CAREERS 360

PRACTICE Series

Gujarat Board Class 12

Biology

Previous Year Questions with Detailed Solution

GSEB Class 12 Biology Question with Solution - 2024

SECTION-A

PART-A

1) Statement (A): Pyramid of energy is always upright

Reason (R): Some energy is always lost as heat at each step
(A) A is wrong and R is right.
(B) A and R both are true but R is not true explanation of A.
(C) A is true and R is wrong
(D) A and R both are true, R is a right explanation of statement-A.

Solution:

The correct answer is (D). Both statement (A) and reason (R) are true, and (R) provides a correct explanation of (A) because energy is lost as heat at each trophic level, leading to a constantly upright pyramid of energy.

2) that came in to India has become ubiquitous in occurrence and causes pollen allergy.
(A) Runner
(B) Carrot grass
(C) Water Hyacinth
(D) Sea grass

Solution:

The correct answer is (B) Carrot grass. Carrot grass (Parthenium hysterophorus), which came into India, has become widespread and is known to cause pollen allergies.

3) Which plant seeds possess perisperm?
(A) black pepper, maize
(B) Maize, beet
(C) black pepper, beet
(D) Wheat, Black pepper

Solution:

The correct answer is (C) black pepper, beet. Both black pepper (Piper nigrum) and beet (Beta vulgaris) seeds possess perisperm, which is the residual nucellus tissue present in the seed.

4) Clarian gariepinus is harmful to which organism
(A) Steller's Sea cow
(B) Nile perch
(C) Cichlid fishes
(D) Indigenous catfish

Solution:

The correct answer is (D) Indigenous catfish. *Clarias gariepinus* (African catfish) is harmful to indigenous catfish species as it competes with them for resources and can also be invasive, disrupting local ecosystems.

5) How many more hotspots have been added in the list of biodiversity.
(A) 09
(B) 05
(C) 03
(D) 07

Solution:

The correct answer is (C) 03. Three additional biodiversity hotspots have been added to the global list, expanding the total number of recognized hotspots.

6) In a particular climatic condition, decomposion rate is if detritus is rich in liginin and chitin.
(A) zero
(B) slower
(C) stable
(D) faster

Solution:

The correct answer is (B) slower. The decomposition rate is slower if detritus is rich in lignin and chitin, as these compounds are resistant to microbial breakdown.

7) is an example of parthenocarpic fruit.
(A) Banana
(B) Mango
(C) Apple
(D) Ground-nut

Solution:

The correct answer is (A) Banana. Banana is an example of a parthenocarpic fruit, which develops without fertilization and thus does not contain seeds.

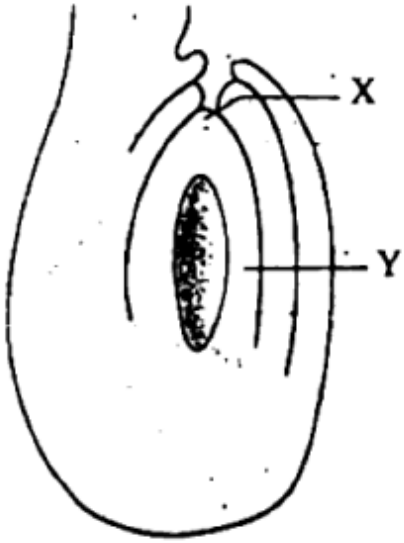
8) Which type of endosperm is present in coconut?
(A) Only non cellular endosperm
(B) Only cellular endosperm

(C) Both free nuclear endosperm and cellular endosperm
(D) Only free nuclear endosperm

Solution:

The correct answer is (C) Both free nuclear endosperm and cellular endosperm. In coconut, the liquid part (coconut water) is free nuclear endosperm, while the white solid part (coconut meat) is cellular endosperm.

9) Identify X and Y in given diagram.



(A) X - Nucellus, Y - embryosac
(B) X - Outer integument, Y - embryosac
(C) X - Micropyle, Y - Nucellus
(D) X - Micropylar pole, Y - Nucellus

Solution:

The correct answer is (C) X - Micropyle, Y - Nucellus. The diagram shows the structure of an ovule, where X refers to the micropyle (the small opening through which fertilization occurs) and Y represents the nucellus, the tissue inside the ovule that nourishes the developing embryo sac.

10) Full form of CDRI
(A) Central Drug Research Institute
(B) Central Drug Resource Institute.
(C) Central Drug Resource Investigation
(D) Central Disease Research Institute

Solution:

The correct answer is (A) Central Drug Research Institute. CDRI stands for Central Drug Research Institute, which is a premier research organization in India focused on drug development and research.

11) Which option shows correctly matched pairs for column - I and column - II?

	Column - I		Column - II
(p)	Leydig cells	(i)	Help in the lubrication of the penis
(q)	Sertoil cells	(ii)	Secretion of progesteron
(r)	Corpus luteum	(iii)	Secretion of Androgens
(s)	Bulbourethral gland	(iv)	Provide nutrition to the sperm

(A) (p-ii), (q-i), (r-iv), (s-iii)
(B) (p-iv), (q-iii), (r-ii), (s-1)
(C) (p-iii), (q-iv), (r-ii), (s-i)
(D) $(\mathrm{p}-\mathrm{i}), (\mathrm{q}-\mathrm{ii}), (\mathrm{r}-\mathrm{iii}), (\mathrm{s}-\mathrm{iv})$

Solution:

The correct answer is (C) (p-iii), (q-iv), (r-ii), (s-i).

Here's the correct matching:

- (p) Leydig cells → (iii) Secretion of androgens (Leydig cells produce testosterone).
- (q) Sertoli cells → (iv) Provide nutrition to the sperm (Sertoli cells nourish developing sperm cells).
- (r) Corpus luteum → (ii) Secretion of progesterone (Corpus luteum produces progesterone during the luteal phase).
- (s) Bulbourethral gland → (i) Help in the lubrication of penis (Bulbourethral glands secrete a lubricating fluid).

12) Which one is diploid
(A) Spermatid
(B) Primary spermatocytes
(C) Secondary spermatocytes
(D) Spermatozoa

Solution:

The correct answer is (B) Primary spermatocytes. Primary spermatocytes are diploid (2n) cells that undergo meiosis I to form haploid secondary spermatocytes.

13) Which method is used by doctor to inject sperm directly in to the ovum?
(A) GIFT
(B) IC S I
(C) CT
(D) IU I

Solution:

The correct answer is (B) ICSI (Intracytoplasmic Sperm Injection). In this method, a single sperm is directly injected into an ovum (egg) to facilitate fertilization, commonly used in assisted reproductive technologies.

14) Identify the recessive character of peas plant studied by mendel.
(A) Terminal flower
(B) Violet flower
(C) Inflated Pod shape
(D) Round seed

Solution:

The correct answer is (A) Terminal flower. Terminal flower is a recessive trait in pea plants, as studied by Mendel, while the dominant trait is an axial flower position.

15) Which sexual disease is not compeletely curable?
(A) gonorrhoea
(B) syphilis
(C) trichomoniasis
(D) hepatitis - B

Solution:

The correct answer is (D) hepatitis - B. Hepatitis B is a viral infection that affects the liver and, while its symptoms can be managed, it is not completely curable in all cases. Chronic infection can persist even after treatment.

16) Hormone releasing IUDs
(A) CuT
(B) Cu 7
(C) $\mathrm{LNG}-20$
(D) Multiload 375

Solution:

The correct answer is (C) LNG-20. LNG-20 is a hormone-releasing intrauterine device (IUD) that releases the hormone levonorgestrel to prevent pregnancy.

17) Which of the following is a Mendelian disorder?
(A) Cystic fibrosis
(B) Malaria
(C) Pneumonia
(D) Filariasis

Solution:

The correct answer is (A) Cystic fibrosis. Cystic fibrosis is a Mendelian disorder caused by mutations in a single gene (CFTR gene), following Mendelian inheritance patterns.

18) The contraceptive pills for females are of
(A) HCG
(B) Testosterone

(C) Progestogen
(D) Oxytocin

Solution:

The correct answer is (C) Progestogen. Contraceptive pills for females typically contain progestogen, often in combination with estrogen, to prevent ovulation and thereby act as a contraceptive.

19) Choose the correct option
(A) Kline felter disorder is caused due to monosomy of sex chromosomes
(B) Gametes are formed by equational division in male honey bee
(C) Colour blindness disorder due to defect in autosomes
(D) Sickle - cell anaemia occur by frame shift mutation

Solution:

The correct answer is (D) Sickle-cell anaemia occurs by frame shift mutation. Sickle-cell anemia is caused by a point mutation in the HBB gene, leading to abnormal hemoglobin, which can be considered a type of frameshift mutation in terms of its effect on protein structure.

- (A) is incorrect because Klinefelter syndrome is caused by trisomy (XXY) rather than monosomy.
- (B) is incorrect because male honey bees (drones) are haploid and form gametes through mitosis, not equational (meiosis II) division.
- (C) is incorrect because color blindness is a sex-linked disorder, not related to autosomes.

20) Which option shows correctly matched pairs from

	Column - I		Column - II
(p)	Trichoderma Polysporum	(i)	Butyric acid
(q)	Monascus Purpurous	(ii)	Cyclosporin A
(r)	Clostridium Butyricum	(iii)	Citric acid
(s)	Aspergillus niger	(iv)	Statins

(A) (p-iv), (q-ii), (r-i), (s-iii)
(B) (p-ii), (q-iv), (r-i), (s-iii)
(C) (p-ii), (q-i), (r-iii), (s-iv)
(D) $(\mathrm{p}-\mathrm{i}), (\mathrm{q}-\mathrm{ii}), (\mathrm{r}-\mathrm{iii}), (\mathrm{s}-\mathrm{iv})$

Solution:

The correct answer is (B) (p-ii), (q-iv), (r-i), (s-iii).

Here's the correct matching:

- (p) *Trichoderma polysporum* → (ii) Cyclosporin A (an immunosuppressant drug).
- (q) *Monascus purpureus* → (iv) Statins (used to lower cholesterol).
- (r) *Clostridium butyricum* → (i) Butyric acid (a type of fatty acid).
- (s) *Aspergillus niger* → (iii) Citric acid (produces citric acid through fermentation).

21) Production of which beverage carried out with-out distillation
(A) Rum
(B) Brandy
(C) Wine
(D) Whisky

Solution:

The correct answer is (C) Wine. Wine is produced through the fermentation of fruit (typically grapes) without the need for distillation, unlike rum, brandy, and whisky, which are distilled beverages.

22) Baculo virus is included in which genus?
(A) Hepetitis virus
(B) T.M.V. Virus
(C) Nucleopoly hedro virus
(D) Rhinovirus

Solution:

The correct answer is (C) Nucleopolyhedrovirus. Baculoviruses belong to the genus *Nucleopolyhedrovirus* and are known to infect insects, primarily used as biological control agents in pest management.

23) Representing global biodiversity for proportionate number of species of maior taxa of plants. Identify $\mathbf{X}$ and $\mathbf{Y}$ from given diagram.

(A) X-Algae, Y - Moss
(B) X - lichen, Y - Algae
(C) X-Fungi, Y - Algae
(D) X-Algae, Y - Angiosperm

Solution:

The correct answer is (C) X - Fungi, Y - Algae. In global biodiversity diagrams, fungi typically represent a significant portion due to their species diversity, and algae represent a smaller but notable proportion of plant taxa.

24) The large holes in 'swiss cheese' due to
(A) CO_2
(B) NO_2

(C) CH_4
(D) O_2

Solution:

The correct answer is (A) CO_2. The large holes in Swiss cheese are formed due to the production of carbon dioxide (CO_2) by the bacteria Propionibacterium shermanii during the fermentation process.

25) Endonuclease
(A) It creats billion copies of DNA
(B) It remove nucleotide from the ends of DNA
(C) It joins the nucleotide in DNA
(D) It makes cut at the specific - Position within the DNA

Solution:

The correct answer is (D) It makes a cut at the specific position within the DNA. Endonucleases are enzymes that cleave the phosphodiester bond within a DNA molecule at specific recognition sites, often used in genetic engineering and molecular biology.

26) Large reservoir of erythrocytes is
(A) Spleen
(B) Liver
(C) Appendix
(D) Thymus gland

Solution:

The correct answer is (A) Spleen. The spleen serves as a large reservoir of erythrocytes (red blood cells) and also plays a role in filtering blood and recycling old red blood cells.

27) Hugo De-vries worked on which plant and gave the idea of mutation.
(A) Dog flower
(B) Commelina
(C) Evening Primrose
(D) Pea

Solution:

The correct answer is (C) Evening Primrose. Hugo de Vries conducted his experiments on the Evening Primrose (Oenothera lamarckiana) and proposed the theory of mutation based on his observations.

28) The brain capasity of Homohabilis
(A) 650 to 800 CC
(B) 900 to 1200 CC
(C) 1400 to 1600 CC
(D) 850 to 950 CC

Solution:

The correct answer is (A) 650 to $\mathbf{800CC}$. The brain capacity of Homo habilis ranged between 650 to 800 cubic centimeters (CC), which is larger than that of earlier hominins but smaller than modern humans.

29) Which chemicals produced by mast cells are responsible for allergy?
(A) Adrenalin and Steroids
(B) Hestamine and Serotonin
(C) Antibody and Penicillin
(D) Antitoxin and Interferon

Solution:

The correct answer is (B) Histamine and Serotonin. Mast cells release chemicals like histamine and serotonin during allergic reactions, which contribute to inflammation and other allergy symptoms.

30) Bacterio phage $\phi \times 174$ posess nucleotides.
(A) 8653
(B) 8356
(C) 5386
(D) 6538

Solution:

The correct answer is (C) 5386 . Bacteriophage $\phi \times 174$ possesses 5386 nucleotides in its singlestranded DNA genome.

31) Histones are riched in which basic aminoacids.
(A) Valine and methionine
(B) Phenylalanine and methionine
(C) Valine and glutamine
(D) Lysin and Arginine

Solution:

The correct answer is (D) Lysine and Arginine. Histones are rich in the basic amino acids lysine and arginine, which help them bind to the negatively charged DNA and play a critical role in the structure of chromatin.

32) Select correct pair based on divergent evolution.
(A) Thorn of Bougainvilea and tendril of Cucurbits
(B) Flippers of Penguin and wing of bird
(C) Eye of octopus and flippers of dolfin
(D) Modefied root of sweet potato and modified stem of potato

Solution:

The correct answer is (A) Thorn of Bougainvillea and tendril of Cucurbits. This is an example of divergent evolution, where both structures (thorn and tendril) originated from a common ancestral structure (the stem) but evolved to serve different functions.

33) Which is initiator codon?
(A) AUG
(B) UUU
(C) CAC
(D) CAA

Solution:

The correct answer is (A) AUG. AUG is the initiator codon, which codes for methionine and signals the start of protein synthesis during translation.

34) What is the sequence of mRNA if the sequence of the coding strand in a transcription unit is written as
$5'$-ATGCATGCA - $3'$
(A) ATGCATGCA
(B) UACGUACGU
(C) AUGCAUGCA
(D) TACGTACGT

Solution:

The correct answer is (C) AUGCAUGCA. The mRNA sequence is complementary to the template strand and identical to the coding strand, except that thymine (T) is replaced with uracil (U). Therefore, the mRNA sequence corresponding to the given coding strand is AUGCAUGCA.

35) Which type of animals first evolved from lobefine?
(A) Aves
(B) Reptiles
(C) Amphibians
(D) Mammals

Solution:

The correct answer is (C) Amphibians. Amphibians were the first animals to evolve from lobe-finned fish, marking a crucial transition from aquatic to terrestrial life.

36) Which of the following is correct order of steps in the PCR?
(A) Denaturation $\rightarrow$ Annealing $\rightarrow$ Extension
(B) Annealing $\rightarrow$ Denaturation $\rightarrow$ Extension
(C) Denaturation $\rightarrow$ Extension $\rightarrow$ Annealing
(D) Extension $\rightarrow$ Denaturation $\rightarrow$ Annealing

Solution:

The correct answer is (A) Denaturation $\rightarrow$ Annealing $\rightarrow$ Extension. In PCR (Polymerase Chain Reaction), the correct order of steps is:
1. Denaturation: DNA strands are separated by heating.
2. Annealing: Primers bind to the template DNA.
3. Extension: DNA polymerase extends the primers to form a new DNA strand.

37) A nematode Meloidegyne incognita infects the root of which plants?
(A) Chillies
(B) Tomato
(C) Tobacco
(D) Cabbage

Solution:

The correct answer is (C) Tobacco. The nematode Meloidogyne incognita infects the roots of tobacco plants, causing root-knot disease, which affects the plant's growth and productivity.

38) DNA can be studied after staining with in various fields.
(A) Eosin
(B) Ethidium Chloride
(C) Ethidium Bromide
(D) Fast Green

Solution:

The correct answer is (C) Ethidium Bromide. Ethidium bromide is commonly used to stain DNA in various fields, such as gel electrophoresis, because it intercalates between DNA bases and fluoresces under UV light, allowing visualization of DNA.

39) Find out the antibiotic resistance gene of the following
(A) BamHI
(B) Hind III
(C) Sal I
(D) $\mathrm{amp}^{\mathrm{R}}$

Solution:

The correct answer is (D) amptr $^{\mathrm{TR.}}$. The amp $^{\mathrm{TR}}$ gene provides resistance to the antibiotic ampicillin and is commonly used as a selectable marker in cloning vectors. The other options (BamH, Hindlll, and Sall) are restriction enzymes, not antibiotic resistance genes.

40) Golden rice is rich in
(A) Vitamin - D
(B) Vitamin - A
(C) Vitamin-C
(D) Vitamin - B

Solution:

The correct answer is (B) Vitamin A. Golden rice is genetically modified to be rich in beta-carotene, a precursor of vitamin A, to help combat vitamin A deficiency in populations where this nutrient is scarce.

41) Corn borer is controlled by
(A) Cry II Ac
(B) Cry II Ab
(C) Cry IAc
(D) Cry I Ab

Solution:

The correct answer is (C) Cry IAc. The Cry IAc gene, derived from Bacillus thuringiensis (Bt), is effective in controlling the corn borer by producing a toxin that targets the pest when expressed in genetically modified crops.

42) Write full form of G.E.A.C
(A) General engineering applied concept
(B) Genetic engineering approval committee
(C) Genetic engineering approval concept
(D) General engineering approval committee

Solution:

The correct answer is (B) Genetic Engineering Approval Committee. The GEAC is responsible for approving the use of genetically modified organisms (GMOs) and products in India.

43) How much human protein is present in one litre milk of Rosie cow?
(A) 4.2 gm
(B) 2.8 gm
(C) 5.2 gm
(D) 2.4 gm

Solution:

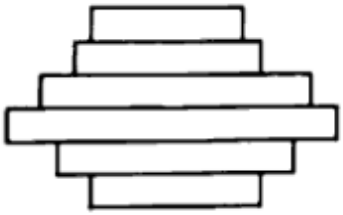
The correct answer is (B) 2.8 gm. The *Rosie* cow, a genetically modified cow, produces milk that contains 2.8 grams of human protein (alpha-lactalbumin) per litre.

44) Which type of interrelation is observed in species $A(+)$ and species $B(-)$
(A) Amensalism
(B) Predation
(C) Commensalism
(D) Mutualism

Solution:

The correct answer is (B) Predation. In predation, one species (A) benefits (+) by feeding on the other species (B), which is harmed (-).

45) A given figure of age pyramid for human population indicate?



(A) Expanding - Declining human Population
(B) Declining human population
(C) Stable human Population
(D) Expanding human population

Solution:

The given figure of the age pyramid shows a nearly uniform structure across different age groups, indicating that the population is not growing or shrinking significantly. This type of pyramid typically represents a stable human population.

The correct answer is (C) Stable human Population.

46) In any population group, if rate of natality and immigration is increases then the density is
(A) Zero
(B) Decrease
(C) Stable
(D) Increase

Solution:

The correct answer is (D) Increase. If the rates of natality (birth rate) and immigration (influx of individuals from other areas) increase in a population, the population density will also increase.

47) Which is the example of competitive interaction from the given below?
(A) Starfish Pisaster and clown fish
(B) Cuscuta and Mycorrhiza
(C) Visiting flamingoes and Resident fishes of shallow South American lakes
(D) Monarch butterfly and Balanus

Solution:

The correct answer is (C) Visiting flamingoes and Resident fishes of shallow South American lakes. This is an example of competitive interaction as both flamingoes and resident fishes compete for the same food resources (e.g., plankton) in the lakes.

47) Which is the example of competitive interaction from the given below?
(A) Starfish Pisaster and clown fish
(B) Cuscuta and Mycorrhiza
(C) Visiting flamingoes and Resident fishes of shallow South American lakes
(D) Monarch butterfly and Balanus

Solution:

The correct answer is (C) Visiting flamingoes and Resident fishes of shallow South American lakes. Both flamingoes and resident fishes in these lakes compete for the same food resources, such as plankton, making this an example of competitive interaction.

48) Select the statement which explains best parasitism.
(A) One organism is benefited, other is affected.
(B) Both the organisms are benefited.
(C) One organism is benefited, other is not affected.
(D) One organism is benefited.

Solution:

The correct answer is (A) One organism is benefited, other is affected. In parasitism, one organism (the parasite) benefits by deriving nutrients at the expense of the other organism (the host), which is harmed in the process.

49) The second trophic level in a lake is
(A) Decomposers
(B) Phytoplankton
(C) Fishes
(D) Zooplankton

Solution:

The correct answer is (D) Zooplankton. In a lake ecosystem, the second trophic level typically consists of zooplankton, which feed on phytoplankton (the primary producers at the first trophic level).

50) The number of trophic levels in the grazing food chain is restricted as the transfer of energy follows
(A) 16%
(B) 10%
(C) 8%
(D) 12%

Solution:

The correct answer is (B) 10\%. The number of trophic levels in a grazing food chain is restricted because, according to the 10\% law of energy transfer, only about 10\% of the energy is passed from one trophic level to the next, limiting the amount of energy available at higher levels.

PART-B

1) Explain pollination in Vellineria and sea grasses.

Solution:

In Vallisneria (a freshwater plant) and sea grasses, pollination occurs through water, a process known as hydrophily. In Vallisneria, male flowers release pollen that floats on the water surface to reach the female flowers. In sea grasses, pollen is adapted to float and travel through water currents to fertilize submerged flowers.

2) Explain microsporogenesis in flowering plants.

Solution:

Microsporogenesis in flowering plants is the process by which microspores, which develop into pollen grains, are formed inside the anthers of the flower. It begins with diploid microspore mother cells (microsporocytes) undergoing meiosis to produce four haploid microspores. These microspores then mature into pollen grains, which are the male gametophytes responsible for fertilization.

3) Describe any two natural birth control methods.

Solution:

Two natural birth control methods are:
1. Rhythm Method (Fertility Awareness): This method involves tracking the menstrual cycle to determine the days when a woman is most fertile and avoiding intercourse during those days. By identifying the ovulation period, couples can plan or avoid pregnancy accordingly.
2. Withdrawal Method (Coitus Interruptus): In this method, the male partner withdraws the penis from the vagina before ejaculation to prevent sperm from entering the female reproductive tract. It relies on timing and control to reduce the chances of fertilization.

4) Difference between Vasectomy and Tubectomy.

Solution:

1. Procedure:
- Vasectomy: A surgical procedure performed on males where the vas deferens (the tubes that carry sperm from the testicles) are cut or sealed, preventing sperm from being released during ejaculation.
- Tubectomy: A surgical procedure performed on females where the fallopian tubes (which carry eggs from the ovaries to the uterus) are cut or tied, preventing the eggs from reaching the uterus for fertilization.
2. Target Gender:
- Vasectomy: Performed on males.
- Tubectomy: Performed on females.
3. Recovery Time:
- Vasectomy: Generally has a quicker recovery time, with minimal discomfort and shorter downtime.
- Tubectomy: Usually involves a more complex procedure with a longer recovery period compared to vasectomy.

Both procedures are considered permanent methods of contraception.

5) Describe Turner's Syndrome.

Solution:

Turner's Syndrome is a genetic disorder that affects females, caused by the complete or partial absence of one X chromosome ($45, \mathrm{X}$ karyotype). Individuals with this condition typically exhibit short stature, and underdeveloped ovaries leading to infertility, and may have other physical features like a webbed neck or heart defects. It affects physical development but usually does not impact intellectual ability.

6) State the criteria for molecules that work as genetic material.

Solution:

The criteria for a molecule to function as genetic material are:
1. Replication: It must be able to replicate itself accurately to pass genetic information to the next generation.
2. Storage of Information: It should store genetic information that dictates the development and functioning of organisms.
3. Expression of Information: It must express the stored information through transcription and translation to produce proteins and other necessary molecules.
4. Variation (Mutation): It should have the ability to mutate or undergo changes to allow genetic diversity and evolution.

7) Describe cellular and cytokine barriers of innate immunity.

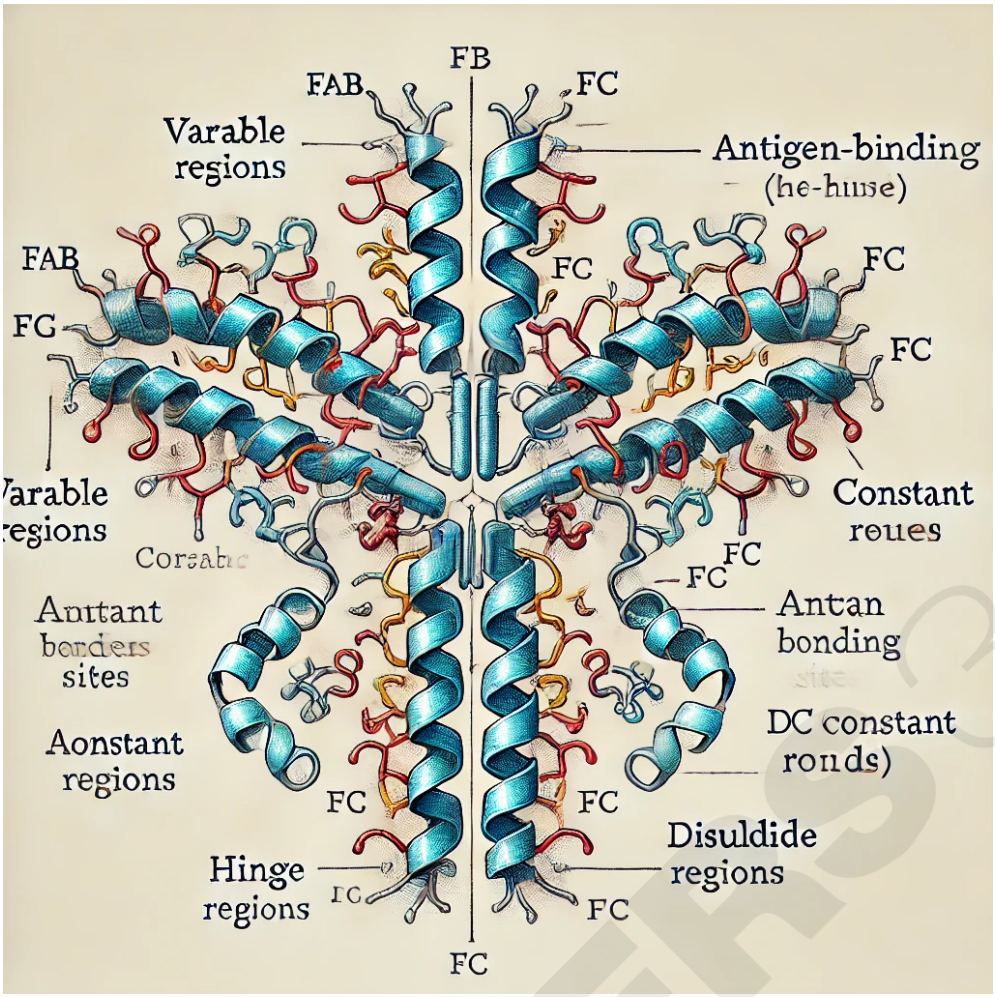
Solution:

In innate immunity, two important types of barriers are cellular barriers and cytokine barriers:
1. Cellular Barriers: These involve immune cells that act as the first line of defense against pathogens. Examples include macrophages, neutrophils, and natural killer (NK) cells, which identify, engulf, and destroy invading microorganisms or infected cells through processes like phagocytosis.
2. Cytokine Barriers: Cytokines are signaling proteins released by immune cells in response to infections. They regulate immune responses by promoting inflammation and activating other immune cells. Interferons are an example of cytokines that inhibit viral replication and alert neighboring cells to increase their defenses.

8) Draw a well labelled diagram of an antibody molecule.

Solution:

Here is the well-labeled diagram of an antibody molecule as requested. Let me know if you need any additional details or modifications



9) Write a short note: Selectable marker.

Solution:

A selectable marker is a gene introduced into a cell, typically in genetic engineering, that allows researchers to identify and select cells that have successfully incorporated foreign DNA. These markers confer resistance to certain antibiotics or other toxic substances, enabling only the transformed cells (those carrying the marker gene) to survive and proliferate. For example, antibiotic resistance genes like ampicillin resistance are commonly used as selectable markers in bacterial transformation to easily distinguish between transformed and non-transformed cells.

10) Explain brood parasitism in birds.

Solution:

Brood parasitism in birds is a reproductive strategy where one bird species (the parasite) lays its eggs in the nest of another species (the host), leaving the host to incubate the eggs and raise the parasitic chicks. The host bird often cannot distinguish between its own eggs and the parasitic ones. A well-known example is the cuckoo, which lays its eggs in the nests of other birds. The parasitic chicks may outcompete or even remove the host's chicks, ensuring that the parasite's offspring receive the full care and resources of the host.

11) Explain Gross primary productivity and Net primary productivity.

Solution:

Gross Primary Productivity (GPP) refers to the total amount of energy or biomass produced by photosynthetic organisms (such as plants) in an ecosystem through the process of photosynthesis. It represents the total rate at which energy is captured from sunlight and converted into organic molecules.

Net Primary Productivity (NPP) is the amount of energy or biomass that remains after the producers have used some of the energy for their own metabolic processes (like respiration). NPP is the energy available to herbivores and higher trophic levels in an ecosystem. Mathematically, it can be expressed as:

$$\text{NPP} = \text{GPP} - \text{Respiration}$$

12) Explain causes of biodiversity losses by over exploitation.

Solution:

Overexploitation refers to the unsustainable use of natural resources at a rate faster than they can regenerate, leading to biodiversity loss. Some key causes include:
1. Overfishing: Excessive fishing depletes fish populations, disrupts marine ecosystems, and threatens species with extinction, reducing aquatic biodiversity.
2. Hunting and Poaching: The illegal or excessive hunting of animals for commercial gain, such as for fur, tusks, or medicinal products, can drive species to extinction and upset ecosystem balances.
3. Deforestation and Logging: Unsustainable harvesting of timber and clearing forests for agriculture or industry destroys habitats, leading to loss of plant and animal species.
4. Overharvesting of Plants: The unsustainable collection of medicinal or ornamental plants can deplete native species and affect ecosystems.

These practices deplete populations, alter ecosystems, and reduce the genetic diversity needed for species adaptation and survival.

SECTION-B

13) Describe double fertilization in flowering plant. (Diagram is not necessary)

Solution:

Double fertilization is a unique process in flowering plants where two sperm cells from a pollen grain enter the ovule. One sperm fertilizes the egg cell to form a diploid zygote, while the other fuses with two polar nuclei to form the triploid endosperm. The zygote develops into the embryo, and the endosperm nourishes it during development.
14) Explain various events during a menstrual cycle in detail. (Diagram is not necessary)

Solution:

The menstrual cycle is divided into four phases:
1. Menstrual Phase (Day 1-5): The endometrial lining sheds, resulting in menstruation.
2. Follicular Phase (Day 1-13): Follicle-Stimulating Hormone (FSH) stimulates follicle development in the ovaries, and estrogen levels rise, rebuilding the endometrium.
3. Ovulation (Day 14): A surge in Luteinizing Hormone (LH) triggers the release of a mature egg from the ovary.
4. Luteal Phase (Day 15-28): The corpus luteum forms and secretes progesterone to prepare the uterus for possible pregnancy. If fertilization does not occur, hormone levels drop, leading to menstruation.
15) Explain transforming principle with Griffith experiment.

Solution:

Griffith's experiment in 1928 demonstrated the "transforming principle" by using two strains of Streptococcus pneumoniae: a virulent (S) strain and a non-virulent (R) strain. He found that when heat-killed S strain was mixed with live R strain, the R strain transformed into a virulent strain, suggesting that some genetic material from the dead S strain was transferred to the R strain, initiating transformation.
16) Describe Miller's experiment with diagram.

Solution:

Miller and Urey's experiment simulated early Earth's conditions by passing a mixture of water, methane, ammonia, and hydrogen through electrical sparks (simulating lightning). The experiment produced organic compounds like amino acids, suggesting that life's building blocks could form in prebiotic Earth conditions.
17) Explain adaptive radiation. (Figure is not necessary)

Solution:

Adaptive radiation is the evolutionary process where a single ancestral species rapidly diversifies into multiple new species to fill various ecological niches. A classic example is Darwin's finches, which evolved different beak shapes to exploit different food sources on the Galápagos Islands.
18) Describe biological treatment of Sewage. (Figure is not necessary)

Solution:

Biological treatment of sewage involves using microbes, primarily bacteria, to break down organic matter in wastewater. In secondary treatment, aerobic bacteria decompose organic pollutants in aeration tanks. In anaerobic digestion, bacteria in sludge break down waste without oxygen. These processes reduce pollutants and produce biogas as a byproduct.
19) Write significance of microbes as Biofertilisers.

Solution:

Microbes, such as bacteria and fungi, act as biofertilizers by fixing atmospheric nitrogen (e.g., Rhizobium in legumes), solubilizing phosphorus (e.g., Pseudomonas), and decomposing organic matter. They enhance soil fertility, promote plant growth, and reduce the need for chemical fertilizers,

making agriculture more sustainable.

20) Describe genetically engineered insulin with diagram.

Solution:

Genetically engineered insulin is produced using recombinant DNA technology. The human insulin gene is inserted into bacterial plasmids, which are then introduced into *E. coli* or yeast cells. These microbes produce insulin, which is harvested and purified for medical use. This method provides a reliable source of insulin for diabetics.

21) Discuss : "Different levels of biodiversity".

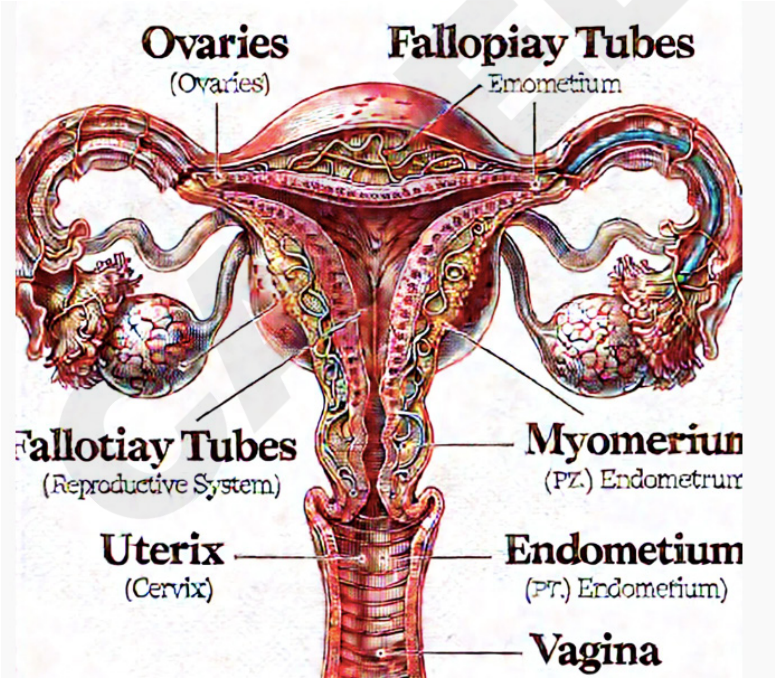
Solution:

Biodiversity exists at three levels:

1. **Genetic Diversity:** Variation in genes within a species, allowing adaptation to environmental changes.
2. **Species Diversity:** The variety of species within an ecosystem or across the planet.
3. **Ecosystem Diversity:** The range of different ecosystems, including forests, deserts, wetlands, and oceans, each with its unique communities and environmental conditions. These levels contribute to ecosystem resilience and overall biological health.

22) Draw labelled diagram of the female reproductive system and explain about structure of the uterus.

Solution:



Here is the labeled diagram of the female reproductive system as requested. Regarding the structure of the uterus:

The **uterus** is a pear-shaped, muscular organ located in the pelvic cavity. It has three distinct layers:

1. **Perimetrium:** The outermost protective layer of the uterus.
2. **Myometrium:** The thick middle layer composed of smooth muscle fibers, which play a key role during childbirth by contracting to expel the baby.
3. **Endometrium:** The innermost lining of the uterus, which thickens during the menstrual cycle to support a potential pregnancy and sheds during menstruation if fertilization does not occur.

23) Give detailed account about colour blindness and sickle cell anaemia.
(Diagram is not require)

Solution:

- **Colour Blindness:** It is a genetic disorder where individuals cannot distinguish certain colors, commonly red and green. This condition is typically inherited in an X-linked recessive pattern. Males are more often affected because they have only one X chromosome, while females need two defective X chromosomes to express the condition.

- **Sickle Cell Anaemia:** It is an inherited blood disorder caused by a mutation in the hemoglobin gene, leading to abnormal, sickle-shaped red blood cells. These cells are less efficient at carrying oxygen and tend to block blood flow in vessels, causing pain, fatigue, and organ damage. Sickle cell disease follows an autosomal recessive inheritance pattern.

24) Explain metabolism of Lactose according to Jacob and Monod model.
(Diagram is not required)

Solution:

The Jacob and Monod model explains the regulation of lactose metabolism in E. coli through the lac operon. When lactose is absent, a repressor binds to the operator region, preventing transcription of genes required for lactose metabolism. When lactose is present, it binds to the repressor, inactivating it, allowing RNA polymerase to transcribe the genes needed to produce enzymes like β-galactosidase, which breaks down lactose into glucose and galactose.
25) "Cancer detection, diagnosis and treatment" - Discuss.

Solution:

- **Detection:** Cancer can be detected through screening methods such as mammograms, Pap smears, colonoscopies, and blood tests for tumor markers.
- **Diagnosis:** It involves imaging techniques like MRI, CT scans, and biopsies to confirm the presence of cancerous cells and determine the stage.
- **Treatment:** Cancer treatment may include surgery to remove tumors, radiation therapy to destroy cancer cells, chemotherapy to target rapidly dividing cells, and newer approaches like immunotherapy and targeted therapy, which focus on specific cancer-related molecules or the immune system.

26) Explain the following:
i) Competent Host
ii) Isolation of the genetic material (DNA)

Solution:

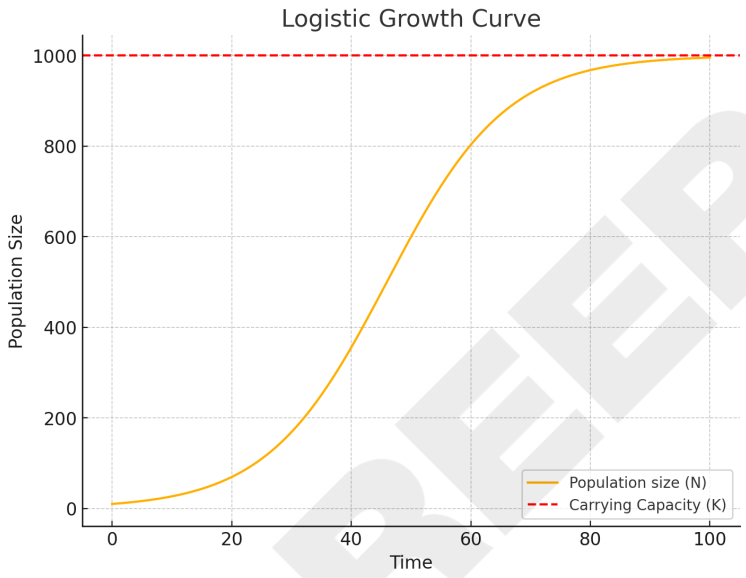
i) **Competent Host:** A competent host is a cell, often bacterial, that is capable of taking up foreign DNA during genetic transformation. It is made competent through chemical or physical treatments, such as calcium chloride or electroporation, allowing the DNA to pass through the cell membrane.

ii) **Isolation of the Genetic Material (DNA):** This process involves breaking open cells (lysis) to release the DNA, followed by purification steps to remove proteins and other cell debris. Typically, enzymes like proteases and RNases are used, and DNA is precipitated using alcohol after being separated from other cellular components.

27) Explain the logistic growth of the population with the help of a graph.

Solution:

Logistic growth describes how a population's growth slows as it approaches the carrying capacity of its environment, forming an S-shaped curve. Initially, population growth is exponential due to abundant resources. As resources become limited, growth slows and eventually stabilizes when the population reaches the carrying capacity, where birth and death rates balance out.



The graph above represents the logistic growth curve of a population. Initially, the population grows rapidly in an exponential manner when resources are abundant. As the population size approaches the carrying capacity (K), the growth rate slows down due to limiting factors such as food, space, and competition.

GSEB Class 12 Biology Question with Solution - 2023

SECTION-A

PART-A

1) Which one of the following is incompatible for physical barrier of innate immunity?
(A) Saliva in mouth
(B) Skin
(C) Mucus coating
(D) Respiratory track

Solution:

The correct answer is (A) Saliva in mouth. While saliva contains antimicrobial properties and enzymes like lysozyme, it is not classified as a physical barrier in innate immunity. Physical barriers include the skin, mucus coatings, and the respiratory tract lining that physically block pathogen entry.

2) For which of the following disease the variety of chilli 'Pusa Sadabahar' have the resistance?
(A) Black rot
(B) Leaf Curl
(C) White rust
(D) Bacterial blight

Solution:

The correct answer is (B) Leaf Curl. The chilli variety 'Pusa Sadabahar' has been bred for resistance to leaf curl, a common viral disease that affects chilli plants, leading to stunted growth and reduced yield.

3) Mycorrhiza ---------
(A) Represents the symbiotic association of Rhizobium and leguminous plants
(B) Represents the symbiotic association of cynobacteria and Azotobacter
(C) Represents the symbiotic association of blue green algae and plant
(D) Represents the symbiotic association of many members of genus Glomus and plant

Solution:

The correct answer is (D) Represents the symbiotic association of many members of genus Glomus and plant. Mycorrhiza refers to a mutualistic association between fungi, particularly from the genus Glomus, and plant roots, where the fungi help in nutrient absorption, especially phosphorus, and in return, receive carbohydrates from the plant.

4) Which of the following facility is not present in bioreactors.
(A) Sampling ports
(B) Temperature control system
(C) Preservatives
(D) Foam control system

Solution:

The correct answer is (C) Preservatives. Bioreactors are designed for controlled environments to support cell growth and product formation, equipped with facilities like sampling ports, temperature control systems, and foam control systems. Preservatives are not used in bioreactors, as they could inhibit cell growth and interfere with biological processes.

5) Which of the following chain is not present in mature insulin?
(A) D peptide
(B) B peptide
(C) C peptide
(D) A peptide

Solution:

The correct answer is (C) C peptide. In mature insulin, the $\mathbf{A}$ and $\mathbf{B}$ chains are present, which are linked by disulfide bonds. The $\mathbf{C}$ peptide is removed during the maturation process of insulin and is not present in the final, active form of the hormone.

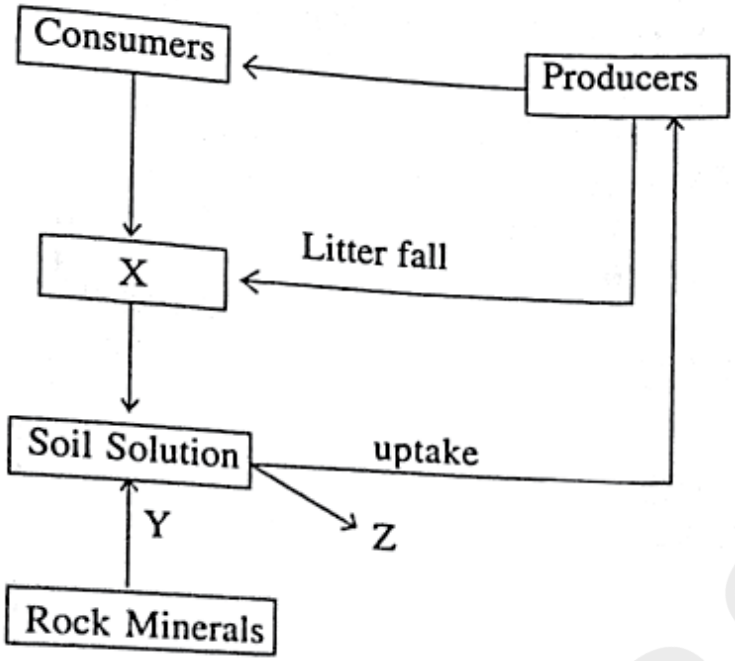
6) Analyse the validity of following statements for desert plants.
(i) Many desert plants have a thick cuticle on their leaf surfaces.
(ii) Their stomata arranged in deep pits
(iii) Many plants have special photosynthetic pathway (CAM)
(iv) Many plants modify their stem into spines to reduce transpiration
(A) (i) and (iv) are correct
(B) (i), (ii) and (iii) are correct
(C) (iii) and (iv) are correct

Solution:

The correct answer is (B) (i), (ii) and (iii) are correct.
- Many desert plants have a thick cuticle on their leaf surfaces to minimize water loss.
- Their stomata are arranged in deep pits to reduce transpiration.
- Many desert plants also utilize a special photosynthetic pathway (CAM), which allows them to open their stomata at night, reducing water loss.

However, desert plants generally modify leaves into spines, not stems, to reduce transpiration.

7) Identify the X, Y, Z in the modal of phosphorus cycle in a terrestrial ecosystem.



	X	Y	Z
(A)	Detritus	Run off	Weathering
(B)	Detritus	Weathering	Run off
(C)	Decomposer	Weathering	Run off
(D)	Weathering	Runoff	Detritus

Solution:

The correct answer is (B) Detritus, Weathering, Run off.

In the phosphorus cycle of a terrestrial ecosystem:
- X (Detritus) refers to dead organic matter that contributes phosphorus back to the soil.
- Y (Weathering) releases phosphorus from rocks into the soil.
- Z (Run off) is the process where phosphorus is carried by water from the land into water bodies.

8) Statement A :- Greater biological diversity is observed in tropical regions.
Reason R - Tropical environments are more seasonal and relatively less constant
(A) A is incorrect and R is correct
(B) A and R both are correct R is not a correct explanation of A
(C) A is correct and R is incorrect
(D) A and R both are correct and R is the correct explanation of A

Solution:

The correct answer is (C) A is correct and R is incorrect.

Statement A is correct because greater biological diversity is indeed observed in tropical regions due to the stable climate, ample sunlight, and high productivity.

Reason R is incorrect because tropical environments are actually less seasonal and more constant compared to temperate regions, which promotes higher biodiversity.

9) Give the (combined) relative contribution of N_2O and CO_2 greenhous gases to total global warming.
(A) 66%
(B) 36%
(C) 74%
(D) 26%

Solution:

The correct answer is (C) 74%.
The combined relative contribution of CO_2 (carbon dioxide) and N_2O (nitrous oxide) to total global warming is approximately 74%. CO_2 is the largest contributor, followed by other gases like N_2O.

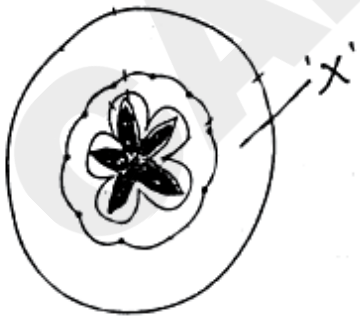
10) Which of the following animals exhibit a menstrual cycle?
(A) Dogs
(B) Tigers
(C) Rats
(D) Apes

Solution:

The correct answer is (D) Apes.

Among the options, apes (including humans and other primates) exhibit a menstrual cycle. Other animals like dogs, tigers, and rats undergo an estrous cycle, not a menstrual cycle.

11) Identify the X in the given below diagram of false fruit



(A) Thalamus
(B) Epicarp
(C) Mesocarp
(D) Endocarp

Solution:

The correct answer is (A) Thalamus.

In a false fruit, the thalamus (receptacle) is the part of the flower that enlarges and becomes the edible part of the fruit, rather than the ovary alone, which is the case in true fruits.

12) Baculo viruses
(A) Induce the resistance to root born pathogen, tolerance to salinity
(B) Attack insects and other arthopods
(C) Useful to get rid of mosquitoes
(D) Use in the treatment of plant disease

Solution:

The correct answer is (B) Attack insects and other arthropods.

Baculoviruses are a group of viruses known to specifically infect and kill insects and other arthropods. They are often used as biological control agents to manage pest populations in agriculture without harming plants or other non-target organisms.

13) Which one of the following is copper releasing IUDs?
(A) Multilod 375
(B) Progestasert
(C) Lippes loop
(D) Female Condoms

Solution:

The correct answer is (A) Multiload 375.

Multiload 375 is a copper-releasing intrauterine device (IUD), which works by releasing copper ions that are toxic to sperm, thus preventing fertilization. Progestasert and Lippes loop are noncopper IUDs, while female condoms are a barrier method of contraception, not an IUD.

14) Which of the following exhibit male heterogametic sex determination?
(A) Human
(B) Honey bee
(C) Pigeon
(D) Hen

Solution:

The correct answer is (A) Human.

In humans, sex determination follows the male heterogametic system (XY), where males have two different sex chromosomes (XY) and females have two of the same (XX). In contrast, birds like hens and pigeons exhibit female heterogametic (ZW) sex determination, while honey bees follow a haplodiploid system.

15) How much temperature provided in closed flask containing CH_4H_2, NH_3 and water vapour during S.L. Miller experiment?
(A) $100^{\circ}C$
(B) $400^{\circ}C$
(C) $200^{\circ}C$
(D) $800^{\circ}C$

Solution:

The correct answer is (A) $100^{\circ}C$.

In the Stanley L. Miller experiment, the closed flask containing a mixture of methane (CH_4), hydrogen (H_2), ammonia (NH_3), and water vapor was heated to $100^{\circ}C$ to simulate the conditions of early Earth and study the formation of organic compounds.

16) When does haemozoin is release after the entry of plasmo dium as a sporozoites in human body?
(A) Parasite migrate to the mosquito salivary glands
(B) Parasite enter in to human body and before it reach the liver
(C) When parasite reproduce asexually in red blood cell and burst the RBC
(D) When the parasite reproduce asexually in liver cell and bursting the cell

Solution:

The correct answer is (C) When parasite reproduce asexually in red blood cell and burst the RBC.

Haemozoin is a toxic substance released when the Plasmodium parasite reproduces asexually inside red blood cells (RBCs) and causes them to burst. This rupture leads to the symptoms of malaria, including fever and chills.

17) Analyse the validity of the following statements
(i) σ (sigma) factor get associates with DNA polymerase at promoter site during the process of transcription in bacteria
(ii) Exons are joined in defined order with each other during transcription in Eukaryotes
(iii) There is a single DNA dependent RNA polymerase that catalyse transcription of all types of RNA in bacteria
(iv) Introns are said to be those sequence that appear in mature or processed RNA (in Eukaryotes)
(A) (i) and (iv) are correct
(B) (ii) and (iii) are correct
(C) (ii) and (iv) are correct
(D) (i) and (iii) are correct

Solution:

The correct answer is (D) (i) and (iii) are correct.
- Statement (i) is correct because the σ (sigma) factor associates with RNA polymerase (not DNA polymerase) at the promoter site during transcription in bacteria, helping to initiate the process.
- Statement (iii) is correct because bacteria have a single DNA-dependent RNA polymerase that catalyzes the transcription of all types of RNA (mRNA, tRNA, rRNA).

Statement (ii) is incorrect because exons are joined after transcription during the process of splicing, not during transcription.

Statement (iv) is incorrect because introns are non-coding sequences that are spliced out and do not appear in mature or processed RNA in eukaryotes; exons remain in the mature RNA.

18) In MOET method the cow is administered hormone ☐ which induce ☐ maturation and super ☐ R
Chosse the correct options for above P, Q, R statements
(A) $\mathrm{P-LH}$

Q - Uterus
R - Ovulation
(B) $\mathrm{P-LH}$

Q - Follicular
R - Lactation
(C) P-FSH

Q - Follicular
R - Ovulation
(D) $\mathrm{P-FSH}$

Q - Ovary
R - Lactation

Solution:

The correct answer is (C) P-FSH, Q - Follicular, R - Ovulation.
In the Multiple Ovulation Embryo Transfer (MOET) method:
- P (FSH) stands for Follicle Stimulating Hormone, which is administered to induce multiple follicle development.
- Q (Follicular) refers to the maturation of multiple follicles.
- R (Ovulation) is the process of releasing mature eggs from the follicles.

19) In STPs the structure form by the association of bacteria and fungal filaments during secondary treatment
(A) Primary Sludge
(B) Activated sludge
(C) Flocs
(D) Effluent

Solution:

The correct answer is (C) Flocs.

In sewage treatment plants (STPs), during the secondary treatment, bacteria and fungal filaments form a structure known as flocs. These flocs help in the breakdown of organic matter in the wastewater, contributing to the treatment process.

19) In STPs the structure form by the association of bacteria and fungal filaments during secondary treatment
(A) Primary Sludge
(B) Activated sludge
(C) Flocs
(D) Effluent

Solution:

The correct answer is (C) Flocs.

In sewage treatment plants (STPs), during the secondary treatment process, flocs are formed by the association of bacteria and fungal filaments. These flocs play a crucial role in breaking down organic matter in the wastewater, aiding in the purification process.

20) Which stain is used to staining the separated DNA fragments those isolated by Gel electrophoresis
(A) Ethidium bromide
(B) Saffranine
(C) Iodine
(D) Methyle blue

Solution:

The correct answer is (A) Ethidium bromide.

Ethidium bromide is a commonly used stain for visualizing DNA fragments separated by gel electrophoresis. It binds to the DNA and fluoresces under ultraviolet (UV) light, allowing the bands of DNA to be seen.

21) Which of the following organisation of India that make decisions regarding the validity of GM research and the safety of introducing GM - organism for public services?
(A) ICMR
(B) GEAC
(C) IARI
(D) EFB

Solution:

The correct answer is (B) GEAC.

The Genetic Engineering Appraisal Committee (GEAC) is the organization in India responsible for making decisions regarding the validity of genetically modified (GM) research and the safety of introducing GM organisms for public use. It operates under the Ministry of Environment, Forest and Climate Change.

22) From which of the following bacteria the enzyme DNA X polymerase is isolated that is necessary for PCR method.
(A) Haemophilus influenzae

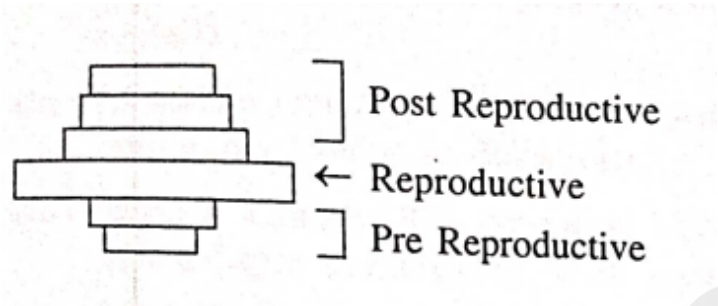
(B) E. Coli
(C) Agrobacterium tumifaciens
(D) Thermus aquaticus

Solution:

The correct answer is (D) Thermus aquaticus.

The enzyme Taq DNA polymerase, which is crucial for the PCR (Polymerase Chain Reaction) method, is isolated from the bacterium Thermus aquaticus. This enzyme is heat-resistant and remains active during the high-temperature cycles of PCR.

23) Which status of the given age pyramid is indicating for human population in a habitate?



(A) Uncertain
(B) Stable Population
(C) Declining Population
(D) Expanding population

Solution:

The correct answer is (C) Declining Population.
In the given age pyramid, the pre-reproductive group is smaller than the reproductive and postreproductive groups, indicating that fewer young individuals are entering the reproductive phase. This suggests a declining population, where the birth rate is lower than the replacement level, leading to a shrinking population over time.

24) Match the pair

	Column - I Extinct species		Column - II Country
P	Dodo	i	Russia
Q	Quagga	ii	Mauritius
R	Thylacine	iii	Australia
S	Steller's sea cow	iv	Africa

(A) $(\mathrm{P}-\mathrm{iii})(\mathrm{Q}-\mathrm{iv})(\mathrm{R}-\mathrm{i})(\mathrm{S}-\mathrm{ii})$
(B) $(P-ii)(Q-iv)(R-ii)(S-i)$
(C) $(\mathrm{P}-\mathrm{ii})(\mathrm{Q}-\mathrm{iii})(\mathrm{R}-\mathrm{iv})(\mathrm{S}-\mathrm{i})$
(D) $(\mathrm{P}-\mathrm{i})(\mathrm{Q}-\mathrm{iv})(\mathrm{R}-\mathrm{iii})(\mathrm{S}-\mathrm{ii})$

Solution:

The correct answer is (C) (P-ii)(Q-iv)(R-iii)(S-i).
Here is the correct matching:
- P - Dodo $\rightarrow$ ii - Mauritius (The Dodo bird was native to Mauritius and is now extinct.)
- Q - Quagga $\rightarrow$ iv - Africa (The Quagga, a subspecies of the zebra, was native to South Africa.)
- R - Thylacine $\rightarrow$ iii - Australia (The Thylacine, also known as the Tasmanian tiger, was native to Australia.)
- S - Steller's sea cow $\rightarrow$ i - Russia (The Steller's sea cow was found around the Commander Islands near Russia.)

25) Two species exhibiting amensalism interaction, choose the correct option from the following for that

	Species A	Species B
(A)	0	–
(B)	+	0
(C)	–	+
(D)	+	+

Solution:

The correct answer is (A) 0 \& -.

In amensalism, one species (Species A) is unaffected (0), while the other species (Species B) is negatively impacted (-). This interaction typically occurs when one organism unintentionally harms another without benefiting or being harmed itself.

26) Identify one disease from the following which can transmitted by sharing of injection needles
(A) Trichomoniasis
(B) Syphilis
(C) Gonorrhoe
(D) AIDS

Solution:

The correct answer is (D) AIDS.
AIDS (Acquired Immunodeficiency Syndrome) is caused by the HIV virus and can be transmitted through the sharing of injection needles, which can transfe infected blood from one person to another. The other diseases listed, such as Trichomoniasis, Syphilis, and Gonorrhea, are typically transmitted through sexual contact, not by sharing needles.

27) Which of the following exhibit convergent evolution?
(A) Wings of butterfly and birds
(B) Thorn of bouga in willea and tendril of cucurbita
(C) Forlimbs of man and flippers of whale
(D) Eye of the octopus and mammals

Solution:

The correct answer is (A) Wings of butterfly and birds.

Convergent evolution occurs when unrelated species evolve similar traits independently, often because they live in similar environments or face similar selective pressures. The wings of butterflies and birds are examples of convergent evolution, as both have developed wings for flight despite being from different evolutionary lineages (insects vs. birds).

28) In which of the following plant the male and female flowers are present at the different plants?
(A) Castor
(B) Sunflower
(C) Coconut
(D) Papaya

Solution:

The correct answer is (D) Papaya.

In papaya plants, male and female flowers are present on different plants, which makes papaya a dioecious plant. This means that one plant produces only male flowers, and another produces only female flowers. The other plants listed, such as castor, sunflower, and coconut, have different flower arrangements but are not typically dioecious.

29) Which of the following method of pollination is functionally cross pollination but genetically it is similar to autogamy?
(A) Xenogamy
(B) Geitonogamy
(C) Autogamy
(D) None of them

Solution:

The correct answer is (B) Geitonogamy.

Geitonogamy is a type of pollination where pollen is transferred from one flower to another flower on the same plant. Functionally, it is cross-pollination because it involves the transfer of pollen between different flowers, but genetically it is similar to autogamy (self-pollination) because the pollen comes from the same plant.

30) Which of the following gland helps in the lubrication of the penis?
(A) Bulbourethral glands
(B) Testis
(C) Prostate
(D) Seminal Vesicles

Solution:

The correct answer is (A) Bulbourethral glands.

The bulbourethral glands (also known as Cowper's glands) secrete a lubricating fluid that helps in the lubrication of the penis during sexual arousal. This fluid also helps neutralize any acidity in the urethra. The other glands, such as the testis, prostate, and seminal vesicles, have different functions related to the production of sperm and seminal fluid.

31) Which statement of the following is not correct for surgical methods of contraceptive?
(A) Surgical methods are highly effective but their reversibility is very poor
(B) After vasectomy the sperm is present in the epididymis
(C) Small incision is done on rete testis during vasectomy
(D) After tubectomy the ovum is not enter in the uterus

Solution:

The correct answer is (C) Small incision is done on rete testis during vasectomy.

This statement is incorrect because, in a vasectomy, a small incision is made to cut or block the vas deferens, not the rete testis. The vas deferens is the duct that carries sperm from the testicles to the urethra. After a vasectomy, sperm cannot travel from the epididymis to the urethra, effectively preventing fertilization.

32) Which of the following scientist used frequency of recombination between gene pairs on the same chromosome as a measure of the distance between genes and 'mapped' their position on the chromosome?
(A) Henking
(B) Theodore Boveri
(C) Correns
(D) Alfred Sturtevant

Solution:

The correct answer is (D) Alfred Sturtevant.

Alfred Sturtevant was the scientist who first used the frequency of recombination between gene pairs on the same chromosome as a measure of the distance between genes and created the first genetic map. This technique allowed him to determine the relative positions of genes on a chromosome based on recombination frequencies.

33) The ratio of nitrogen bases in a specific segment of double strands DNA is 52%. Which are linked by three hydrogen bond, So what is the ratio of purine nitrogen bases at the same segment?
(A) 50%
(B) 26%
(C) 52%
(D) 48%

Solution:

The correct answer is (B) $\mathbf{26\%}$.
In DNA, the nitrogen bases linked by three hydrogen bonds are Guanine (G) and Cytosine (C). Since the given segment is 52% G-C pairs, and G-C pairs involve a purine (Guanine) and a pyrimidine (Cytosine), half of the 52% will be Guanine (G), which is a purine.

Thus, the ratio of purine nitrogen bases from $\mathrm{G}-\mathrm{C}$ pairs will be:

$$\frac{52}{2}=26\%$$

Therefore, the ratio of purine nitrogen bases (Guanine) in this specific segment is 26%.

34) What were the brain capacity of Homo erectus?
(A) $1450-1500\mathrm{CC}$
(B) 900 CC
(C) 650 - 800 CC
(D) 1400 CC

Solution:

The correct answer is (B) 900 CC.

The brain capacity of Homo erectus was approximately 900 cubic centimeters (CC), which is larger than earlier hominins but smaller than that of modern humans.

35) From where the drug 'Smack' is extracted?
(A) From the leaf of Erythroxylum coca
(B) From the flower tops of the Cannabis
(C) From the latex of opium poppy
(D) From the seed of Atropabelladona

Solution:

The correct answer is (C) From the latex of opium poppy.

Smack, also known as heroin, is extracted from the latex of the opium poppy (Papaver somniferum). It is a highly addictive opioid drug that is processed from morphine, which is derived from the opium poppy.

36) Which one of the following fish is different from other fishes on the basis of habitat?
(A) Sardines
(B) Catla
(C) Mackerel
(D) Hilsa

Solution:

The correct answer is (B) Catla.

Catla is a freshwater fish, while the other fishes-Sardines, Mackerel, and Hilsa-are primarily marine fishes. This makes Catla different from the others based on habitat.

37) Identify the compatible pair
(A) Trichoderma polysporum - Statins
(B) Acetobacter aceti - Strepto kinase
(C) Clostridium butylicum - Cyclosporin - A
(D) Aspergillus niger - citric Acid

Solution:

The correct answer is (D) Aspergillus niger - Citric Acid.

Aspergillus niger is a fungus used industrially for the production of citric acid. The other pairs are incorrect because:
- Trichoderma polysporum produces Cyclosporin A, not statins.
- Acetobacter aceti is used for producing acetic acid, not streptokinase.
- Clostridium butylicum is involved in the production of butyric acid, not Cyclosporin A.

38) Which are the following enzymes whose recognition site are present on ampicillin resistance gene in pBR - 322
(A) Pvu I and Pst I
(B) Bam H I and Sal I
(C) Hind II and Eco RI
(D) Pvu II and Pst I

Solution:

The correct answer is (A) Pvu I and Pst I.

In the pBR322 plasmid, the recognition sites for the enzymes Pvu I and Pst I are located within the ampicillin resistance gene. Cleavage at these sites can disrupt the gene, allowing researchers to assess whether the gene remains functional after the insertion of foreign DNA.

39) Which protein is used to treat emphysema?
(A) $\alpha - 1$ Antitrypsin
(B) Antitrypsin
(C) α - Interferons
(D) Interferons

Solution:

The correct answer is (A) a-1 Antitrypsin.
a-1 Antitrypsin is a protein used to treat emphysema, a condition where the lung tissue is damaged, leading to difficulty in breathing. Deficiency in a-1 Antitrypsin can lead to an increased risk of developing emphysema, and therapy involving this protein can help manage the condition.

40) By which of the following equation the verhulst - Pearl logistic Growth is described?
(A) $N_{t+1} = N_t[(B + I) - (D + E)]$
(B) $Nt = Noe^{rt}$
(C) $\frac{dN}{dt} = rN\left(\frac{K-N}{K}\right)$
(D) $\frac{dN}{dt} = rN$

Solution:

The correct answer is (C) $\frac{dN}{dt} = rN\left(\frac{K-N}{K}\right)$.
This equation represents the Verhulst-Pearl logistic growth model, where:
- N is the population size,
- r is the intrinsic growth rate,
- K is the carrying capacity of the environment,
- $\frac{dN}{dt}$ is the rate of change of the population over time.

The model accounts for the fact that as the population size N approaches the carrying capacity K, the growth rate slows down.

41) That show inverted ecological pyramid :
(A) Pyramid of biomass shows a sharp decrease in biomass at higher trophic levels
(B) Pyramid of biomass in sea
(C) Pyramid of numbers in a grassland ecosystem
(D) An Ideal pyramid of energy

Solution:

The correct answer is (B) Pyramid of biomass in sea.

In an inverted ecological pyramid of biomass, the biomass at higher trophic levels is greater than at lower levels. This occurs in aquatic ecosystems like the sea, where the biomass of primary producers (like phytoplankton) is lower than the biomass of consumers (like fish), as the producers have a high turnover rate.

42) The active chemical reserpine is obtained from which of the following plant?
(A) Aloe vera
(B) Holy basil

(C) Rauwolfia Vomitoria
(D) Adhatoda

Solution:

The correct answer is (C) Rauwolfia vomitoria.
Reserpine is an active chemical compound that is extracted from the plant Rauwolfia vomitoria (also known as Rauwolfia serpentina). It has been historically used to treat high blood pressure and mental disorders due to its effects on the nervous system.

43) Statement A - Motor vehicles equipped with catalytic converter should use unleaded petrol

Reason R - Lead in the petrol inactivates the catalyst.
(A) A is incorrect R is correct
(B) A and R both are correct R is not a correct explanation of A
(C) A is correct R is incorrect
(D) A and R both are correct and R is the correct explanation of A

Solution:

The correct answer is (D) A and R both are correct and R is the correct explanation of A.

Statement A is correct because motor vehicles equipped with catalytic converters should use unleaded petrol.

Reason $\mathbf{R}$ is also correct because lead in petrol inactivates the catalyst in catalytic converters, rendering them ineffective in reducing harmful emissions. Thus, the reason properly explains the statement.

44) The number of chromosomes in the root tip of apple plant is 34 . So give the number of chromosomes in megaspore mother cell of the same plant.
(A) 20
(B) 34
(C) 51
(D) 17

Solution:

The correct answer is (B) 34.

The megaspore mother cell in plants is diploid, just like the cells in the root tip. Since the root tip of the apple plant has 34 chromosomes, the megaspore mother cell will also have 34 chromosomes before it undergoes meiosis to produce haploid megaspores.

45) Which of the following seed is ex-albuminous?
(A) Groundnut
(B) Barley
(C) Castor
(D) Maize

Solution:

The correct answer is (A) Groundnut.

Ex-albuminous seeds are those that lack a significant amount of endosperm at maturity, as the developing embryo mostly absorbs it. Groundnut is an example of an ex-albuminous seed, while seeds like barley, castor, and maize are albuminous, retaining endosperm.

46) Which of the following group of hormones produced only during pregnancy?
(A) Progesteron, Estrogen, Relaxin
(B) hPL, hCG, Estrogen
(C) hCG, hPL, Relaxin
(D) hCG, hPL, progesterone

Solution:

The correct answer is (C) hCG, hPL, Relaxin.

These hormones are produced specifically during pregnancy:
- hCG (human chorionic gonadotropin): Maintains the corpus luteum and progesterone production.
- hPL (human placental lactogen): Helps regulate the mother's metabolism and fetal growth.
- Relaxin: Relaxes the pelvic ligaments and cervix in preparation for childbirth.

Progesterone and Estrogen are produced in other phases as well, not exclusively during pregnancy.

47) Which of the following is not associated in STIs
(A) Chlamydiasis
(B) AIDS
(C) Hepatitis - B
(D) Cancer

Solution:

The correct answer is (D) Cancer.

Sexually transmitted infections (STIs) include diseases like Chlamydiasis, AIDS, and Hepatitis B, all of which can be transmitted through sexual contact. While some STIs, such as HPV, can lead to cancer (like cervical cancer), cancer itself is not classified as an STI.

48). Which are the two amino acids that linked with threonine by peptide bond at fourth position of Hbs peptide?
(A) Histidine and Leucine
(B) Leucine and Proline
(C) Valine and Glutamic acid
(D) Proline and Valine

Solution:

The correct answer is (D) Proline and Valine.

In the hemoglobin S (HbS) peptide, the amino acids proline and valine are linked by peptide bonds at the fourth position with threonine. This mutation in HbS , particularly involving the substitution of glutamic acid by valine at a specific position, is responsible for the sickle cell disease condition.

49) The structural gene y of Lac Operon Code for which amino acid?
(A) RNA Polymerase
(B) Transacetylase
(C) Permease
(D) β Galactosidase

Solution:

The correct answer is (C) Permease.

In the Lac Operon, the structural gene y codes for permease, an enzyme that facilitates the transport of lactose into the bacterial cell. The other structural genes include **z**, which codes for β-galactosidase, and **a**, which codes for transacetylase.

50) In one population the frequency of allele ' A ' is 0.6 and the frequency of allele 'a' is 0.4 for any one character. So what is the frequencies of organism having homozygous recessive allele for the same character?
(A) 24%
(B) 48%
(C) 36%
(D) 16%

Solution:

The correct answer is (D) 16%.

The frequency of homozygous recessive individuals in a population can be calculated using the Hardy-Weinberg equation: $p^2 + 2pq + q^2 = 1$, where:
- p is the frequency of the dominant allele (A),
- q is the frequency of the recessive allele (a).

The frequency of homozygous recessive individuals (aa) is given by q^2.
Given:
- $p = 0.6$ (frequency of allele A),
- $q = 0.4$ (frequency of allele a).

The frequency of homozygous recessive individuals (aa) is $q^2 = (0.4)^2 = 0.16$, or 16%.

PART-B

1) Explain sporulation in Amoeba.

Solution:

Sporulation in **Amoeba** is a type of asexual reproduction that occurs under unfavorable conditions. The Amoeba forms a cyst around itself, and within the cyst, it divides repeatedly to form multiple spores. When conditions become favorable again, the cyst breaks open, releasing numerous spores that develop into individual Amoeba.
2) Describe the goal of HGP.

Solution:

The goal of the **HGP** was to map and sequence the entire human genome, identifying all the genes and determining the sequences of the base pairs that make up human DNA. This project aimed to understand genetic structure, function, and variations, which can be applied to medicine, genetics, and biotechnology.
3) Which are the artificial hybridisation techniques accepted for crop improvement.

Solution:

Techniques include **emasculation**, where anthers are removed from a flower to prevent self-pollination, and **bagging**, where flowers are covered to prevent unwanted cross-pollination. **Pollination** is then done manually using desired pollen to create hybrids with improved traits like higher yield, disease resistance, and drought tolerance.
4) Write short notes :- Hydrarch succession

Solution:

Hydrarch succession is the ecological succession that starts in a water body (like a pond or lake) and gradually progresses towards a terrestrial ecosystem. It involves a series of stages where aquatic plants are replaced by terrestrial vegetation as the water body fills with sediment.
5) Specify the four basic processes which affect population density.

Solution:

The four processes are **natality** (birth rate), **mortality** (death rate), **immigration** (influx of individuals from outside), and **emigration** (movement of individuals out of the population). These processes determine the growth or decline of population density.
6) What is pleiotropy? Describe it with one example with characteristics.

Solution:

Pleiotropy occurs when one gene affects multiple, seemingly unrelated traits. An example is **Marfan syndrome**, where a single mutation in the **FBN1 gene** affects connective tissues, leading to features like long limbs, heart defects, and vision problems, all stemming from the same genetic mutation.
7) The pathogens responsible for pneumonia in humans and note the symptoms of the disease.

Solution:

Pneumonia in humans is caused by bacteria like **Streptococcus pneumoniae**, viruses, or fungi. Symptoms include **fever, cough, difficulty breathing**, chest pain, and fatigue. The infection leads to inflammation of the lung tissue, making breathing difficult.
8) Describe the effects of UV-B on human health

Solution:

Exposure to **UV-B radiation** can cause skin damage, such as **sunburn**, **premature aging**, and increased risk of **skin cancer**. It can also harm the eyes, leading to conditions like **cataracts**, and suppress the immune system, making individuals more prone to infections.

SECTION-B

9) Micro organism release gases during metabolism - give the examples which prove it.

Solution:

Microorganisms, especially in anaerobic conditions, produce gases like methane (CH_4), carbon dioxide (CO_2), and hydrogen sulfide (H_2S) during metabolism. For example, methanogenic bacteria in the digestive tracts of ruminants produce methane, while yeast produces CO_2 during the fermentation of sugars in bread and alcohol production.

10) Explain : Vaccination and Immunisation.

Solution:

Vaccination involves the administration of a vaccine containing weakened or inactive pathogens to stimulate the immune system to produce a defense (antibodies) against specific diseases.
Immunisation is the process by which an individual's immune system becomes fortified against a pathogen, either through vaccination or natural exposure to the disease.

11) Explain RNA interference with example.

Solution:

RNA interference (RNAi) is a biological process in which RNA molecules inhibit gene expression by destroying specific mRNA molecules. An example is the use of **RNAi in plants** to silence genes responsible for viral infections, such as preventing the spread of **potato virus Y** by silencing viral genes.

12) Give the salient features of genetic code.

Solution:

Salient Features of Genetic Code:

- **Triplet**: Each codon consists of three nucleotides.
- **Universal**: The genetic code is nearly the same in all organisms.
- **Degenerate**: Multiple codons can code for the same amino acid.
- **Non-overlapping**: Each nucleotide is part of only one codon.
- **Unambiguous**: Each codon specifies only one amino acid.

13) What is adoptive radiation? Explain it with example.

Solution:

Adaptive radiation refers to the evolution of different species from a common ancestor in response to different environmental pressures. An example is **Darwin's finches** on the Galápagos Islands, which evolved different beak shapes to exploit different food sources, demonstrating adaptive radiation.
14) Explain species are a relationship of pattern of biodiversity with graph.

Solution:

The species-area relationship describes the pattern where the number of species increases with the area surveyed. This relationship is important in understanding biodiversity patterns. As the area increases, the habitat diversity typically increases, leading to a higher number of species.

This relationship can be expressed mathematically as:

$S = cA^z$

Where:
- $\mathbf{S}$ is the number of species,
- A is the area,
- $\mathbf{c}$ is a constant,
- $\mathbf{z}$ is the slope of the curve, indicating how species richness increases with area.

15) What is Oogenesis? Give the short information about oogenesis (Chart is not required)

Solution:

Oogenesis is the process of formation and development of the female gamete (ovum). It occurs in the ovaries and begins during fetal development, where primordial germ cells divide to form oogonia. Oogonia develop into primary oocytes that remain arrested in prophase I of meiosis until puberty. During each menstrual cycle, one oocyte completes meiosis I to form a secondary oocyte and a polar body. The secondary oocyte undergoes meiosis II upon fertilization to form the mature ovum.
16) Draw the diagram of steps information of recombinant DNA by action of restriction endonuclease enzyme - EcoRI and explain its mechanism.

Solution:

Mechanism of Recombinant DNA Formation (EcoRI Action):

EcoRI is a restriction endonuclease enzyme that cuts DNA at specific recognition sequences (GAATTC) and creates sticky ends.

When EcoRI cuts a DNA molecule, it leaves overhanging sticky ends that can pair with complementary sticky ends of another DNA fragment cut by the same enzyme.

This allows the insertion of a foreign DNA fragment into a plasmid vector. DNA ligase then seals the nicks, forming recombinant DNA.

The mechanism involves cleavage at the recognition site, forming sticky ends, followed by ligation of the foreign gene into the vector.

17) Give your view for the following steps of breeding a new genetic variety of a crop.
i) Cross hybridisation among the selected parents.
ii) Selection and testing of superior recombinants.

Solution:

i) Cross Hybridisation Among Selected Parents: In this step, selected parents with desired traits are cross-bred to combine their favorable characteristics. This step creates genetic variability and the potential for superior combinations of traits.
ii) Selection and Testing of Superior Recombinants: After cross-breeding, the offspring (recombinants) are evaluated for desirable traits. The bestperforming individuals are selected and further tested under different environmental conditions to ensure stability and superiority.
18) What is Mendelian disorders? Discuss any two Mendelian disorder which shows sex linked recessive disorder. Colowi Bindness.

Solution:

Mendelian Disorders: Mendelian disorders are genetic diseases caused by single gene mutations that follow Mendelian inheritance patterns (dominant or recessive). Two examples of sex-linked recessive disorders are:

Hemophilia: A disorder where the blood does not clot properly due to a mutation in clotting factor genes on the X chromosome. Males are primarily affected, while females are carriers.

Duchenne Muscular Dystrophy (DMD): A disorder caused by a mutation in the dystrophin gene on the X chromosome, leading to progressive muscle weakness. It primarily affects males, while females are typically carriers.