Reason (R) are correct statements, but
Reason (R) is not the correct explanation of the Assertion (A).

Option 3:
Assertion (A) is correct, but Reason (R) is wrong statement.

Option 4:
Assertion (A) is wrong, but Reason (R) is correct statement.

Solution:
Low spin tetrahedral complexes are rarely observed.

because Crystal field splitting energy is less than pairing energy for tetrahedral complexes.

Both Assertion (A) and Reason (R) are correct statements, and
Reason (R) is the correct explanation of the Assertion (A).

Hence option A is correct

Q. 958 **Assertion (A) :** Elevation in boiling point is a colligative property.

Reason (R) : Elevation in boiling point is directly proportional to molarity.

Option 1:
Both Assertion (A) and Reason (R) are correct statements, and
Reason (R) is the correct explanation of the Assertion (A).

Option 2:
Both Assertion (A) and Reason (R) are correct statements, but
Reason (R) is not the correct explanation of the Assertion (A).

Option 3:
Assertion (A) is correct, but Reason (R) is wrong statement.

Option 4:
Assertion (A) is wrong, but Reason (R) is correct statement.

Correct Answer:
Assertion (A) is correct, but Reason (R) is wrong statement.

Solution:
Assertion (A) : Elevation in boiling point is a colligative property.

Reason (R) : Elevation in boiling point is directly proportional to morality, not molarity.

Assertion (A) is correct, but Reason (R) is wrong statement.

Hence option C is correct

Q. 959 **Assertion (A) :** Oxidation of ketones is easier than aldehydes.

Reason (R) : $C-C$ bond of ketones is stronger than $C-H$ bond of aldehydes.

Option 1:
Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is the correct explanation of the Assertion (A).

Option 2:
Both Assertion (A) and Reason (R) are correct statements, but Reason (R) is not the correct explanation of the Assertion (A).

Option 3:
Assertion (A) is correct, but Reason (R) is wrong statement.

Option 4:
Assertion (A) is wrong, but Reason (R) is correct statement.

Solution:
Assertion (A) is wrong, but Reason (R) is correct statement.

Hence option D is correct

Q. 960 State Raoult's law for a solution containing volatile components. What is the similarity between Raoult's law and Henry's law ?

Option 1:

Option 2:

Option 3:

Option 4:

Solution:
Raoult's law for a solution containing volatile components says that for a solution of volatile liquids, the partial vapour pressure of each component of the solution is directly proportional to its mole fraction present in solution.

If we compare the equations for Raoult's law and Henry's law, it can be seen that the partial pressure of the volatile component or gas is directly proportional to its mole fraction in solution.

Q. 961 Write the role of

(a) Dilute $NaCN$ in the extraction of Gold.

(b) CO in the extraction of Iron.

Solution:
(a) NaCN acts as a leaching agent and it forms complex with gold.

[Ag(CN)2] - 4Au + 8CN– + 2H2O + O2 --------> 4 [Au(CN2)] – + 4OH–

(b) CO acts as a reducing agent.

Q. 962 How is leaching carried out in the case of low grade copper ores ? Name the method used for refining of copper metal.

Solution:
Leaching carried out in the case of low grade copper ores is by using acid or bacteria.

Method used for refining of copper metal is Electrolytic refining

Q. 963 Define adsorption with an example. What is the role of adsorption in heterogeneous catalysis ?

Solution:
Adsorption refers to the accumulation of molecular species at the surface rather than in the bulk of a solid or liquid.

Example. adsorption of gases on surface of active charcoal

Q. 964 Define Brownian movement. What is the cause of Brownian movement in colloidal particles ? How is it responsible for the stability of Colloidal Sol ?

Solution:

- Brownian movement is a state of continuous zig-zag motion of particles.
- Cause of Brownian movement in colloidal particles is unbalanced bombardment of the particles by the molecules of the dispersion medium.
- The Brownian movement has a stirring effect which does not permit the particles to settle.

Q. 965 (a) Write the IUPAC name and hybridisation of the complex $[Fe(CN)_6]^{3-}$.
(Given : Atomic number of $Fe = 26$)

(b) What is the difference between an ambidentate ligand and a chelating ligand ?

Solution:
(a) IUPAC name and hybridisation of the complex $[Fe(CN)_6]^{3-}$is

Hexacyanidoferrate(III) / Hexacyanoferrate(III) and d^2sp^3 respectively

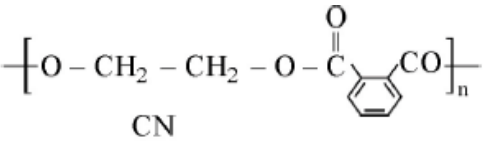
(b) Ligand which can ligate through two different atoms is called ambidentate ligand whereas di- or polydentate ligand uses its two or more donor atoms to bind a single metal ion. A chelating ligand forms a more stable complex as compared to an ambidentate ligand. chelating ligand forms a cyclic complex while ambidentate ligand forms a non-cyclic complex

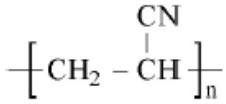
Q. 966 How do antiseptics differ from disinfectants ? Name a substance which can be used as a disinfectant as well as an antiseptic.

Solution:
Antiseptic is applied on living tissue, to kill or stop growth of microbes while disinfectant is applied on inanimate/ non -living objects

Substance which can be used as a disinfectant as well as an antiseptic is 0.2 per cent solution of phenol is an antiseptic while its one percent solution is disinfectant

Q. 967 Identify the monomers in the following polymers

(i) 

(ii) 

Solution:
(i) Ethylene glycol and phthalic acid

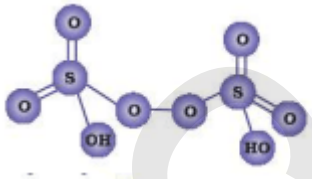
(ii) Acrylonitrile

Q. 968 Draw the structures of the following :

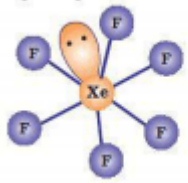
(i) $H_2S_2O_8$ (ii) XeF_6

Solution:
Structures

(i) $H_2S_2O_8$



(ii) XeF_6



Q. 969 A $0.01\ m$ aqueous solution of $AlCl_3$ freezes at $-0.068^{\circ}C$. Calculate the percentage of dissociation. [Given : K_f for Water$= 1.86\ K\ kg\ mol^{-1}$]

Solution:
$\Delta Tf = i(K_f)m$

0.068 = i x 1.86 x 0.01

i = 3.65 or 3.656

α = i-1/n-1

α = 0.883 or 0.885

Hence percentage of dissociation is 88.3% or 88.5%

Q. 970 When a steady current of $2a$ was passed through two electrolytic cells A and B containing electrolytes $ZnSO_4$ and $CuSO_4$ connected in series,$2\ g$ of Cu were deposited at the cathode of cell B. How long did the current flow ? What mass of Zn was deposited at cathode of cell A ?
[Atomic mass :$Cu = 63.5gmol^{-1},\ Zn = 65gmol^{-1};\ 1F = 96500\ C\ mol^{-1}$]

Solution:
Given-

current = $2a$

Cu deposited = 2 g

$Cu = 63.5gmol^{-1},\ Zn = 65gmol^{-1};\ 1F = 96500\ C\ mol^{-1}$

m=ZxIxt

2 = 63.5 x 2 x t/2x96500

t = 3039.4 s

m1/m2 = eq wt 1/eq wt 2

2 / m2 = (63.5/2) / (65/2)

Hence, m2 = 2.05 g

Q. 971 Differentiate between following :

(i) Amylose and Amylopectin

(ii) Globular protein and Fibrous protein

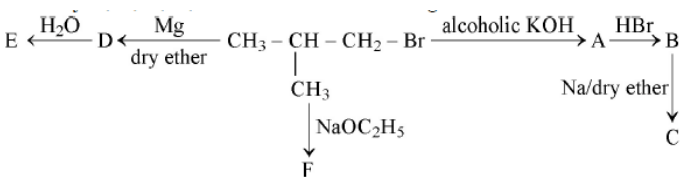
(iii) Nucleotide and Nucleoside

Solution:
(i) Amylose is water soluble component of starch while amylopectin is insoluble in water

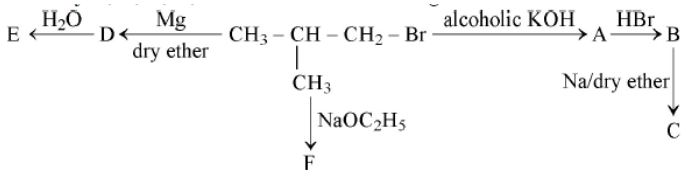
(ii) Globular proteins are spherical in shape while fibrous are linear

(iii) Nucleoside consists of a sugar and a base When nucleoside is linked to phosphate group, it forms a nucleotide

Q. 972 Identify A, B, C, D, E and F in the following :



Solution:



A: $(CH_3)_2C=CH_2$

B : $(CH_3)_2CBrCH_3$

C : $(CH_3)_3C - C(CH_3)_3$

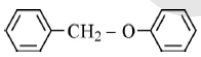
D: $(CH_3)_2CHCH_2MgBr$

E : $(CH_3)_2CHCH_3$

F: $(CH_3)_2 CHCH_2OC_2H_5$

Q. 973 Give the structures of final products expected from the following reactions :

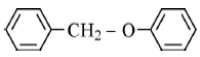
(i) Hydroboration of propene followed by oxidation with H_2O_2 in alkaline medium.
(ii) Dehydration of $(CH_3)_3C - OH$ by heating it with $20\ ^o/_o\ H_3PO_4$ at $358\ K$..

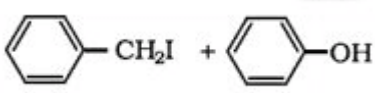
(iii) Heating of  with HI.

Solution:
Structures of final products expected from the following reactions :

(i) Hydroboration of propene followed by oxidation with H_2O_2 in alkaline medium forms $CH_3CH_2CH_2OH$

(ii) Dehydration of $(CH_3)_3C - OH$ by heating it with $20\ ^o/_o\ H_3PO_4$ at $358\ K$ forms $(CH_3)_2C=CH_2$

(iii) Heating of  with HI forms



Q. 974 How can you convert the following ?

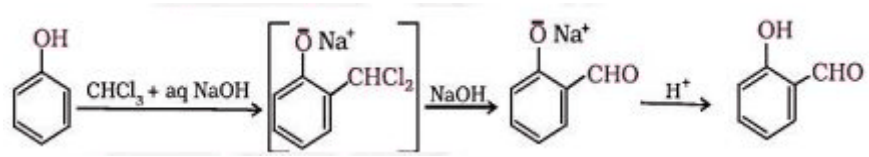
(i) Phenol to o—hydroxybenzaldehyde.

(ii) Methanal to ethanol

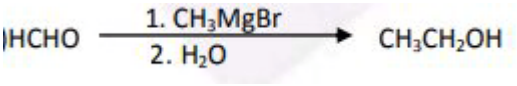
(iii) Phenol to phenyl ethanoate.

Solution:

(i) Phenol to o—hydroxybenzaldehyde.



(ii) Methanal to ethanol



(iii) Phenol to phenyl ethanoate.

Q. 975 Give reasons :

(i) Aniline does not undergo Friedal-Crafts reaction.

(ii) Aromatic primary amines cannot be prepared by Gabriel's phthalimide synthesis.

(iii) Aliphatic amines are stronger bases than ammonia.

Solution:
(i) Aniline does not undergo Friedal-Crafts reaction because Aniline forms salt with AlCl3, the Lewis acid.

(ii) Aromatic primary amines cannot be prepared by Gabriel's phthalimide synthesis because Aryl halides do not undergo nucleophilic substitution with the anion formed by phthalimide

(iii) Aliphatic amines are stronger bases than ammonia because Due to +I effect of alkyl group electron density on N atom increases.

Q. 976 Write three differences between lyophobic sol and lyophilic sol.

Solution:
Lyophobic sol

1. Interaction between dispersed phase and dispersion medium are weak
2. irreversible
3. Can be easily coagulated

Lyophilic sol

1. Interaction between dispersed phase and dispersion medium are strong
2. reversible
3. Can't be easily coagulated

Q. 977 Define the following terms :

(i) Protective colloid

(ii) Zeta potential

(iii) Emulsifying agent

Solution:
(i) Lyophilic colloids have a unique property of protecting lyophobic colloids. Lyophilic colloids form a layer around the lyophobic colloids to protect them from the electrolyte or coagulation.

(ii) Zeta potential is the Potential difference between the fixed layer and the diffused layer of opposite charges of a colloid.

(iii) Emulsifying agent is a Substances used for stabilisation of an emulsion.

Q. 978 (a) Give reasons :

(i) Transition metals and their compounds show catalytic activities.

(ii) Separation of a mixture of Lanthanoid elements is difficult.

(iii) $Zn,\ Cd$ and Hg are soft and have low melting point

.(b) Write the preparation of the following :

(i) $Na_2Cr_2O_7$ fromNa_2CrO_4

(ii) K_2MnO_4 from MnO_2

Solution:
a)

i) Transition metals and their compounds show catalytic activities because of Variable or multiple oxidation states, ability to form complexes, they provide large surface area for adsorption.

ii) Separation of a mixture of Lanthanoid elements is difficult because of Similar size, similar properties

iii) Because they donot have unpaired electron and have weak interatomic metallic bonding also have completely or fully filled d orbitals

b)

i) $2Na_2CrO_4 + 2\ H_+ \rightarrow Na_2Cr_2O_7 + 2\ Na^+ + H_2O$

ii) $2MnO_2 + 4KOH + O_2 \rightarrow 2K_2MnO_4 + 2H_2O$

Q. 979 (a) Account for the following :

(i) Ti^{3+} is coloured whereas Sc^{3+} is colourless in aqueous solution.

(ii) Cr^{2+} is a strong reducing agent.

(b) Write two similarities between chemistry of lanthanoids and actinoids.

(c) Complete the following ionic equation :

$3MnO_4^{2-} + 4H^+ \rightarrow$

Solution:

a)

i) Ti^{3+} has an unpaired electron while there are no unpaired electrons in Sc^{3+}

ii) Because of Stable t_2g^3 of Cr^{3+} ion

b)

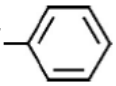
1. Both show variable oxidation states

2. Both show f-f transitions

c) $3MnO_4^{2-} + 4H^+ \rightarrow 2MnO_4^- + MnO_2 + 2H_2O$

Q. 980 (a) Write the products formed when benzaldehyde reacts with the following reagents :

(i) CH_3CHO in presence of dilute $NaOH$

(ii) $H_2N - NH$ 

(iii) $Conc.NaOH$

(b) Distinguish between following :

(i) $CH_3 - CH = CH - CO - CH_3$ and $CH_3 - CH_2 - CO - CH = CH_2$

(ii) Benzaldehyde and Benzoic acid.

Solution:

(a) Write the products formed when benzaldehyde reacts with the following reagents :

(i) when benzaldehyde reacts with CH_3CHO in presence of dilute $NaOH$, it forms 3-hydroxy-3-phenylpropanal

(ii) Phenyl hydrazone of benzaldehyde

(iii) Sodium benzoate and benzyl alcohol

(b)

(i) On heating with NaOH and I_2 : $CH_3 - CH = CH - CO - CH_3$ will form yellow ppt of CHI_3 while other compound doesn't

(ii) On adding $NaHCO_3$: Benzoic acid produces brisk effervescence while other compound doesn't

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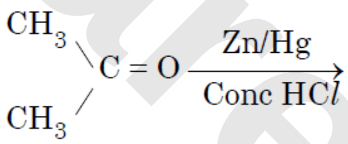
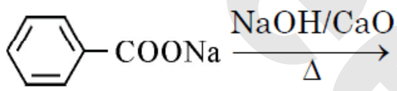
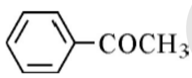
Q. 981 (a) Write the final products in the following :

(i) 

(ii) 

(iii) $CH_2 = CH - CH_2 - CN \xrightarrow[(b)H_3O]{(a)DIBAL-H)}$

(b) Arrange the following in the increasing order of their reactivity towards nucleophilic addition reaction :

$CH_3COCH_3,\ HCHO, CH_3CHO,$ 

(c) Draw the structure of $2,4\ DNP$ derivative of acetaldehyde.

Solution:
a)

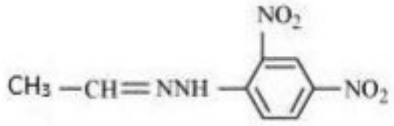
(i) CH3CH2CH3

(ii) C6H6

(iii) CH2=CH-CH2CHO

b) C6H5COCH3 < CH3COCH3 < CH3CHO < HCHO

(c) Structure of $2,4\ DNP$ derivative of acetaldehyde



Q. 982 (a) A first order reaction is $25\ ^{o}/_{o}$ complete in 40 minutes. Calculate the value of rate constant. In what time will the reaction be $80\ ^{o}/_{o}$ completed ?

(b) Define order of reaction. Write the condition under which a bimolecular reaction follows first order kinetics.

Solution:

(a) $k = (2.303 / t) \log ([A]_o / [A]_t)$

$k = (2.303 / 40) \log (100 / 75)$

$= 0.007\ min^{-1}$

$t = (2.303 / k) \log ([A]_o / [A]_t)$

$t = (2.303 / 0.0071) \log (100/20)$

$t = 230\ min$

(b) Order of reaction is the Sum of powers of the concentration of the reactants in the rate law expression.

Bimolecular reaction follows first order kinetics when one of the reactant is present in large excess.

Q. 983 (a) A first order reaction is $50\ ^{o}/_{o}$ complete in 30 minutes at $300\ K$ and in 10 minutes at $320\ K$. Calculate activation energy (E_a) for the reaction. $(R = 8.314\ J\ K^{-1}\ mol^{-1})$

(b) Write the two conditions for collisions to be effective collisions.

(c) How order of reaction and molecularity differ towards a complex reaction ?

[Given : $log2 = 0.3010,\ log3 = 0.4771,\ log4 = 0.6021,\ log5 = 0.6991$]

Solution:

a) $k = 0.693/ t_{1/2}$

$k_1 = 0.693/ t_{1/2} = 0.693 / 30$

$k_2 = 0.693/ t_{1/2} = 0.693 / 10$

$\log k_2/k_1 = E_a /2.303\ R (1/ T_1 - 1/ T_2)$

$\log 3 = E_a /2.303 \times 8.314 (1/ 300 - 1/ 320)$

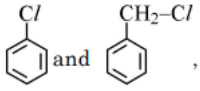
E_a = 43.8 kJ/mol

b) Conditions for collisions to be effective collisions

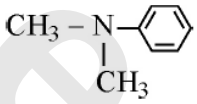
1. Proper orientation and

2. Energy of the colliding particles should be more than threshold energy

c) For a complex reaction, order of reaction is applicable while molecularity has no meaning.

Q. 984 Out of  , which will undergo S_N1 reaction faster with OH^- ?

Solution:
$C_6H_5CH_2Cl$ will undergo S_N1 reaction faster with OH^-

Q. 985 Write the IUPAC name of 

Solution:
N,N-dimethylaniline

Q. 986 What type of linkage is present in polysaccharides ?

Solution:
Glycosidic linkage

Q. 987 Name an artificial sweetener whose use is limited to cold drinks.

Solution:
Aspartame is an artificial sweetener whose use is limited to cold drinks

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Q. 988 Name the polymer which is used for making non-stick utensils.

Solution:
Teflon is used for making non-stick utensils.

Q. 989 Kohlrausch given the following relation for strong electrolytes :

$$\wedge = \wedge_0 - A\sqrt{C}$$

Which of the following equality holds ?

Option 1:
$\wedge = \wedge_0 \ as \ C \to \sqrt{A}$

Option 2:
$\wedge = \wedge_0 \ as \ C \to \infty$

Option 3:
$\wedge = \wedge_0 \ as \ C \to 0$

Option 4:
$\wedge = \wedge_0 \ as \ C \to 1$

Correct Answer:
$\wedge = \wedge_0 \ as \ C \to 0$

Solution:
$\wedge = \wedge_0 \ as \ C \to 0$ holds true.

Hence option C is correct

Q. 990 In an electrochemical process, a salt bridge is used

Option 1:
as a reducing agent.

Option 2:
as an oxidizing agent.

Option 3:
to complete the circuit so that current can flow.

Option 4:
None of these

Correct Answer:
to complete the circuit so that current can flow.

Solution:
In an electrochemical process, a salt bridge is used to complete the circuit so that current can flow.

Hence option C is correct

Q. 991 In a chemical reaction $X \rightarrow Y$, it is found that the rate of reaction doubles when the concentration of X is increased four times. The order of the reaction with respect to X is

Option 1:
1

Option 2:
0

Option 3:
2

Option 4:
$\frac{1}{2}$

Correct Answer:
$\frac{1}{2}$

Solution:
The order of the reaction with respect to X is 1/2

Hence option D is correct

Q. 992 Which of the following will give a white precipitate upon reacting with $AgNo_3$?

Option 1:
$K_2[Pt(en)_2Cl_2]$

Option 2:
$[Co(NH_3)_3Cl_3]$

Option 3:
$[Cr(H_2O)_6]Cl_3$

Option 4:
$[Fe(H_2O)_3Cl_3]$

Correct Answer:
$[Cr(H_2O)_6]Cl_3$

Solution:
$[Cr(H_2O)_6]Cl_3$ will give a white precipitate upon reacting with $AgNo_3$

Q. 993 Copper matte contains

Option 1:
$Cu_2S.Cu_2O\ and\ silica$

Option 2:
$Cu_2S.\ CuO\ and\ silica$

Option 3:
$Cu_2S.\ FeO\ and\ silica$

Option 4:
$Cu_2S.\ FeS\ and\ silica$

Solution:
Copper matte contains $Cu_2S.\ FeS\ and\ silica$

Hence option D is correct

Q. 994 **Assertion (A) :** $0.1\ M$ solution of KCl has greater osmotic pressure than $0.1\ M$ solution of glucose at same temperature.

Reason (R) : In solution, KCl dissociates to produce more number of particles.

Option 1:
Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is the correct explanation of the Assertion (A).

Option 2:
Both Assertion (A) and Reason (R) are correct statements, but Reason (R) is not the correct explanation of the Assertion (A).

Option 3:
Assertion (A) is correct, but Reason (R) is wrong statement.

Option 4:
Assertion (A) is wrong, but Reason (R) is correct statement.

Correct Answer:
Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is the correct explanation of the Assertion (A).

Solution:
Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is the correct explanation of the Assertion (A).

Hence option A is correct

Q. 995 **Assertion (A) :** Ortho and para-nitrophenols can be separated by steam distillation.

Reason (R) : Ortho isomer associates through intermolecular hydrogen bonding while Para isomer associates through intramolecular hydrogen bonding.

Option 1:
Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is the correct explanation of the Assertion (A).

Option 2:
Both Assertion (A) and Reason (R) are correct statements, but Reason (R) is not the correct explanation of the Assertion (A).

Option 3:
Assertion (A) is correct, but Reason (R) is wrong statement.

Option 4:
Assertion (A) is wrong, but Reason (R) is correct statement.

Correct Answer:
Assertion (A) is correct, but Reason (R) is wrong statement.

Solution:
Assertion (A) is correct, but Reason (R) is wrong statement.

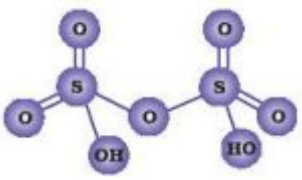
Hence option C is correct

Q. 996 Draw the structures of the following :

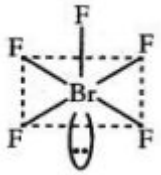
(i) $H_2S_2O_7$

(ii) BrF_5

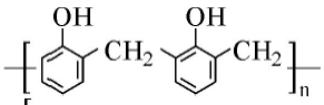
Solution:
(i) $H_2S_2O_7$

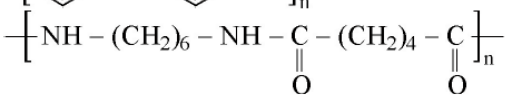


(ii) BrF_5



Q. 997 Identify the monomers in the following polymers :

(i) 

(ii) 

Solution:
(i) Formaldehyde and phenol

(ii) Adipic acid and hexamethylenediamine

Q. 998 Discuss the nature of bonding in metal carbonyls.

Solution:
The metal-carbon bonds in metal carbonyls have both σ and π characters.

A σ bond is formed when the carbonyl carbon donates a lone pair of electrons to the vacant orbital of the metal.

In metal carbonyls, synergic effect is created due to the metal-ligand bonding.

Q. 999 How do antiseptics differ from disinfectants ? Name a substance which can be used as a disinfectant as well as an antiseptic.

Solution:
Antiseptics are applied to the living tissues such as wounds, cut and other skin surface but disinfectants are effective against micro-organism and used for drainage system, floors cleaning etc.
For example :- 0.2% Phenol can be used as both antiseptic and disinfectant.

Q. 1000 A hydrocarbon C_5H_{12} gives only one monochloride on photochemical chlorination. Identify the compound.

Solution:

$(CH_3)_4C$ gives only one product

Q. 1001 Out of $(CH_3)_3N$ and $(CH_3)_2NH$ which one is more basic in aqueous solution ?

Solution:
$(CH_3)_2NH$ due to less steric hinderance

Q. 1002 Out of $Cis-[Pt(en)_2Cl_2]^{2+}$ and $Trans-[pt(en_2)Cl_2]^{2+}$, which one is optically active ?

Solution:
$Cis-[Pt(en)_2Cl_2]^{2+}$ is optically active

Q. 1003 Name the method of refining used to obtain semiconductor of very high purity.

Solution:
Zone refining is used to obtain semiconductor of very high purity.

Q. 1004 Is $-\left[CH_2-CH=CH-CH_2-CH_2-\underset{CN}{CH}\right]_n-$ a homopolymer or copolymer ?

Solution:

$-\left[CH_2-CH=CH-CH_2-CH_2-\underset{CN}{CH}\right]_n-$ is a copolymer

Q. 1005 The amount of electricity required to produce one mole of Zn from $ZnSO_4$ solution will be :

Option 1:
$3f$

Option 2:
$2f$

Option 3:
$1F$

Option 4:
$4f$

Correct Answer:
$2f$

Solution:
The amount of electricity required to produce one mole of Zn from $ZnSO_4$ solution will be 2F.

As 2 moles of electrons will be required to reduce one mole of $ZnSO_4$ to Zn

Hence option B is correct

Q. 1006 Zinc is coated over iron to prevent rusting of iron because

Option 1:
$E^{\circ}_{zn^{2+}/Zn} = E^{\circ}_{Fe^{2+}/Fe}$

Option 2:
$E^{\circ}_{zn^{2+}/Zn} < E^{\circ}_{Fe^{2+}/Fe}$

Option 3:
$E^{\circ}_{zn^{2+}/Zn} > E^{\circ}_{Fe^{2+}/Fe}$

Option 4:
None of these

Correct Answer:
$E^{\circ}_{zn^{2+}/Zn} < E^{\circ}_{Fe^{2+}/Fe}$

Solution:
Zinc is coated over iron to prevent rusting of iron because $E^{\circ}_{zn^{2+}/Zn} < E^{\circ}_{Fe^{2+}/Fe}$

Hence option B is correct

Q. 1007 The unit of rate constant depends upon the

Option 1:
molecularity of the reaction.

Option 2:
activation energy of the reaction.

Option 3:
order of the reaction.

Option 4:
temperature of the reaction.

Correct Answer:
order of the reaction.

Solution:
The unit of rate constant depends upon the order of the reaction

Hence option C is correct

Q. 1008 The formula of the complex triamminetri $(nitrito-O)$ Cobalt (iii) is

Option 1:
$[Co(ONO)_3(NH_3)_3]$

Option 2:
$[Co(NO_2)_3(NH_3)_3]$

Option 3:
$[Co(ONO_2)_3(NH_3)_3]$

Option 4:
$[Co(NO_2)(NH_3)_3]$

Correct Answer:
$[Co(ONO)_3(NH_3)_3]$

Solution:
The formula of the complex triamminetri $(nitrito-O)$ Cobalt (iii) is

$[Co(ONO)_3(NH_3)_3]$

Q. 1009 Which of the following is a disaccharide ?

Option 1:
Glucose

Option 2:
Starch

Option 3:
Cellulose

Option 4:
Lactose

Correct Answer:
Lactose

Solution:
Lactose is a disaccharide

Hence option D is correct

Q. 1010

Assertion (A) : An ideal solution obeys Henry's law.

Reason (R) : In an ideal solution, solute-solute as well as solventsolvent interactions are similar to solute-solvent interaction.

Option 1:
Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is the correct explanation of the Assertion (A).

Option 2:
Both Assertion (A) and Reason (R) are correct statements, but Reason (R) is not the correct explanation of the Assertion (A).

Option 3:
Assertion (A) is correct, but Reason (R) is wrong statement.

Option 4:
Assertion (A) is wrong, but Reason (R) is correct statement.

Correct Answer:
Assertion (A) is wrong, but Reason (R) is correct statement.

Solution:
Assertion (A) is wrong, but Reason (R) is correct statement.

hence option D is correct

Q. 1011

Assertion (A) : Benzaldehyde is less reactive than ethanal towards nucleophilic addition reactions.

Reason (R) : Ethanal is more sterically hindered.

Option 1:
Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is the correct explanation of the Assertion (A).

Option 2:
Both Assertion (A) and Reason (R) are correct statements, but Reason (R) is not the correct explanation of the Assertion (A).

Option 3:
Assertion (A) is correct, but Reason (R) is wrong statement.

Option 4:
Assertion (A) is wrong, but Reason (R) is correct statement.

Correct Answer:
Assertion (A) is correct, but Reason (R) is wrong statement.

Solution:
Assertion (A) is correct, but Reason (R) is wrong statement.

Hence option C is correct

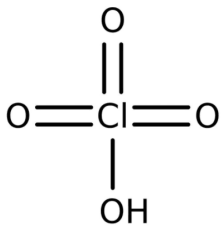
Q. 1012 Draw the structures of the following :

(i) $HClO_4$

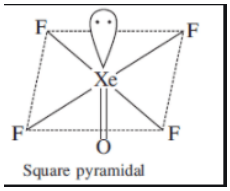
(ii) $XeOF_4$

Solution:
Structures are:

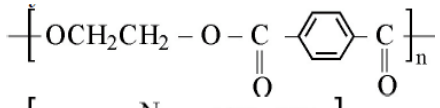
(i)

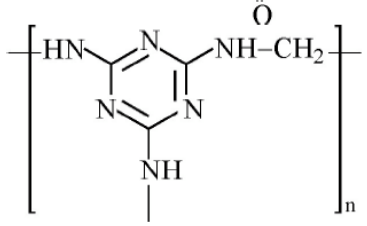


(ii)



Q. 1013 Identify the monomers in the following polymers :

(i) 

(ii) 

Solution:
Monomers are:

(i) Glycol and terephthalic acid

(ii) Melamine and formaldehyde

Q. 1014 Define the following terms with a suitable example in each :

(i) Bacteriocidal antibiotics

(ii) Food preservatives.

Solution:
(i) Bacteriocidal antibiotics are chemical substance which in low concentrations inhibits the growth or destroys microorganisms. Example: Ofloxacin

(ii) Food preservatives prevent spoilage of food due to microbial growth. Example: table salt.

Q. 1015 (i) What are the hydrolysis products of DNA ?

(ii) What happens when D-glucose is treated with Bromine water ?

(iii) What is the effect of denaturation on the structure of proteins ?

Solution:
(i) Hydrolysis products of DNA are Deoxyribose sugar , Nitrogenous base and phosphoric acid

(ii) When D-glucose is treated with Bromine water, Gluconic acid is formed

(iii) By Denaturation on the structure of proteins, 2^{o} and 3^{o} structures are destroyed.