BIHAR-BOARD-CLASS-12-BIOLOGY-119-SET-F-2025 Question Paper with Solutions

Time Allowed :3 Hours 15 mins	**Maximum Marks :**70	**Total questions :**96

General Instructions

Instructions to the candidates:

1. **Candidate must enter his/her Question Booklet Serial No. (10 Digits) in the OMR Answer Sheet.**
2. Candidates are required to give their answers in their own words as far as practicable.
3. Figures in the right-hand margin indicate full marks.
4. An extra time of 15 minutes has been allotted for the candidates to read the questions carefully.
5. This question booklet is divided into two sections — **Section-A** and **Section-B**.

Q1. By which of the following is sugarcane sown?

(A) Tubers

(B) Cutting of stems

(C) Bulbs

(D) Seeds

Correct Answer: (B) Cutting of stems

Solution:

Step 1: Understand sugarcane propagation.

Sugarcane is primarily propagated by vegetative methods, particularly through cuttings rather than seeds.

Step 2: Review the options.

- Tubers are typically used for propagating plants like potatoes, not sugarcane.
- Cutting of stems is a common method for sugarcane propagation, where a piece of the stem is planted to grow a new plant.
- Bulbs are used in plants like onions or garlic, not sugarcane.
- Seeds are not used in sugarcane propagation, as sugarcane is primarily propagated through stem cuttings.

Step 3: Conclude.

The correct method of propagating sugarcane is by cutting of stems, making option (B) the correct answer.

Final Answer:

$$\boxed{\text{Cutting of stems}}$$

Quick Tip

Sugarcane is commonly propagated through stem cuttings, which allows the plant to maintain its desirable traits.

Q2. Which of the following is affected by SO_2 pollution?

(A) Nucleus

(B) Mitochondria

(C) Chloroplast

(D) Golgi bodies

Correct Answer: (B) Mitochondria

Solution:

Step 1: Understand SO_2 pollution.

Sulfur dioxide (SO_2) pollution primarily affects the cellular components involved in energy production.

Step 2: Review the options.

- The nucleus is responsible for genetic material and is not directly impacted by SO_2 pollution.
- Mitochondria are responsible for energy production in the cell and are highly sensitive to SO_2 pollution.
- Chloroplasts are involved in photosynthesis, but they are not as directly affected by SO_2 pollution as mitochondria.
- Golgi bodies are involved in the modification and packaging of proteins, but they are not as affected by SO_2 pollution.

Step 3: Conclude.

SO_2 pollution affects mitochondria, making option (B) the correct answer.

Final Answer:

$$\boxed{\text{Mitochondria}}$$

Quick Tip

SO_2 pollution can cause oxidative damage to mitochondria, affecting cellular energy production.

Q3. Which of the following is the period between birth and death?

(A) Life cycle

(B) Life span

(C) Birth rate

(D) Propagation

Correct Answer: (B) Life span

Solution:

Step 1: Understand the terms.

The period between birth and death is a key biological concept related to the longevity of organisms.

Step 2: Review the options.

- Life cycle refers to the stages of development of an organism, but it doesn't specifically denote the period from birth to death.
- Life span refers to the total duration an organism lives, from birth to death, making this the correct answer.
- Birth rate refers to the number of births in a population and is not related to the life period.
- Propagation refers to the reproduction or spreading of organisms, not the period of life.

Step 3: Conclude.

The period between birth and death is called the life span, making option (B) the correct answer.

Final Answer:

$$\boxed{\text{Life span}}$$

Quick Tip

Life span varies between species and is influenced by genetic and environmental factors.

Q4. Sertoli cells are controlled by which of the following hormones?

(A) LH

(B) FSH

(C) Prolactin

(D) GH

Correct Answer: (B) FSH

Solution:

Step 1: Understand Sertoli cells.

Sertoli cells are the supporting cells of the seminiferous tubules in the testes. They play an essential role in spermatogenesis.

Step 2: Review the options.

- LH (Luteinizing Hormone) stimulates Leydig cells to produce testosterone but does not directly control Sertoli cells.
- FSH (Follicle Stimulating Hormone) stimulates Sertoli cells to support and nourish developing sperm, making it the correct hormone for controlling Sertoli cells.
- Prolactin is involved in milk production and lactation, not in controlling Sertoli cells.
- GH (Growth Hormone) influences overall growth but does not have a direct role in Sertoli cell function.

Step 3: Conclude.

FSH directly controls Sertoli cells, making option (B) the correct answer.

Final Answer:

$$\boxed{\text{FSH}}$$

Quick Tip

FSH is crucial for spermatogenesis as it activates Sertoli cells to nurture sperm development.

Q5. Which of the following cannot pass through placenta?

(A) Alcohol

(B) Fatty acids

(C) Iron

(D) Maternal antibodies

Correct Answer: (D) Maternal antibodies

Solution:

Step 1: Understand the placenta.

The placenta acts as a selective barrier that allows the exchange of gases, nutrients, and waste products between the mother and fetus, but it also restricts certain substances.

Step 2: Review the options.

- Alcohol can pass through the placenta and affect the fetus, leading to fetal alcohol syndrome.
- Fatty acids can pass through the placenta to provide energy to the fetus.
- Iron is transported across the placenta to the fetus for its development.
- Maternal antibodies cannot pass through the placenta, as they are typically too large to be transferred.

Step 3: Conclude.

Maternal antibodies do not pass through the placenta, making option (D) the correct answer.

Final Answer:

$$\boxed{\text{Maternal antibodies}}$$

Quick Tip

While most nutrients pass through the placenta, maternal antibodies are not directly transferred to the fetus.

Q6. Which of the following is an important factor in the formation of new species?

(A) Isolation

(B) Mutation

(C) Variation

(D) Competition

Correct Answer: (A) Isolation

Solution:

Step 1: Understand speciation.

The formation of new species, known as speciation, typically requires a separation of gene pools, often resulting from isolation.

Step 2: Review the options.

- Isolation prevents gene flow between populations, leading to the accumulation of differences that result in speciation, making it a crucial factor.
- Mutation introduces genetic variation, but it alone does not guarantee the formation of new species.
- Variation provides the raw material for natural selection but is not in itself sufficient for new species formation without isolation.
- Competition affects survival and reproductive success but does not directly lead to the formation of new species.

Step 3: Conclude.

Isolation is a key factor that contributes to speciation, making option (A) the correct answer.

Final Answer:

$$\boxed{\text{Isolation}}$$

Quick Tip

Isolation is often the first step in speciation, allowing populations to evolve independently.

Q7. The opening of which of the following is known as blastopore?

(A) Gastrula

(B) Morula

(C) Blastula

(D) Neural

Correct Answer: (A) Gastrula

Solution:

Step 1: Understand the stages of embryonic development.

Blastopore is an opening that forms during early embryonic development, specifically in the gastrula stage.

Step 2: Review the options.

- Gastrula is the stage where the blastopore forms. This is the correct answer.
- Morula is an early stage in development where the embryo consists of a solid ball of cells, but no blastopore is formed.
- Blastula is a later stage after gastrulation, where a hollow sphere of cells forms, but the blastopore is not an opening of this stage.
- Neural refers to the stage where the neural tube forms in development but is not related to the blastopore.

Step 3: Conclude.

The blastopore is formed during the gastrula stage, making option (A) the correct answer.

Final Answer:

$$\boxed{\text{Gastrula}}$$

Quick Tip

Blastopore is a key feature of the gastrula stage in embryonic development, marking the beginning of body axis formation.

Q8. Which of the following is a correct pair?

(A) G = T

(B) C = G

(C) G = C

(D) A = T

Correct Answer: (D) A = T

Solution:

Step 1: Recall base pairing in DNA.

In DNA, the nitrogenous bases follow specific pairing rules where Adenine (A) always pairs with Thymine (T), and Cytosine (C) always pairs with Guanine (G).

Step 2: Review the options.

- Option (A) G = T is incorrect because Guanine (G) pairs with Cytosine (C), not Thymine (T).
- Option (B) C = G is correct based on the base pairing rules.
- Option (C) G = C is correct, but it's not the best answer to the question which asks for a "correct pair."
- Option (D) A = T is the correct pairing in DNA as per the standard base pairing rules.

Step 3: Conclude.

The correct pair according to the base pairing rules is A = T, making option (D) the correct answer.

Final Answer:

$$\boxed{\text{A = T}}$$

Quick Tip

Base pairing in DNA follows strict rules: A pairs with T, and C pairs with G.

Q9. Which of the following is a soluble RNA?

(A) m-RNA

(B) r-RNA

(C) c-RNA

(D) t-RNA

Correct Answer: (A) m-RNA

Solution:

Step 1: Understand RNA types.

There are several types of RNA involved in protein synthesis, each with distinct roles.

Step 2: Review the options.

- m-RNA (messenger RNA) is soluble and carries genetic information from DNA to the ribosome for protein synthesis.
- r-RNA (ribosomal RNA) is part of the ribosome structure but is not considered soluble.
- c-RNA is not a recognized standard RNA type.
- t-RNA (transfer RNA) is involved in protein synthesis but is not classified as soluble RNA.

Step 3: Conclude.

m-RNA is the soluble form of RNA, making option (A) the correct answer.

Final Answer:

$$\boxed{\text{m-RNA}}$$

Quick Tip

m-RNA is the only soluble RNA type, essential for transferring genetic information during protein synthesis.

Q10. By which of the following bonds are the nucleotides of DNA attached?

(A) Hydrogen

(B) Covalent

(C) Electrovalent

(D) All of these

Correct Answer: (B) Covalent

Solution:

Step 1: Recall nucleotide bonding in DNA.

The nucleotides in DNA are attached through covalent bonds, forming the backbone of the DNA strand.

Step 2: Review the options.

- Hydrogen bonds form between complementary base pairs (A-T and C-G), but the nucleotides are connected by covalent bonds.
- Covalent bonds form the sugar-phosphate backbone, connecting the nucleotides in a DNA strand.
- Electrovalent bonds are not involved in nucleotide bonding in DNA.
- Option (D) ”All of these” is incorrect since only covalent bonds are involved in nucleotide bonding.

Step 3: Conclude.

The nucleotides in DNA are connected by covalent bonds, making option (B) the correct answer.

Final Answer:

Covalent

Quick Tip

Covalent bonds connect the nucleotides in DNA, while hydrogen bonds hold the complementary base pairs together.

Q11. Which of the following is an example of analogous organs?

(A) Wings of birds and butterfly

(B) Tail of dog and cat

(C) Wing of bat and hand of man

(D) All of these

Correct Answer: (A) Wings of birds and butterfly

Solution:

Step 1: Understand analogous organs.

Analogous organs are those that perform similar functions but have different origins or structures.

Step 2: Review the options.

- The wings of birds and butterflies are analogous organs as they perform the same function (flight) but are structurally different (bird wings are made of feathers, butterfly wings are made of membranes).
- The tail of dogs and cats are homologous organs as they are derived from the same structure in a common ancestor.
- The wing of a bat and the hand of man are also homologous organs as they share a common origin but have different functions.
- Therefore, the correct answer is option (A).

Step 3: Conclude.

The wings of birds and butterflies are analogous organs, making option (A) the correct answer.

Final Answer:

Wings of birds and butterfly

Quick Tip

Analogous organs perform similar functions but have different evolutionary origins.

Q12. By which of the following is water hyacinth pollinated?

(A) Water

(B) Insect

(C) Wind

(D) Both (B) and (C)

Correct Answer: (D) Both (B) and (C)

Solution:

Step 1: Understand water hyacinth pollination.

Water hyacinth can be pollinated by both wind and insects, depending on environmental conditions.

Step 2: Review the options.

- Water hyacinth is commonly pollinated by insects.
- It can also be pollinated by wind, as it has light pollen that can be carried by air currents.
- Therefore, the correct answer is option (D) as it includes both insect and wind pollination.

Step 3: Conclude.

Water hyacinth can be pollinated by both wind and insects, making option (D) the correct answer.

Final Answer:

$$\boxed{\text{Both (B) and (C)}}$$

Quick Tip

Water hyacinth is versatile in its pollination methods, utilizing both insects and wind.

Q13. In which of the following are male and female flowers found on the same plant?

(A) Cucumber

(B) Coconut

(C) Brinjal

(D) Tomato

Correct Answer: (B) Coconut

Solution:

Step 1: Understand monoecious plants.

Monoecious plants have both male and female flowers on the same plant, unlike dioecious plants where male and female flowers are on separate plants.

Step 2: Review the options.

- Cucumber is a dioecious plant, so male and female flowers are found on different plants.
- Coconut is a monoecious plant, so both male and female flowers are found on the same plant.
- Brinjal and tomato are also dioecious plants, with male and female flowers found on separate plants.

Step 3: Conclude.

Coconut is a monoecious plant, making option (B) the correct answer.

Final Answer:

Coconut

Quick Tip

Monoecious plants have both male and female flowers on the same plant, while dioecious plants do not.

Q14. On which of the following planets is there a possibility of life?

(A) Mars

(B) Mercury

(C) Venus

(D) Jupiter

Correct Answer: (A) Mars

Solution:

Step 1: Understand the conditions for life.

The conditions necessary for life include water, a stable atmosphere, and moderate temperatures.

Step 2: Review the options.

- Mars is the most likely planet to have conditions suitable for life, as evidence of water and a potentially habitable environment has been found.

- Mercury is too hot and lacks an atmosphere to support life.
- Venus has extreme temperatures and a thick toxic atmosphere, making it unlikely for life.
- Jupiter is a gas giant with no solid surface, making it unsuitable for life.

Step 3: Conclude.

Mars has the most potential for life, making option (A) the correct answer.

Final Answer:

Mars

Quick Tip

Mars is the most Earth-like planet in our solar system and the primary focus of astrobiology research for potential life.

Q15. Which of the following is related to pomiculture?

(A) Silk
(B) Fruit
(C) Vegetable
(D) Flower

Correct Answer: (B) Fruit

Solution:

Step 1: Understand pomiculture.

Pomiculture is the branch of horticulture that deals with the cultivation of fruit crops.

Step 2: Review the options.

- Silk is related to sericulture (silk farming), not pomiculture.
- Fruit is the correct answer, as pomiculture focuses on the cultivation of fruit crops.
- Vegetables are part of another branch of agriculture.
- Flowers are related to floriculture, not pomiculture.

Step 3: Conclude.

Pomiculture is related to fruit cultivation, making option (B) the correct answer.

Final Answer:

$$\boxed{\text{Fruit}}$$

Quick Tip

Pomiculture is a specialized field focused on the cultivation of fruit crops such as apples, oranges, and grapes.

Q16. Which of the following is a biotic component of the ecosystem?

(A) Air

(B) Sunlight

(C) Water

(D) Producer

Correct Answer: (D) Producer

Solution:

Step 1: Understand biotic components.

Biotic components are the living parts of an ecosystem, such as plants, animals, and microorganisms.

Step 2: Review the options.

- Air, sunlight, and water are abiotic components of an ecosystem, as they are non-living factors.

- Producers, such as plants, are biotic components because they are living organisms that produce food through photosynthesis.

Step 3: Conclude.

Producers are living organisms and thus biotic components, making option (D) the correct answer.

Final Answer:

$$\boxed{\text{Producer}}$$

Quick Tip

Biotic components include all living organisms in an ecosystem, while abiotic components are the non-living factors.

Q17. Which of the following is a marine fish?

(A) Catla

(B) Mangur

(C) Hilsa

(D) Singhi

Correct Answer: (C) Hilsa

Solution:

Step 1: Understand marine fish.

Marine fish live in saltwater habitats like oceans and seas.

Step 2: Review the options.

- Catla is a freshwater fish found in rivers and lakes.

- Mangur (Mrigal) is also a freshwater fish.

- Hilsa is a marine fish found in coastal waters and is well-known for its presence in the Bay of Bengal.

- Singhi is a freshwater fish found in rivers.

Step 3: Conclude.

Hilsa is a marine fish, making option (C) the correct answer.

Final Answer:

$$\boxed{\text{Hilsa}}$$

Quick Tip

Marine fish like Hilsa are found in saltwater habitats, unlike freshwater species such as Catla and Mangur.

Q18. Which of the following is a source of quinine?

(A) Canabis

(B) Cinchona

(C) Poppy

(D) Eucalyptus

Correct Answer: (B) Cinchona

Solution:

Step 1: Understand quinine.

Quinine is a compound obtained from the bark of the Cinchona tree, commonly used for the treatment of malaria.

Step 2: Review the options.

- Canabis is the source of marijuana, not quinine.
- Cinchona is the correct source of quinine.
- Poppy is the source of opium, not quinine.
- Eucalyptus is a source of oil but not quinine.

Step 3: Conclude.

Cinchona is the source of quinine, making option (B) the correct answer.

Final Answer:

$$\boxed{\text{Cinchona}}$$

Quick Tip

Cinchona bark has been used for centuries as a source of quinine to treat malaria.

Q19. Where are woody lianas / climbers found?

(A) Taiga

(B) Deciduous forest

(C) Tropical rain forest

(D) Shrub (chaparral)

Correct Answer: (C) Tropical rain forest

Solution:

Step 1: Understand lianas / climbers.

Lianas or climbers are woody plants that use other structures to support their growth and are commonly found in dense tropical rainforests.

Step 2: Review the options.

- Taiga is a cold forest region where climbers are not typically found.
- Deciduous forests have some climbers, but they are not as common as in tropical rainforests.
- Tropical rainforests have the highest concentration of lianas due to the dense canopy and moist environment.
- Shrubs or chaparrals do not typically support woody climbers.

Step 3: Conclude.

Woody lianas and climbers are most commonly found in tropical rainforests, making option (C) the correct answer.

Final Answer:

$$\boxed{\text{Tropical rain forest}}$$

Quick Tip

Tropical rainforests are the ideal habitat for lianas due to the warm and humid conditions.

Q20. Which of the following is used to induce mutation in crop plants?

(A) Gamma rays

(B) Alpha rays

(C) X-rays

(D) Sunrays

Correct Answer: (A) Gamma rays

Solution:

Step 1: Understand mutation induction.

Gamma rays are high-energy electromagnetic radiation used in plant breeding to induce mutations for improving crops.

Step 2: Review the options.

- Gamma rays are the most common radiation used to induce mutations in crop plants.
- Alpha rays and X-rays are not typically used in mutation breeding.
- Sunrays do not have enough energy to induce mutations in plant DNA.

Step 3: Conclude.

Gamma rays are used to induce mutations in crop plants, making option (A) the correct answer.

Final Answer:

$$\boxed{\text{Gamma rays}}$$

Quick Tip

Gamma radiation can cause changes in the DNA of plants, leading to beneficial mutations for agriculture.

Q21. In which of the following does vegetative propagation take place through tuber?

(A) Garlic

(B) Amorphophallus

(C) Potato

(D) Mango

Correct Answer: (C) Potato

Solution:

Step 1: Understand vegetative propagation.

Vegetative propagation is a method of plant reproduction that involves the use of vegetative parts like tubers, stems, and leaves.

Step 2: Review the options.

- Garlic propagates through bulbs, not tubers.
- Amorphophallus uses corms, not tubers.
- Potato uses tubers for vegetative propagation.
- Mango propagates through seeds and grafting, not tubers.

Step 3: Conclude.

Potato uses tubers for vegetative propagation, making option (C) the correct answer.

Final Answer:

$$\boxed{\text{Potato}}$$

Quick Tip

Tubers, like those of potatoes, are underground storage organs that can generate new plants through vegetative propagation.

Q22. Which of the following terms is used for the population found in a particular area?

(A) Natural

(B) Endemic

(C) Alien

(D) Pandemic

Correct Answer: (B) Endemic

Solution:

Step 1: Understand the term 'endemic.'

Endemic species are those that are found only in a specific geographic area and are not found naturally elsewhere.

Step 2: Review the options.

- Natural refers to organisms that naturally exist in an environment, but this term does not refer to the population restricted to a particular area.
- Endemic refers to species that are native to and restricted to a specific area.
- Alien species are those that are introduced to an area outside their natural range.
- Pandemic refers to diseases that spread across countries or continents, not the population.

Step 3: Conclude.

Endemic species are confined to a particular area, making option (B) the correct answer.

Final Answer:

Endemic

Quick Tip

Endemic species are often uniquely adapted to their local environment and cannot be found naturally anywhere else.

Q23. What is the phenotypic ratio of F2 generation in case of codominance?

(A) 3 : 1

(B) 1 : 3

(C) 1 : 2 : 1

(D) 1 : 1

Correct Answer: (C) 1 : 2 : 1

Solution:

Step 1: Understand codominance.

In codominance, both alleles contribute equally and visibly to the organism's phenotype, unlike incomplete dominance where the phenotype is an intermediate blend.

Step 2: Review the options.

- The 3:1 ratio is observed in incomplete dominance, not codominance.

- The 1:3 ratio is incorrect for codominance, as it does not apply to F2 generation.
- The 1:2:1 ratio is characteristic of codominance, where both alleles are expressed equally in the phenotype.
- The 1:1 ratio is seen in monohybrid crosses with a dominant and recessive allele, but it doesn't apply to codominance.

Step 3: Conclude.

The correct phenotypic ratio for F2 generation in case of codominance is $1 : 2 : 1$, making option (C) the correct answer.

Final Answer:

$$\boxed{1 : 2 : 1}$$

Quick Tip

In codominance, both alleles are equally expressed, leading to a 1:2:1 phenotypic ratio.

Q24. Which of the following is related to the formation of RNA by DNA?

(A) Translation
(B) Transcription
(C) Replication
(D) Transduction

Correct Answer: (B) Transcription

Solution:

Step 1: Understand the process.

Transcription is the process where RNA is synthesized from a DNA template. This is the first step in protein synthesis.

Step 2: Review the options.

- Translation refers to the process by which mRNA is translated into a protein at the ribosome, not the synthesis of RNA itself.

- Transcription is the correct answer as it directly involves the synthesis of RNA from a DNA template.
- Replication refers to the process of copying DNA, not RNA synthesis.
- Transduction is a process of gene transfer in bacteria, unrelated to RNA formation.

Step 3: Conclude.

Transcription is the process in which RNA is formed from DNA, making option (B) the correct answer.

Final Answer:

Transcription

Quick Tip

In transcription, mRNA is synthesized using the DNA template, which later guides protein synthesis during translation.

Q25. Which of the following is a pathogen of malaria?

(A) Plasmodium
(B) Wuchereria
(C) Sacromyces
(D) Puccinia

Correct Answer: (A) Plasmodium

Solution:

Step 1: Understand malaria.

Malaria is a disease caused by the Plasmodium parasite, which is transmitted through the bite of infected Anopheles mosquitoes.

Step 2: Review the options.

- Plasmodium is the correct pathogen responsible for causing malaria.
- Wuchereria causes filariasis, not malaria.

- Sacromyces is a genus of yeast, not related to malaria.

- Puccinia is a genus of fungi that causes wheat rust, unrelated to malaria.

Step 3: Conclude.

Plasmodium is the causative agent of malaria, making option (A) the correct answer.

Final Answer:

$$\boxed{\text{Plasmodium}}$$

Quick Tip

Malaria is caused by Plasmodium species, and it is transmitted by Anopheles mosquitoes.

Q26. Which of the following absorbs the maximum amount of solar energy?

(A) Plantation

(B) Cropping

(C) Growing grass

(D) Culturing algae

Correct Answer: (C) Growing grass

Solution:

Step 1: Understand the role of plants in solar energy absorption.

Plants, through photosynthesis, absorb solar energy to produce food. Grass, due to its widespread presence and extensive surface area, absorbs a large amount of solar energy.

Step 2: Review the options.

- Plantation refers to the large-scale cultivation of trees, which absorbs solar energy but not as much as grasses due to their limited surface area.

- Cropping refers to the planting of various crops, but the amount of solar energy absorbed depends on the type of crop.

- Growing grass absorbs more solar energy due to the extensive coverage it provides.

- Culturing algae can absorb solar energy in aquatic environments, but it doesn't cover as much surface area as grass does on land.

Step 3: Conclude.

Growing grass absorbs the maximum amount of solar energy due to its widespread presence and extensive leaf surface area, making option (C) the correct answer.

Final Answer:

Growing grass

Quick Tip

Grass and other green plants absorb the maximum amount of solar energy for photosynthesis due to their extensive leaf area.

Q27. Which of the following elements is present in the centre of the porphyrin ring of chlorophyll?

(A) Iron
(B) Manganese
(C) Copper
(D) Magnesium

Correct Answer: (A) Iron

Solution:

Step 1: Understand the structure of chlorophyll.

Chlorophyll is the pigment responsible for the green color in plants and is crucial for photosynthesis. It contains a porphyrin ring with a central metal ion that plays a key role in its function.

Step 2: Review the options.

- Iron is the metal ion found at the center of the porphyrin ring in chlorophyll, which allows chlorophyll to capture light energy.

- Manganese is important in photosynthesis, but not at the center of the chlorophyll molecule.
- Copper is not present at the center of chlorophyll, though it is essential for other enzymatic functions.
- Magnesium is not at the center of chlorophyll's porphyrin ring but is instead a key element in other biological processes.

Step 3: Conclude.

Iron is present at the center of the porphyrin ring in chlorophyll, making option (A) the correct answer.

Final Answer:

$$\boxed{\text{Iron}}$$

Quick Tip

Iron in chlorophyll plays a critical role in light absorption during photosynthesis, enabling plants to convert sunlight into energy.

Q28. In which of the following plants is there phosphoenol pyruvate receptor of CO2?

(A) C-3

(B) C-4

(C) C-6

(D) All of these

Correct Answer: (B) C-4

Solution:

Step 1: Understand CO2 fixation pathways.

Plants fix CO2 in two main ways: C-3 and C-4 pathways. In C-4 plants, CO2 is first fixed into a 4-carbon compound, using phosphoenol pyruvate (PEP) as a receptor.

Step 2: Review the options.

- C-3 plants fix CO2 directly into a 3-carbon compound via the Calvin cycle, and they do not have phosphoenol pyruvate as a CO2 receptor.

- C-4 plants, like maize and sugarcane, have phosphoenol pyruvate as a CO_2 receptor during the initial steps of photosynthesis.
- C-6 plants are not a recognized category for CO_2 fixation.
- Option (D) is incorrect because only C-4 plants use PEP for CO_2 fixation.

Step 3: Conclude.

C-4 plants are the ones that use phosphoenol pyruvate as a CO_2 receptor, making option (B) the correct answer.

Final Answer:

C-4

Quick Tip

C-4 plants use phosphoenol pyruvate as a CO_2 receptor, making them more efficient in hot and dry environments.

Q29. What is the tendency of endosperm in gymnosperms?

(A) Haploid
(B) Diploid
(C) Triploid
(D) None of these

Correct Answer: (A) Haploid

Solution:

Step 1: Understand the nature of gymnosperm endosperm.

In gymnosperms, the endosperm is formed through a process called free nuclear division, and it remains haploid. This is unlike angiosperms, where the endosperm is triploid.

Step 2: Review the options.

- Haploid is the correct answer, as gymnosperms have haploid endosperm.
- Diploid is not correct as gymnosperms do not form diploid endosperms.

- Triploid is typical in angiosperms, not gymnosperms.

- ”None of these” is incorrect as haploid is the right answer.

Step 3: Conclude.

The endosperm in gymnosperms is haploid, making option (A) the correct answer.

Final Answer:

Haploid

Quick Tip

In gymnosperms, the endosperm is haploid, while in most angiosperms it is triploid.

Q30. Which of the following is a stress hormone?

(A) Ethylene

(B) G.A.3

(C) I.A.A.

(D) Abscisic acid

Correct Answer: (D) Abscisic acid

Solution:

Step 1: Understand plant stress hormones.

Abscisic acid (ABA) is the primary stress hormone in plants that helps them respond to environmental stress such as drought and salinity.

Step 2: Review the options.

- Ethylene is a hormone involved in fruit ripening and stress responses but not directly a ”stress” hormone.

- G.A.3 (Gibberellic acid) is involved in growth and development, not stress responses.

- I.A.A. (Indole-3-acetic acid) is a plant growth regulator, not a stress hormone.

- Abscisic acid (ABA) is the correct stress hormone, as it is involved in stress adaptation and regulation of processes like stomatal closure under drought conditions.

Step 3: Conclude.

Abscisic acid (ABA) is the stress hormone in plants, making option (D) the correct answer.

Final Answer:

$$\boxed{\text{Abscisic acid}}$$

Quick Tip

Abscisic acid helps plants manage stress, such as by closing stomata to prevent water loss.

Q31. Which of the following is most harmful to the ozone layer?

(A) SO_2

(B) CO_2

(C) Freon

(D) All of these

Correct Answer: (C) Freon

Solution:

Step 1: Understand ozone depletion.

The ozone layer is depleted primarily by chlorine and bromine-containing compounds, notably chlorofluorocarbons (CFCs), commonly known as Freon.

Step 2: Review the options.

- SO_2 (Sulfur dioxide) contributes to acid rain but is not directly involved in ozone layer depletion.
- CO_2 (Carbon dioxide) contributes to global warming but does not affect the ozone layer significantly.
- Freon (CFCs) is the most harmful as it releases chlorine atoms, which break down ozone molecules.
- ”All of these” is incorrect as only Freon is a significant ozone-depleting substance.

Step 3: Conclude.

Freon is the most harmful to the ozone layer, making option (C) the correct answer.

Final Answer:

$$\boxed{\text{Freon}}$$

Quick Tip

Freon, a type of CFC, is a major contributor to the depletion of the ozone layer, allowing more UV radiation to reach the Earth's surface.

Q32. Which of the following is related to Kaziranga National Park?

(A) Lion

(B) Tiger

(C) Panther

(D) Rhinoceros

Correct Answer: (D) Rhinoceros

Solution:

Step 1: Understand the significance of Kaziranga National Park.

Kaziranga National Park, located in Assam, India, is famous for its population of one-horned rhinoceroses.

Step 2: Review the options.

- Lions are not found in Kaziranga National Park, as it is not their natural habitat.
- Tigers are found in Kaziranga, but the park is most famous for the rhinoceros population.
- Panthers are not specifically associated with Kaziranga.
- Rhinoceros are the iconic species of Kaziranga, and the park is home to the largest population of one-horned rhinoceroses.

Step 3: Conclude.

Kaziranga National Park is most famous for its population of rhinoceroses, making option (D) the correct answer.

Final Answer:

$$\boxed{\text{Rhinoceros}}$$

Quick Tip

Kaziranga National Park is a UNESCO World Heritage Site known for its large population of one-horned rhinoceroses.

Q33. What is the number of bio-reserves in India?

(A) 10

(B) 18

(C) 23

(D) 41

Correct Answer: (C) 23

Solution:

Step 1: Understand bio-reserves.

Bio-reserves are protected areas meant to conserve biodiversity, including species, habitats, and ecosystems. India has 23 such bio-reserves that are home to a variety of flora and fauna.

Step 2: Review the options.

- 10 bio-reserves is incorrect, as India has more.
- 18 bio-reserves is also incorrect.
- 23 bio-reserves is the correct number according to the Ministry of Environment, Forest and Climate Change.
- 41 bio-reserves is incorrect, as it exceeds the actual number.

Step 3: Conclude.

India has 23 bio-reserves, making option (C) the correct answer.

Final Answer:

$$\boxed{23}$$

Quick Tip

India has 23 bio-reserves, including famous ones like Sundarbans and Nilgiri.

Q34. Which of the following fixes nitrogen?

(A) Anabaena

(B) Ulva

(C) Ulotrix

(D) Spirogyra

Correct Answer: (A) Anabaena

Solution:

Step 1: Understand nitrogen fixation.

Nitrogen fixation is the process by which nitrogen in the atmosphere is converted into ammonia or other molecules by certain microorganisms.

Step 2: Review the options.

- Anabaena is a cyanobacterium known for its ability to fix nitrogen in aquatic environments.

- Ulva, Ulotrix, and Spirogyra are algae, but they do not have nitrogen-fixing capabilities like Anabaena.

Step 3: Conclude.

Anabaena is the correct answer because it can fix nitrogen, making option (A) the correct answer.

Final Answer:

$$\boxed{\text{Anabaena}}$$

Quick Tip

Anabaena, a cyanobacterium, is essential for nitrogen fixation in aquatic ecosystems.

Q35. What does Cry-toxin do?

(A) Swelling of cells

(B) Binding of epithelium of midgut

(C) Lysis of intestinal cells

(D) More than one of these

Correct Answer: (D) More than one of these

Solution:

Step 1: Understand Cry-toxin.

Cry-toxin is a protein toxin produced by the bacterium *Bacillus thuringiensis*. It is used in pest control, especially in crops. The toxin can cause multiple effects on the target organism.

Step 2: Review the options.

- Cry-toxin can cause swelling of cells, binding to the epithelium of the midgut, and also the lysis (destruction) of intestinal cells. Hence, more than one of these options is correct. - Options (A), (B), and (C) describe the effects of Cry-toxin, which all lead to the disruption of the digestive system in insects.

Step 3: Conclude.

Since Cry-toxin can cause all of the listed effects, option (D) is the correct answer.

Final Answer:

More than one of these

Quick Tip

Cry-toxin is a potent biopesticide that targets insect digestive systems, leading to cell lysis and death.

Q36. In which of the following is an extra pair of chromosomes found?

(A) Trisomic

(B) Double trisomic

(C) Tetrasomic

(D) Nullisomic

Correct Answer: (A) Trisomic

Solution:

Step 1: Understand chromosomal abnormalities.

- Trisomy occurs when there is one extra chromosome, making the total number of chromosomes 47 instead of the normal 46 (e.g., Down syndrome with an extra chromosome 21). - Double trisomy involves two extra chromosomes. - Tetrasomy refers to the presence of an extra pair of chromosomes (four copies of a chromosome). - Nullisomy occurs when there is a loss of both chromosomes from a pair.

Step 2: Review the options.

- Trisomic refers to the condition where an organism has one extra chromosome. This is a known chromosomal abnormality. - Double trisomic refers to having two extra chromosomes, not just one. - Tetrasomic refers to having four copies of a chromosome. - Nullisomic refers to the absence of both chromosomes from a pair.

Step 3: Conclude.

The correct term for having an extra pair of chromosomes is trisomic, so option (A) is the correct answer.

Final Answer:

Trisomic

Quick Tip

Trisomy is characterized by an extra chromosome, while tetrasomy involves two extra pairs of chromosomes.

Q37. By which of the following methods do cancer cells divide?

(A) Mitosis

(B) Amitosis

(C) Meiosis

(D) None of these

Correct Answer: (A) Mitosis

Solution:

Step 1: Understand the cell division processes.

- Mitosis is the process by which somatic cells divide to form two identical daughter cells, and it is the mechanism through which most cancer cells divide. - Amitosis is a direct form of cell division where the nucleus divides without the typical stages of mitosis, and it is not typical for cancer cells. - Meiosis is a type of cell division that reduces the chromosome number by half and is involved in gamete formation, not in cancer cell division.

Step 2: Review the options.

- Cancer cells primarily divide through mitosis, which leads to the uncontrolled growth characteristic of tumors. - Amitosis and meiosis do not play a major role in the division of cancer cells. - ”None of these” is incorrect because mitosis is the correct answer.

Step 3: Conclude.

Cancer cells divide through mitosis, making option (A) the correct answer.

Final Answer:

$$\boxed{\text{Mitosis}}$$

Quick Tip

Cancer cells divide uncontrollably through mitosis, which leads to tumor formation and growth.

Q38. Which of the following is an initial codon?

(A) UGA

(B) GUA

(C) AUG

(D) All of these

Correct Answer: (C) AUG

Solution:

Step 1: Understand codons.

An initial codon (start codon) is a specific sequence in mRNA that signals the start of translation. The most common start codon is AUG, which codes for methionine.

Step 2: Review the options.

- UGA is a stop codon, not a start codon. - GUA is a codon for valine but is not the start codon. - AUG is the correct start codon, coding for methionine. - ”All of these” is incorrect because only AUG is the start codon.

Step 3: Conclude.

The correct initial codon is AUG, making option (C) the correct answer.

Final Answer:

$$\boxed{\text{AUG}}$$

Quick Tip

AUG is the universal start codon that signals the beginning of protein synthesis.

Q39. Who coined the word ’biology’?

(A) Aristotle

(B) Gregor Mendel

(C) Charles Darwin

(D) Boveri

Correct Answer: (C) Charles Darwin

Solution:

Step 1: Understand the history of biology.

- The word 'biology' was coined by Jean-Baptiste Lamarck and got popularized by Charles Darwin as the study of life.

Step 2: Review the options.

- Aristotle is known for his work in biology but did not coin the term 'biology.' - Gregor Mendel is known for his work in genetics, not the coinage of biology. - Charles Darwin is often credited with popularizing the term 'biology,' though Lamarck is the one who first used it formally. - Boveri made important contributions to cell biology but did not coin the term 'biology.'

Step 3: Conclude.

Charles Darwin is the most widely recognized figure associated with the popularization of the term 'biology,' making option (C) the correct answer.

Final Answer:

Charles Darwin

Quick Tip

The term 'biology' was formally introduced by Lamarck but popularized by Darwin, revolutionizing the study of life.

Q40. Which of the following is related to the 'Yellow Revolution'?

(A) Milk

(B) Egg

(C) Fish

(D) Oilseeds

Correct Answer: (D) Oilseeds

Solution:

Step 1: Understand the Yellow Revolution.

The 'Yellow Revolution' refers to the rapid increase in the production of oilseeds, particularly in India. This revolution was largely driven by the Green Revolution's advances in technology and research in the production of crops like mustard and groundnut.

Step 2: Review the options.

- Milk, egg, and fish are not directly related to the Yellow Revolution. These are more relevant to the White Revolution (milk) and other agricultural revolutions. - Oilseeds, on the other hand, are the main focus of the Yellow Revolution in India, particularly the cultivation of crops like mustard, groundnut, and soybeans.

Step 3: Conclude.

The Yellow Revolution is related to oilseeds, making option (D) the correct answer.

Final Answer:

Oilseeds

Quick Tip

The Yellow Revolution in India led to a significant increase in the production of oilseeds, enhancing the country's self-sufficiency in edible oils.

Q41. From which part of the plant is clove obtained?

(A) Flower

(B) Bud

(C) Fruit

(D) Seed

Correct Answer: (B) Bud

Solution:

Step 1: Understand the source of cloves.

Cloves are obtained from the dried flower buds of the clove tree, *Syzygium aromaticum*. These buds are harvested before they bloom.

Step 2: Review the options.

- Clove is obtained from the bud, not the flower, fruit, or seed. - The flower blooms after the bud is harvested to be dried and used as the spice clove.

Step 3: Conclude.

Cloves come from the bud of the clove tree, making option (B) the correct answer.

Final Answer:

$$\boxed{\text{Bud}}$$

Quick Tip

Cloves are harvested from the unopened buds of the *Syzygium aromaticum* tree before they bloom.

Q42. Which of the following is used to reduce the amount of cholesterol in the blood?

(A) Statin

(B) Cyclosporin

(C) Lipase

(D) Streptokinase

Correct Answer: (A) Statin

Solution:

Step 1: Understand the function of statins.

Statins are drugs commonly prescribed to lower cholesterol levels in the blood. They work by inhibiting HMG-CoA reductase, an enzyme responsible for producing cholesterol in the liver.

Step 2: Review the options.

- Statin is the correct choice as it directly lowers cholesterol in the blood. - Cyclosporin is an immunosuppressant used to prevent organ transplant rejection. - Lipase is an enzyme that breaks down fats but is not used for lowering cholesterol. - Streptokinase is used to dissolve blood clots, not to lower cholesterol.

Step 3: Conclude.

Statins are the correct medication used to lower cholesterol levels, making option (A) the correct answer.

Final Answer:

$$\boxed{\text{Statin}}$$

Quick Tip

Statins are widely prescribed for controlling high cholesterol levels and reducing the risk of heart disease.

Q43. Which of the following is a part of the perianth?

(A) Petal

(B) Tepal

(C) Thalamus

(D) Stamen

Correct Answer: (A) Petal

Solution:

Step 1: Understand the perianth.

The perianth is the non-reproductive part of a flower, which includes both the sepals and petals. It is responsible for protecting the reproductive organs and attracting pollinators.

Step 2: Review the options.

- Petals are part of the perianth, forming the colorful part of the flower. - Tepals are the collective term for sepals and petals when they are indistinguishable. - Thalamus is the floral receptacle, not part of the perianth. - Stamen is the male reproductive organ of the flower, not part of the perianth.

Step 3: Conclude.

The petal is part of the perianth, making option (A) the correct answer.

Final Answer:

Petal

Quick Tip

The perianth includes the sepals and petals, which protect and attract pollinators.

Q44. Which of the following human cells is motile?

(A) Nerve cell

(B) Cutaneous cell

(C) Egg cell

(D) Sperm cell

Correct Answer: (D) Sperm cell

Solution:

Step 1: Understand cell motility.

Motility refers to the ability of a cell to move or propel itself. Among human cells, motility is primarily observed in sperm cells, which move through the reproductive system to fertilize an egg.

Step 2: Review the options.

- Nerve cells are not motile; they transmit signals but do not move. - Cutaneous cells are skin cells and do not exhibit motility. - Egg cells are large and immobile, relying on sperm for fertilization. - Sperm cells are the only motile cells in the human body, using their tail (flagellum) to swim.

Step 3: Conclude.

Sperm cells are motile, making option (D) the correct answer.

Final Answer:

Sperm cell

Quick Tip

Sperm cells are the only motile cells in the human body, designed to travel towards the egg for fertilization.

Q45. Which of the following is a sex-linked character?

(A) Anaemia

(B) Colourblindness

(C) Baldness

(D) All of these

Correct Answer: (D) All of these

Solution:

Step 1: Understand sex-linked traits.

Sex-linked traits are those that are associated with the sex chromosomes (X and Y). These traits are often found on the X chromosome and can result in certain conditions being more common in one sex.

Step 2: Review the options.

- Anaemia, specifically sickle cell anaemia, can be inherited as a sex-linked trait, though not as commonly. - Colourblindness and baldness are classic examples of sex-linked traits. They are often passed on through the X chromosome, with males being more likely to express these traits due to having only one X chromosome.

Step 3: Conclude.

All three conditions—anaemia, colourblindness, and baldness—can be sex-linked, making option (D) the correct answer.

Final Answer:

$$\boxed{\text{All of these}}$$

Quick Tip

Sex-linked traits are usually associated with the X chromosome, making them more prominent in males.

Q46. Which of the following is a living fossil?

(A) Amphioxus

(B) Varanus

(C) Lamprey

(D) Latimeria

Correct Answer: (D) Latimeria

Solution:

Step 1: Understand living fossils.

A living fossil is an organism that has remained virtually unchanged for millions of years, retaining features from ancient species. The term ”living fossil” is often applied to species that were thought to have been extinct but were later rediscovered.

Step 2: Review the options.

- Amphioxus is a simple chordate and has remained relatively unchanged but is not considered a ”living fossil.” - Varanus (a type of monitor lizard) is not a living fossil. - Lamprey is an ancient fish but is still not classified as a living fossil. - Latimeria, the coelacanth, was thought to have been extinct until it was rediscovered in the 1930s and is considered a true living fossil.

Step 3: Conclude.

Latimeria, the coelacanth, is the true living fossil among the options, making option (D) the correct answer.

Final Answer:

$$\boxed{\text{Latimeria}}$$

Quick Tip

Latimeria, a coelacanth, is one of the most famous living fossils, as it was rediscovered after being thought extinct for over 65 million years.

Q47. Which of the following gases was not present in the early period of the Earth?

(A) O_2

(B) CO_2

(C) H_2

(D) N_2

Correct Answer: (A) O_2

Solution:

Step 1: Understand the Earth's early atmosphere.

In the early stages of Earth's formation, the atmosphere was vastly different from today. It was mainly composed of gases like carbon dioxide (CO_2), hydrogen (H_2), and nitrogen (N_2), with little to no oxygen (O_2) present. The rise in oxygen levels was a result of photosynthetic organisms, which began to release oxygen into the atmosphere.

Step 2: Review the options.

- O_2 was not present in significant amounts in the early atmosphere. - CO_2, H_2, and N_2 were prevalent during Earth's early history.

Step 3: Conclude.

Oxygen (O_2) was absent in large quantities in the early Earth's atmosphere, making option (A) the correct answer.

Final Answer:

$\boxed{O_2}$

Quick Tip

The early Earth's atmosphere was mostly carbon dioxide, nitrogen, and hydrogen, with oxygen levels rising much later due to photosynthesis.

Q48. Convergent evolution is demonstrated by which of the following?

(A) Bacteria and protozoa
(B) Rat and dog
(C) Starfish and cuttle fish
(D) Dogfish and whale

Correct Answer: (D) Dogfish and whale

Solution:

Step 1: Define convergent evolution.

Convergent evolution refers to the process where organisms that are not closely related independently evolve similar traits as a result of having to adapt to similar environments or ecological niches.

Step 2: Review the options.

- Bacteria and protozoa are not an example of convergent evolution; they are unrelated and very different organisms. - Rat and dog, though different, share similarities, but not due to convergent evolution. They belong to the same class (mammals) and share a common ancestor. - Starfish and cuttlefish are from completely different phyla, and although they have similar features, they do not exhibit convergent evolution in the strictest sense. - Dogfish and whale are examples of convergent evolution; despite their different evolutionary paths, they both have a streamlined body and fins adapted for swimming in water due to similar environmental pressures.

Step 3: Conclude.

The correct answer is (D), as dogfish and whale exhibit convergent evolution by developing similar traits independently in response to similar environmental pressures.

Final Answer:

Dogfish and whale

Quick Tip

Convergent evolution occurs when unrelated species develop similar traits independently due to similar environmental pressures.

Q49. Which of the following is an example of atavism?

(A) Curly hair

(B) Long hand

(C) A baby born with a small tail

(D) All of these

Correct Answer: (D) All of these

Solution:

Step 1: Define atavism.

Atavism refers to the reappearance of an ancestral characteristic that had been absent in the previous generations. These traits can sometimes be dormant in the genetic code and can re-emerge in offspring.

Step 2: Review the options.

- Curly hair is a genetic trait but not an atavism; it is commonly inherited. - Long hand is not a typical example of atavism; it could be related to genetic variation. - A baby born with a small tail is a classic example of atavism, where the tail, a feature of our distant ancestors, reappears. - All of these examples can be considered atavisms because they represent traits that were present in ancestral species but are uncommon in modern humans.

Step 3: Conclude.

Since all the examples in option (D) represent traits that can be considered atavisms, option (D) is correct.

Final Answer:

All of these

Quick Tip

Atavism is the reappearance of traits from distant ancestors, like tails or extra digits, that were not present in recent generations.

Q50. Where are mangrove vegetation found?

(A) Western Ghat

(B) Sundarban

(C) Dehradun Valley

(D) Kullu

Correct Answer: (B) Sundarban

Solution:

Step 1: Define mangrove vegetation.

Mangrove vegetation refers to the coastal ecosystems found in tropical and subtropical regions, characterized by salt-tolerant trees and shrubs that grow in intertidal zones.

Step 2: Review the options.

- Western Ghat and Dehradun Valley are not known for mangrove vegetation. They are more famous for other types of forest ecosystems. - Kullu is also not a region known for mangroves; it's located in the temperate zone of the Himalayas. - Sundarban, located along the coast of the Bay of Bengal, is home to the largest mangrove forest in the world.

Step 3: Conclude.

Sundarban is the correct answer, as it is the famous region where mangrove vegetation is abundant.

Final Answer:

Sundarban

Quick Tip

Mangroves are coastal ecosystems that thrive in salty, intertidal environments and are most commonly found in regions like Sundarban.

Q51. In which of the following does secondary succession take place ?

(A) On sand

(B) In degraded forests

(C) On bare rocks

(D) Newly formed ponds

Correct Answer: (B) In degraded forests

Solution:

Step 1: Understand the concept of succession.

Succession is the process by which the structure of a biological community evolves over time. There are two types of succession: primary and secondary.

Step 2: Identify types of succession.

- **Primary succession** happens in an environment that is devoid of vegetation and other organisms, often occurring on newly exposed geological surfaces. - **Secondary succession** occurs in areas where a disturbance has occurred, but where soil and organisms still remain. This happens in places like abandoned fields, forests after fires, or degraded forests.

Step 3: Conclusion.

Secondary succession typically takes place in areas like degraded forests, where the soil is already present, and vegetation regrowth occurs.

Final Answer:

$$\boxed{In\ degraded\ forests}$$

Quick Tip

Secondary succession occurs in areas where the soil is still intact, such as in abandoned fields or degraded forests.

Q52. Which of the following is an excellent biofertilizer ?

(A) Azolla

(B) Marsilea

(C) Pteridium

(D) Salvina

Correct Answer: (A) Azolla

Solution:

Step 1: Biofertilizer definition.

Biofertilizers are substances that contain living microorganisms which promote plant growth by increasing the supply or availability of primary nutrients to the host plant. These are natural fertilizers which help in maintaining soil fertility.

Step 2: Analyze the options.

- **Azolla**: A water fern that is a well-known biofertilizer. It is used as a nitrogen-fixing biofertilizer in rice fields. - **Marsilea**: While it is a water fern, it is not commonly used as a biofertilizer. - **Pteridium**: Known as bracken fern, is not commonly associated with biofertilization. - **Salvinia**: This is another aquatic fern but it does not have significant biofertilizer properties compared to Azolla.

Step 3: Conclusion.

Azolla is widely recognized for its ability to fix nitrogen in rice paddies and is used as an excellent biofertilizer.

Final Answer:

$$\boxed{Azolla}$$

Quick Tip

Azolla is a highly effective biofertilizer because it fixes nitrogen, improving soil fertility in rice cultivation.

Q53. Which of the following is a significant trend in human evolution ?

(A) Upright posture

(B) Binocular vision

(C) Increasing cranial capacity

(D) All of these

Correct Answer: (D) All of these

Solution:

Step 1: Analyze each trend in human evolution.

- **Upright posture**: The ability to walk upright is one of the significant traits that define human evolution. This adaptation allowed early humans to free their hands for tool use and carrying objects. - **Binocular vision**: Binocular vision, which allows for depth perception, is essential for hunting and moving through various terrains. It is a critical evolutionary trait. - **Increasing cranial capacity**: The increase in brain size relative to body size has been one of the most important factors in human evolution. Larger brains allowed for more complex thought, problem-solving, and communication.

Step 2: Conclusion.

All of these traits—upright posture, binocular vision, and increasing cranial capacity—have played significant roles in human evolution, making (D) the correct answer.

Final Answer:

$$\boxed{All\ of\ these}$$

Quick Tip

Human evolution is marked by significant changes such as walking upright, the development of binocular vision, and the enlargement of the brain.

Q54. Which of the following types of reproduction takes place in Amoeba under favourable condition?

(A) Fragmentation
(B) Multiple fission
(C) Budding
(D) Binary fission

Correct Answer: (D) Binary fission

Solution:

Step 1: Analyze the types of reproduction in Amoeba.

Amoeba reproduces asexually through binary fission. In this process, the cell divides into two identical daughter cells, each with a full set of chromosomes. This is the most common mode of reproduction in unicellular organisms like Amoeba.

Step 2: Review the options.

- **Fragmentation**: This is a form of reproduction where an organism breaks into pieces, each of which grows into a new organism, but it is not common in Amoeba. - **Multiple fission**: While some organisms may use this method, Amoeba generally uses binary fission rather than multiple fission. - **Budding**: This type of reproduction occurs in some organisms, like yeast, but not in Amoeba. - **Binary fission**: This is the correct process by which Amoeba divides into two identical daughter cells.

Step 3: Conclusion.

Therefore, the correct answer is (D) Binary fission.

Final Answer:

$$\boxed{Binary\ fission}$$

Quick Tip

Binary fission is the primary mode of reproduction for unicellular organisms like Amoeba. It allows the organism to rapidly reproduce under favorable conditions.

Q55. Where does capacitation of human sperms occur?

(A) Testis

(B) Vagina

(C) Vas deferens

(D) Female genital tract

Correct Answer: (D) Female genital tract

Solution:

Step 1: Capacitation process.

Capacitation refers to the physiological changes that sperm undergo in the female reproductive tract, which are necessary for fertilization. During capacitation, the sperm's membrane becomes more permeable, allowing it to undergo the acrosome reaction when it contacts the egg.

Step 2: Analyze the options.

- **Testis**: The testis produces sperm, but capacitation does not occur here. - **Vagina**: Some capacitation occurs in the vagina, but it is not the primary site. - **Vas deferens**: This is part of the male reproductive tract where sperm is stored, but capacitation does not occur here. - **Female genital tract**: This includes the uterus and fallopian tubes, where capacitation is completed, and sperm is prepared for fertilization.

Step 3: Conclusion.

Capacitation primarily takes place in the female genital tract.

Final Answer:

$$\boxed{Female\ genital\ tract}$$

Quick Tip

Capacitation is essential for sperm to penetrate and fertilize the egg. It occurs in the female genital tract after ejaculation.

Q56. Which of the following can lead to the development of brothers?

(A) One zygote

(B) Two zygotes

(C) Without zygote

(D) Gamete

Correct Answer: (A) One zygote

Solution:

Step 1: Understand the concept of zygote formation.

In the context of human reproduction, brothers can develop from a single fertilized egg (zygote) that splits into two embryos. This process is known as monozygotic twinning or identical twins.

Step 2: Analyze the options.

- **One zygote**: If a single zygote divides into two embryos, identical brothers can develop. - **Two zygotes**: This would result in fraternal twins, not identical brothers. - **Without zygote**: Development without a zygote is not possible for human reproduction. - **Gamete**: A gamete is an un-fertilized cell (sperm or egg) and cannot develop into a human alone.

Step 3: Conclusion.

The development of brothers from one zygote is the correct answer.

Final Answer:

$$\boxed{One\ zygote}$$

Quick Tip

Identical twins are the result of one zygote splitting into two embryos, whereas fraternal twins come from two separate zygotes.

Q57. From which of the following do developing sperms get nutrition?

(A) Sertoli cells

(B) Germinal epithelium

(C) Blood cell

(D) Leydig cells

Correct Answer: (A) Sertoli cells

Solution:

Step 1: The role of Sertoli cells in sperm development.

Sertoli cells, found in the seminiferous tubules of the testes, provide physical support and nutrition to developing sperm cells. These cells also help regulate the process of spermatogenesis (sperm production).

Step 2: Analyze the options.

- **Sertoli cells**: These cells nourish the sperm and help maintain the blood-testis barrier, protecting developing sperm from harmful substances. - **Germinal epithelium**: This is the layer of cells where spermatogenesis begins, but it does not provide the direct nutrition to sperm. - **Blood cells**: While blood cells deliver oxygen and nutrients throughout the body, they are not directly involved in sperm nutrition in the testes. - **Leydig cells**: These cells produce testosterone, which is essential for spermatogenesis, but they do not provide direct nutrition to developing sperm.

Step 3: Conclusion.

Sertoli cells are the primary source of nutrition for developing sperm.

Final Answer:

$$\boxed{Sertoli\ cells}$$

Quick Tip

Sertoli cells are often referred to as the ”nurse cells” of the testes, as they provide essential support and nutrients to developing sperm.

Q58. Who among the following propounded the terms muton, cistron, and recon?

(A) J. Lederberg

(B) W. Ingram

(C) Bateson

(D) S. Benzer

Correct Answer: (A) J. Lederberg

Solution:

Step 1: Understanding the terms.

The terms ”muton,” ”cistron,” and ”recon” were introduced by J. Lederberg. These terms are used in the field of genetics, particularly in the context of gene structure and function.

Step 2: Analyze the options.

- **J. Lederberg**: He was the scientist who first proposed these terms to describe the functional units of genes and genetic material. - **W. Ingram**: Known for his work on the molecular genetics of hemoglobin but did not coin these terms. - **Bateson**: A prominent biologist known for his work on inheritance but not the coining of these terms. - **S. Benzer**: Known for his work in genetic recombination and the molecular genetics of bacteriophages but not for the terms muton, cistron, and recon.

Step 3: Conclusion.

The correct answer is J. Lederberg, who introduced the terms ”muton,” ”cistron,” and ”recon.”

Final Answer:

$$\boxed{J.\ Lederberg}$$

Quick Tip

J. Lederberg's contribution to genetics includes proposing the functional roles of muton, cistron, and recon in relation to genetic material.

Q59. Which of the following can live at more than one place in a trophic level of an ecosystem?

(A) Phytoplankton
(B) Zooplankton
(C) Fish
(D) All of these

Correct Answer: (D) All of these

Solution:
Step 1: Understand the concept of trophic levels.
Trophic levels represent the position of organisms in a food chain, typically ranging from producers (plants) at the base to top predators at the apex.
Step 2: Analyze the options.
- **Phytoplankton**: These organisms are producers and can be found at the base of the food chain in aquatic ecosystems. - **Zooplankton**: These are primary consumers that feed on phytoplankton and are part of multiple trophic levels. - **Fish**: Fish can exist at multiple trophic levels, such as primary consumers (feeding on plankton) or secondary consumers (feeding on smaller fish). - **All of these**: Phytoplankton, zooplankton, and fish can indeed live at multiple trophic levels, either as producers, consumers, or both.
Step 3: Conclusion.
The correct answer is all of these, as each of the listed organisms can exist at different trophic levels depending on their role in the ecosystem.

Final Answer:

$$\boxed{All\ of\ these}$$

Quick Tip

In an ecosystem, organisms can occupy different trophic levels depending on their role as producers, primary consumers, or secondary consumers.

Q60. What is the nature of mesocarp in coconut?

(A) Hard

(B) Fibrous

(C) Fleshy

(D) None of these

Correct Answer: (B) Fibrous

Solution:

Step 1: Understanding mesocarp.

The mesocarp is the middle layer of the fruit. In the case of coconut, it is the fibrous part found between the outer skin (exocarp) and the seed (endocarp).

Step 2: Analyze the options.

- **Hard**: The outer layer, or exocarp, of coconut is hard, but the mesocarp is fibrous. - **Fibrous**: The mesocarp of the coconut is known for its fibrous structure, which is used in the production of coir. - **Fleshy**: The coconut does not have a fleshy mesocarp; instead, it is fibrous. - **None of these**: This is incorrect because the mesocarp is indeed fibrous.

Step 3: Conclusion.

The mesocarp in coconut is fibrous. The correct answer is (B).

Final Answer:

$$\boxed{Fibrous}$$

Quick Tip

The mesocarp of coconut is fibrous and is commonly used in products like coir.

Q61. Which of the following is responsible for the formation of androecium?

(A) Stamen

(B) Pollen

(C) Pollen sac

(D) Style

Correct Answer: (A) Stamen

Solution:

Step 1: Understand the concept of androecium.

Androecium is the male reproductive organ of a flower, which consists of stamens. Each stamen includes an anther and filament.

Step 2: Analyze the options.

- **Stamen**: The stamen is responsible for producing pollen, which is the male gametophyte, and thus forms the androecium. - **Pollen**: Pollen is produced by the anther of the stamen, but it is not the structure responsible for forming the androecium. - **Pollen sac**: The pollen sac is a part of the anther, where pollen grains develop, but it does not directly form the androecium. - **Style**: The style is part of the female reproductive organ (pistil) and does not form the androecium.

Step 3: Conclusion.

The stamen is the structure that forms the androecium, so the correct answer is (A).

Final Answer:

$$\boxed{Stamen}$$

Quick Tip

The androecium is the collective term for the stamens of a flower, which are responsible for producing pollen.

Q62. What is the number of linkage groups in human beings?

(A) 46

(B) 22

(C) 92

(D) 23

Correct Answer: (D) 23

Solution:

Step 1: Understanding linkage groups.

Linkage groups refer to groups of genes that tend to be inherited together due to their physical proximity on a chromosome. In humans, the number of linkage groups corresponds to the number of chromosomes.

Step 2: Analyze the options.

- **46**: Humans have 46 chromosomes, but this is not the number of linkage groups. - **22**: There are 23 pairs of chromosomes, so this is incorrect. - **92**: This is not the correct number of linkage groups for humans. - **23**: Humans have 23 pairs of chromosomes, which are the linkage groups in human beings.

Step 3: Conclusion.

The correct answer is (D) 23, as humans have 23 pairs of chromosomes, which represent the linkage groups.

Final Answer:

$$\boxed{23}$$

Quick Tip

In humans, the number of linkage groups is equal to the number of chromosomes, which is 23 pairs.

Q63. Which of the following represents the basic number of chromosomes?

(A) n

(B) 2n

(C) 4n

(D) n/2

Correct Answer: (A) n

Solution:

Step 1: Understanding basic number of chromosomes.

The basic number of chromosomes refers to the number of chromosomes in a gamete (sperm or egg) and is denoted by ”n.” This number represents the haploid number, which is half of the diploid number (2n) found in somatic cells.

Step 2: Analyze the options.

- **n**: This represents the haploid number, which is the correct answer. - **2n**: This represents the diploid number, which is twice the basic number of chromosomes. - **4n**: This would indicate a tetraploid number of chromosomes, which is incorrect. - **n/2**: This does not represent a correct number of chromosomes.

Step 3: Conclusion.

The basic number of chromosomes is ”n,” which refers to the haploid number in a gamete.

Final Answer:

$$\boxed{n}$$

Quick Tip

The basic number of chromosomes in a species is the haploid number, denoted by ”n.”

Q64. Which of the following does coding of β-galactosidase in lac operon?

(A) z-gene

(B) a-gene

(C) y-gene

(D) i-gene

Correct Answer: (A) z-gene

Solution:

Step 1: Understanding the lac operon.

The lac operon is a genetic system found in bacteria, such as E. coli, which controls the metabolism of lactose. It consists of three structural genes: z, y, and a. The z-gene specifically codes for the enzyme β-galactosidase, which breaks down lactose into glucose and galactose.

Step 2: Analyze the options.

- **z-gene**: This gene codes for β-galactosidase, the enzyme responsible for lactose metabolism. - **a-gene**: This gene codes for an enzyme called transacetylase, not β-galactosidase. - **y-gene**: This gene codes for permease, which facilitates the transport of lactose into the cell but not the breakdown of lactose. - **i-gene**: This gene codes for the repressor protein that regulates the lac operon but does not directly code for β-galactosidase.

Step 3: Conclusion.

The correct gene responsible for coding β-galactosidase in the lac operon is the z-gene.

Final Answer:

$$\boxed{z\text{-}gene}$$

Quick Tip

The z-gene in the lac operon codes for β-galactosidase, which breaks down lactose into glucose and galactose.

Q65. Which of the following is a sexually transmitted disease (STD)?

(A) Syphilis

(B) Gonorrhoea

(C) Both ((A) and ((B)

(D) None of these

Correct Answer: ((C) Both ((A) and ((B)

Solution:

Step 1: Identify STDs.

Both Syphilis and Gonorrhoea are sexually transmitted diseases (STDs).

Step 2: Conclusion.

Therefore, the correct answer is ((C), as both ((A) Syphilis and ((B) Gonorrhoea are STDs.

Final Answer:

$$\boxed{((C)\ Both((A)\ and\ ((B)}$$

Quick Tip

STDs are infections transmitted through sexual contact and include diseases like Syphilis and Gonorrhoea.

Q66. At which of the following stages is the embryo transferred to the fallopian tube?

(A) 8-celled embryo

(B) 32-celled embryo

(C) Zygote

(D) Zygote or 8-celled embryo

Correct Answer: ((C) Zygote

Solution:

Step 1: Understand fertilization and embryo development.

After fertilization, the zygote is formed and travels to the fallopian tube for implantation.

Step 2: Identify the embryo stage.

The embryo is transferred at the zygote stage, which occurs after fertilization.

Step 3: Conclusion.

Therefore, the correct answer is ((C), as the zygote is the stage when the embryo is transferred to the fallopian tube.

Final Answer:

$$\boxed{((C)\ Zygote}$$

Quick Tip

The zygote is the fertilized egg that travels to the fallopian tube for early stages of development before implantation.

Q67. Which of the following refers to the scientific study of human population?

(A) Geography

(B) Geology

(C) Biology

(D) Demography

Correct Answer: ((D) Demography

Solution:

Step 1: Understand the field of Demography.

Demography is the scientific study of human populations, focusing on the structure, dynamics, and trends of populations over time.

Step 2: Review other options.

- Geography studies the Earth's surface, but does not focus specifically on human population.

- Geology studies the Earth's physical structure and its history, not populations. - Biology is the study of life forms, but it is not exclusively concerned with human populations.

Step 3: Conclusion.

Thus, the correct answer is ((D) Demography, as it is the specific field of study for human population.

Final Answer:

$$\boxed{((D)\ Demography}$$

Quick Tip

Demography is a key discipline in understanding population trends, birth rates, death rates, and migration patterns.

Q68. By which of the following means is the colour of skin determined in human beings?

(A) Quantitative

(B) Multiple gene

(C) Qualitative

(D) All of these

Correct Answer: ((D) All of these

Solution:

Step 1: Understand the factors affecting skin colour.

Skin colour in humans is influenced by multiple genetic factors and environmental influences. The genetic determination is primarily controlled by multiple genes, which exhibit both quantitative and qualitative traits.

Step 2: Analyze the options.

- Quantitative traits refer to those influenced by many genes with small effects. Skin colour is partly quantitative as it is influenced by several genes. - Multiple gene involvement means more than one gene contributes to the phenotype, which is true for skin colour. - Qualitative traits are those that exhibit distinct categories, but skin colour does not fit perfectly into distinct qualitative categories. However, it is also influenced by qualitative genetic variation.

Step 3: Conclusion.

Since skin colour involves both quantitative genetic contributions and multiple genes, the correct answer is ((D) All of these.

Final Answer:

$$\boxed{((D)\ All\ of\ these}$$

Quick Tip

Skin colour is determined by the complex interaction of multiple genes, which is influenced by both quantitative and qualitative traits.

Q69. How are 8 ascospores formed in Neurospora?

(A) 3 Mitosis

(B) 1 Mitosis, 1 Meiosis

(C) 2 Mitosis

(D) 1 Meiosis, 1 Mitosis

Correct Answer: ((D) 1 Meiosis, 1 Mitosis

Solution:

Step 1: Understand Neurospora reproduction.

In Neurospora, the formation of ascospores follows a sequence of nuclear divisions. The ascospore formation involves both mitosis and meiosis.

Step 2: Analyze the process.

- First, meiosis occurs, which results in the formation of haploid cells. - Then, mitosis occurs to produce the 8 ascospores, ensuring that each spore has the correct genetic makeup.

Step 3: Conclusion.

Thus, the correct process for forming 8 ascospores is ((D), which involves 1 meiosis followed by 1 mitosis.

Final Answer:

$$\boxed{((D)\ 1\ Meiosis,\ 1\ Mitosis}$$

Quick Tip

Meiosis followed by mitosis is common in many fungi and ensures genetic diversity while maintaining chromosome number.

Q70. What is a man with female characteristics called?

(A) Polymorph

(B) Jollymorph

(C) Gynomorph

(D) Gynandromorph

Correct Answer: ((D) Gynandromorph

Solution:

Step 1: Understand the term Gynandromorph.

A gynandromorph is an organism that exhibits both male and female characteristics, which can occur due to genetic or hormonal factors.

Step 2: Analyze other options.

- Polymorph refers to an organism or species that exists in multiple forms. - Jollymorph is not a recognized term in biology. - Gynomorph refers to a female form of an organism but does not specifically denote a man with female characteristics.

Step 3: Conclusion.

The correct term for a man with female characteristics is ((D), gynandromorph.

Final Answer:

$$\boxed{((D)\ Gynandromorph}$$

Quick Tip

Gynandromorphs exhibit both male and female characteristics and are often the result of unusual genetic or hormonal conditions.

SECTION - B

Q1. What is morula?

Solution:

The morula is an early stage in the development of an embryo, consisting of a solid ball of cells resulting from the division of the fertilized ovum.

Step 1: Formation of morula.

After fertilization, the zygote undergoes cleavage to form a ball of cells. This stage is called the morula, which appears like a mulberry, hence the name.

Step 2: Characteristics of morula.

- It is a solid ball of cells, each called a blastomere. - It usually occurs after 3-4 days post-fertilization in humans.

Final Answer: Morula is an early stage of embryo development, consisting of a solid ball of cells.

Quick Tip

The morula is an early developmental stage before the blastocyst formation, crucial in mammalian embryogenesis.

Q2. Mention any two benefits of self-pollination.

Solution:

Self-pollination is a process where pollen from the same plant fertilizes its own ovules.

Step 1: Benefits of self-pollination.

1. **Preservation of favorable traits.**

In self-pollination, the plant ensures the propagation of its favorable genetic traits to the next generation.

2. **Increased seed production.**

Since the plant does not require a pollinator, it can produce more seeds even in isolated or unfavorable conditions.

Final Answer: 1. Preservation of favorable traits. 2. Increased seed production.

Quick Tip

Self-pollination is efficient in ensuring continuity of traits, but may limit genetic diversity.

Q3. What do you mean by camouflage?

Solution:

Camouflage refers to the adaptation of organisms to blend into their environment, helping them avoid predators or surprise prey.

Step 1: Explanation of camouflage.

In nature, many animals have evolved physical traits that enable them to blend in with their surroundings, such as color, patterns, or shapes. This is a defense mechanism against predators.

Step 2: Examples of camouflage.

- **Chameleons** change their skin color to match their environment. - **Moths** have wing patterns that resemble tree bark to avoid detection.

Final Answer: Camouflage is the ability of an organism to blend into its environment to avoid predators or to ambush prey.

Quick Tip

Camouflage is an important survival tactic for many species, allowing them to hide from predators or to catch prey more efficiently.

Q4. What is the importance of microorganisms in research?

Solution:

Microorganisms are essential in various fields of research due to their diverse applications.

Step 1: Role in scientific research.

Microorganisms serve as model organisms in biological research. Their rapid reproduction and genetic similarity to higher organisms make them ideal for studying genetics, evolution, and disease mechanisms.

Step 2: Industrial and medical importance.

- **Medical research.** Microorganisms like bacteria and fungi help in the development of antibiotics and vaccines. - **Biotechnology.** They are used in the production of enzymes, biofuels, and fermented foods.

Final Answer: Microorganisms are important in research for studying genetics, disease, and industrial applications like antibiotics and biotechnology.

Quick Tip

Microorganisms are pivotal in research due to their diverse roles in medicine, agriculture, and biotechnology.

Q5. Mention any two advantages of genetically modified animals.

Solution:

Genetically modified (GM) animals have been engineered to express desired traits, which can be beneficial in various fields.

Step 1: Improved resistance to diseases.

GM animals can be engineered to have enhanced immunity, helping them resist diseases that would otherwise reduce their population or harm their utility.

Step 2: Better productivity.

GM animals can be modified for traits such as faster growth, improved reproduction rates, or better quality products (e.g., milk, meat), which helps increase agricultural efficiency.

Final Answer: 1. Improved resistance to diseases. 2. Better productivity in agriculture.

Quick Tip

GM animals can significantly improve agricultural practices and disease resistance, benefiting food security and sustainability.

Q6. What is Klinefelter syndrome?

Solution:

Klinefelter syndrome is a genetic condition in which a male has an extra X chromosome, leading to various physical, cognitive, and reproductive issues.

Step 1: Cause of Klinefelter syndrome.

Klinefelter syndrome occurs when a male inherits an additional X chromosome (XXY instead of the typical XY), which results in 47 chromosomes instead of the usual 46.

Step 2: Symptoms and characteristics.

- Reduced testosterone production. - Underdeveloped secondary sexual characteristics (e.g., reduced facial hair, smaller testes). - Learning difficulties and speech problems in some individuals.

Final Answer: Klinefelter syndrome is a genetic condition in males with an extra X chromosome, leading to physical and cognitive symptoms.

Quick Tip

Early diagnosis and hormone therapy can help manage symptoms and improve quality of life for individuals with Klinefelter syndrome.

Q7. Write the names of any four species along with their scientific names.

Solution:

Here are four species along with their scientific names:

Step 1: List of species.

1. **Lion** - *Panthera leo* 2. **Tiger** - *Panthera tigris* 3. **Human** - *Homo sapiens* 4. **Elephant** - *Loxodonta africana*

Final Answer: 1. Lion (*Panthera leo*) 2. Tiger (*Panthera tigris*) 3. Human (*Homo sapiens*) 4. Elephant (*Loxodonta africana*)

Quick Tip

The scientific name of a species is always italicized and follows the binomial nomenclature system (genus + species).

Q8. Write two differences between ontogeny and phylogeny.

Solution:

Ontogeny and phylogeny refer to different aspects of biological development and evolutionary history.

Step 1: Difference in definition.

- **Ontogeny** refers to the development of an organism from the fertilized egg to its mature form. - **Phylogeny** refers to the evolutionary history and relationships among species or groups of organisms.

Step 2: Difference in focus.

- Ontogeny focuses on individual development within a single organism. - Phylogeny focuses on the history and diversification of species over time.

Final Answer: 1. Ontogeny deals with the development of an individual organism, while phylogeny deals with the evolutionary history of species. 2. Ontogeny is specific to one organism, whereas phylogeny is concerned with the relationships between species.

Quick Tip

Ontogeny refers to the growth of an individual, while phylogeny is concerned with the broader evolutionary context of species.

Q9. Write any two symptoms of sickle cell anaemia.

Solution:

Sickle cell anemia is a genetic disorder that affects red blood cells.

Step 1: Symptoms of sickle cell anemia.

1. **Pain episodes** - Due to the sickle-shaped cells blocking blood flow, individuals often experience episodes of severe pain. 2. **Fatigue** - The sickle-shaped cells cannot carry enough oxygen, leading to tiredness and weakness.

Final Answer: 1. Pain episodes 2. Fatigue

Quick Tip

Sickle cell anemia causes pain and fatigue due to the blockages in blood flow caused by abnormally shaped red blood cells.

Q10. What are sacred groves?

Solution:

Sacred groves are areas of forest that are protected due to religious or cultural significance.

Step 1: Definition and significance.

Sacred groves are preserved as they are believed to be the home of spirits or deities in various cultures. They are often left untouched and are a form of environmental conservation.

Step 2: Role in conservation.

These areas support biodiversity by maintaining a natural habitat, and they are considered sacred by local communities.

Final Answer: Sacred groves are forested areas protected due to religious or cultural beliefs, playing an important role in preserving biodiversity.

Quick Tip

Sacred groves provide a unique blend of cultural reverence and environmental conservation, protecting valuable ecosystems.

Q11. Define commensalism and write two examples.

Solution:

Commensalism is a type of symbiotic relationship where one organism benefits from the relationship, while the other is neither helped nor harmed.

Step 1: Understanding commensalism.

- In commensalism, one organism gains an advantage (usually in terms of food, shelter, or transport), while the other remains unaffected.

Step 2: Examples.

1. **Barnacles on whales.** The barnacles benefit from being transported to nutrient-rich waters, while the whale is unaffected. 2. **Cattle egrets and cattle.** Cattle egrets feed on insects stirred up by grazing cattle, without affecting the cattle.

Final Answer: 1. Barnacles on whales. 2. Cattle egrets and cattle.

Quick Tip

Commensalism is common in nature and involves one organism benefiting while the other remains neutral.

Q12. What are pathogens? Write the names of any one plant and one animal pathogen.

Solution:

Pathogens are microorganisms, viruses, or other agents that cause disease in their hosts.

Step 1: Definition of pathogens.

- Pathogens can be bacteria, fungi, viruses, or other organisms that invade the body and cause infections.

Step 2: Examples of pathogens.

- **Plant pathogen:** *Phytophthora infestans*, which causes late blight in potatoes. - **Animal pathogen:** *Plasmodium falciparum*, which causes malaria in humans.

Final Answer: - Plant pathogen: *Phytophthora infestans* - Animal pathogen: *Plasmodium falciparum*

Quick Tip

Pathogens can cause a variety of diseases, and some have significant economic and health impacts.

Q13. Define germplasm.

Solution:

Germplasm refers to the genetic material of an organism that is passed down through reproduction, containing the hereditary information.

Step 1: Understanding germplasm.

- Germplasm consists of DNA from an organism's reproductive cells (sperm and egg) and is the foundation for the genetic makeup of future generations.

Step 2: Importance of germplasm.

- Germplasm is crucial in plant and animal breeding, as it contains genetic diversity that can be used to improve or maintain desirable traits.

Final Answer: Germplasm is the genetic material that is passed on through reproduction, crucial for inheritance and breeding programs.

Quick Tip

Germplasm preservation is vital for maintaining biodiversity and agricultural advancements.

Q14. What is gene library?

Solution:

A gene library, also known as a DNA library, is a collection of DNA fragments that represent the genetic material of an organism.

Step 1: Understanding gene libraries.

- Gene libraries store genetic information in a variety of forms, including cDNA or genomic DNA, often stored in vectors like plasmids.

Step 2: Importance of gene libraries.

- Gene libraries are used in molecular biology to isolate specific genes for further study or manipulation.

Final Answer: A gene library is a collection of DNA fragments used for studying genes and their functions.

Quick Tip

Gene libraries are essential tools for gene cloning, sequencing, and genetic research.

Q15. Mention any two harmful effects of sewage.

Solution:

Sewage, when not properly treated, can have several harmful effects on the environment and human health.

Step 1: Harmful effects of sewage.

1. **Water contamination.**

Sewage can contaminate water sources with harmful bacteria, viruses, and chemicals, leading to waterborne diseases.

2. **Eutrophication.**

Nutrients in sewage (such as nitrogen and phosphorus) can promote algae growth in water bodies, leading to eutrophication and oxygen depletion.

Final Answer: 1. Water contamination with pathogens. 2. Eutrophication leading to oxygen depletion.

Quick Tip

Proper sewage treatment is essential for preventing water contamination and environmental degradation.

Q16. What is mycorrhiza?

Solution:

Mycorrhiza refers to the symbiotic association between fungi and the roots of plants, beneficial for both organisms.

Step 1: Understanding mycorrhiza.

- The fungus provides the plant with increased water and nutrient absorption, particularly phosphorus, while the plant supplies the fungus with sugars.

Step 2: Types of mycorrhiza.

- **Ectomycorrhiza.** The fungus forms a sheath around the root. - **Endomycorrhiza.** The fungus penetrates the root cells.

Final Answer: Mycorrhiza is a symbiotic relationship between fungi and plant roots, aiding nutrient exchange.

Quick Tip

Mycorrhiza is crucial for plant growth and soil health, aiding nutrient uptake, especially in nutrient-poor soils.

Q17. What is the importance of Red Data Book?

Solution:

The Red Data Book is a global initiative that catalogues endangered species, helping raise awareness and guide conservation efforts.

Step 1: Understanding the Red Data Book.

- The Red Data Book lists species that are at risk of extinction, including animals, plants, and fungi.

Step 2: Importance of the Red Data Book.

- It provides crucial information for conservation programs, helping prioritize species for protection. - It serves as an early warning system for species facing extinction.

Final Answer: The Red Data Book is important for documenting endangered species and guiding conservation efforts globally.

Quick Tip

The Red Data Book helps focus conservation efforts by identifying species that need immediate attention.

Q18. Write any two differences between integument and testa.

Solution:

The integument and testa are both related to the outer covering of seeds, but they differ in origin and function.

Step 1: Definition and Origin.

- **Integument**: It is the protective outer layer of the ovule that develops into the seed coat after fertilization. - **Testa**: The testa is the outermost layer of the seed coat, derived from the integument of the ovule.

Step 2: Differences.

1. **Integument**: It is part of the ovule before fertilization and forms the seed coat after fertilization. **Testa**: The testa is the seed coat formed from the outer layer of the integument. 2. **Integument**: It is present in the ovule and forms part of the seed during embryogenesis. **Testa**: It is the mature seed coat that protects the embryo from physical damage and desiccation.

Final Answer: 1. Integument forms part of the seed coat, while testa is the fully developed seed coat. 2. Integument is part of the ovule, whereas testa is part of the seed after fertilization.

Quick Tip

Integuments become the testa after fertilization, forming a protective layer around the seed.

Q19. Explain any two differences between c-DNA and s-DNA.

Solution:

c-DNA (complementary DNA) and s-DNA (single-stranded DNA) differ in their structure, function, and formation.

Step 1: Definition.

- **c-DNA**: c-DNA is synthesized from messenger RNA (mRNA) through the process of reverse transcription. It represents the coding sequence of genes. - **s-DNA**: s-DNA is a single-stranded form of DNA, which can be either a naturally occurring DNA molecule or the result of denaturation.

Step 2: Differences.

1. **Formation**: - **c-DNA** is synthesized from mRNA through reverse transcription. - **s-DNA** can be generated by denaturation or by naturally occurring single-stranded regions. 2. **Purpose**: - **c-DNA** is used to study gene expression and to clone genes. - **s-DNA** is typically used in hybridization experiments and may be involved in gene mapping.

Final Answer: 1. c-DNA is synthesized from mRNA, while s-DNA can be obtained by denaturation. 2. c-DNA represents gene expression, while s-DNA is used in hybridization studies.

Quick Tip

c-DNA is crucial for studying gene expression, while s-DNA is typically used for applications in DNA analysis and hybridization.

Q20. What is epistasis?

Solution:

Epistasis refers to the interaction between different genes, where one gene can mask or modify the expression of another gene.

Step 1: Understanding epistasis.

- In epistasis, one gene (the epistatic gene) suppresses or alters the expression of another gene (the hypostatic gene) at a different locus.

Step 2: Types of epistasis.

1. **Recessive epistasis**: The epistatic gene must be homozygous recessive to mask the expression of the other gene. 2. **Dominant epistasis**: A dominant allele at the epistatic gene locus can suppress the expression of the other gene, regardless of its genotype.

Final Answer: Epistasis is the genetic interaction where one gene suppresses or modifies the expression of another gene at a different locus.

Quick Tip

Epistasis helps explain complex traits where the expression of one gene depends on the presence or absence of another.

Q21. What do you understand by ground water? Describe the causes for its depletion and remedies.

Solution:

Groundwater refers to water that is stored beneath the earth's surface in aquifers, which are permeable rock formations that hold water. This water is replenished through precipitation that percolates down into the ground.

Step 1: Understanding groundwater.

- Groundwater is an essential part of the hydrological cycle, serving as a major source of fresh water for drinking, irrigation, and industrial purposes. - It is stored in the spaces between soil particles and in cracks in rocks, and is accessed through wells or springs.

Step 2: Causes of groundwater depletion.

Groundwater depletion occurs when the rate of water extraction exceeds the rate of natural replenishment. Some of the key causes are:

1. **Over-extraction for agriculture**: The excessive use of groundwater for irrigation in regions with little rainfall has led to rapid depletion. 2. **Urbanization and industrial use**: Growing urban populations and industries rely heavily on groundwater for water supply, often leading to unsustainable usage. 3. **Climate change**: Changing weather patterns, with decreased rainfall and increased evaporation, reduce the natural replenishment of groundwater supplies. 4. **Contamination**: Overuse of groundwater can also lead to its contamination from pollutants, further depleting usable reserves.

Step 3: Remedies for groundwater depletion.

To address groundwater depletion, the following measures can be taken:

1. **Water conservation**: Promoting water-saving techniques such as rainwater harvesting, drip irrigation, and efficient domestic water use can reduce reliance on groundwater. 2. **Sustainable extraction practices**: Limiting groundwater extraction to levels that allow natural recharge through managed aquifer recharge (MAR) systems. 3. **Government regulation**: Implementing policies to regulate groundwater usage, ensuring equitable access and sustainable practices for industries and farmers. 4. **Reforestation and watershed management**: Protecting and restoring natural forests and watersheds can help increase groundwater recharge by improving the infiltration of rainwater.

Final Answer: Groundwater is an important source of fresh water stored below the earth's surface. Its depletion is caused by over-extraction, urbanization, climate change, and contamination. Remedies include water conservation, sustainable extraction, regulations, and

watershed management.

Quick Tip

Conserving groundwater requires a combination of sustainable practices, technological innovations, and regulatory measures.

Q22. Explain the differences between any two of the following:

(a) Food chain and food web

Solution:

The food chain and food web are both concepts used to describe the transfer of energy through ecosystems, but they differ in structure and complexity.

Step 1: Definition and Structure.

- **Food chain**: A linear sequence of organisms where each one is eaten by the next organism in the chain. It represents a single pathway of energy flow. - **Food web**: A complex network of interconnected food chains in an ecosystem. It shows how plants and animals are interlinked through different feeding relationships.

Step 2: Key Differences.

1. **Linear vs. Network**: A food chain is linear, showing a simple flow of energy from one organism to another, while a food web is a network of many interconnected food chains.
2. **Complexity**: Food webs are more complex and realistic, representing the diversity of feeding relationships in an ecosystem, while food chains are simplified versions that do not capture the full complexity.

Final Answer: 1. A food chain is a linear sequence, whereas a food web is a complex network of interconnected food chains. 2. Food webs are more complex and accurately represent real ecosystems compared to food chains.

Quick Tip

A food web provides a more accurate representation of how energy flows through an ecosystem due to its complexity.

(b) Primary producer and Secondary producer

Solution:

Primary producers and secondary producers are different types of organisms based on their position in the food chain and their role in energy transfer.

Step 1: Definition.

- **Primary producer**: Organisms like plants, algae, and some bacteria that produce their own food using sunlight or chemical energy (via photosynthesis or chemosynthesis). They form the base of the food chain. - **Secondary producer**: Organisms like herbivores and carnivores that consume primary producers or other organisms to gain energy. Secondary producers include primary consumers and secondary consumers.

Step 2: Key Differences.

1. **Energy Source**: Primary producers generate their own food through photosynthesis or chemosynthesis, whereas secondary producers depend on consuming other organisms for energy. 2. **Position in the food chain**: Primary producers are at the first trophic level, while secondary producers are at higher trophic levels, such as herbivores (primary consumers) or carnivores (secondary consumers).

Final Answer: 1. Primary producers make their own food, while secondary producers depend on others for energy. 2. Primary producers are at the base of the food chain, while secondary producers are at higher trophic levels.

Quick Tip

Primary producers are the foundation of ecosystems, while secondary producers depend on them for sustenance.

(c) Aestivation and Hibernation

Solution:

Aestivation and hibernation are both forms of dormancy that help animals survive extreme environmental conditions, but they occur in different seasons and for different reasons.

Step 1: Definition.

- **Aestivation**: A state of dormancy that some animals enter during hot or dry conditions, often in summer, to conserve water and energy. - **Hibernation**: A state of dormancy that animals enter during cold winter months to conserve energy when food is scarce.

Step 2: Key Differences.

1. **Season**: Aestivation occurs in response to high temperatures and drought conditions, usually in summer, while hibernation occurs in winter due to cold and scarce food. 2. **Purpose**: Aestivation is primarily to conserve water and avoid overheating, while hibernation is aimed at conserving energy during food scarcity and cold temperatures.

Final Answer: 1. Aestivation occurs in hot conditions, while hibernation occurs in cold conditions. 2. Aestivation conserves water, while hibernation conserves energy.

Quick Tip

Aestivation and hibernation are survival strategies that help animals cope with extreme environmental conditions.

Q23. Present a neat, clean, and well-labelled diagram of an embryo inside the human uterus.

Solution:

The human embryo is surrounded by various structures inside the uterus that support its development. The diagram below shows the embryo's location and the relevant parts of the female reproductive system.

Step 1: Key structures of the diagram.

1. **Amniotic sac**: This fluid-filled sac surrounds the developing embryo and provides protection. 2. **Placenta**: The placenta is the organ that forms on the uterine wall,

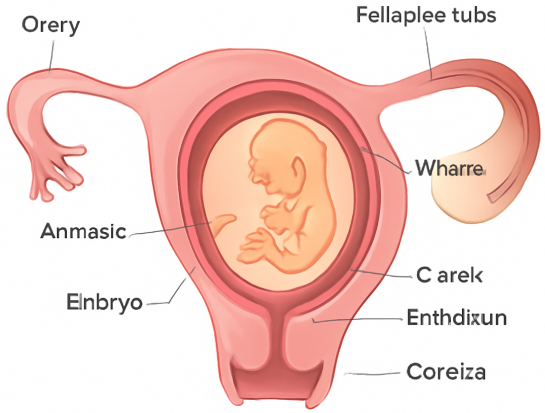

Figure 1: Embryo inside the human uterus

providing nutrients and oxygen to the embryo while removing waste. 3. **Umbilical cord**: It connects the embryo to the placenta and carries blood with nutrients to the fetus and removes waste. 4. **Uterine wall**: The thick layer of tissue that provides support for the embryo, as it is attached to the uterine lining. 5. **Embryo**: The developing organism within the amniotic sac, starting from a zygote and undergoing stages of development.

Final Answer: The diagram illustrates the embryo inside the human uterus, including key features like the amniotic sac, placenta, umbilical cord, and uterine wall.

Quick Tip

The amniotic sac and placenta play crucial roles in protecting and nourishing the embryo throughout pregnancy.

Q24. Describe the process of sex-determination in honeybees.

Solution:

The sex-determination system in honeybees is unique, as it follows a system known as the **haplodiploid system**, which is different from the XY or XX system seen in many other species.

Step 1: Basic Mechanism.

- **Haplodiploidy** means that males are haploid (having only one set of chromosomes) and females are diploid (having two sets of chromosomes). - The queen bee lays both fertilized and unfertilized eggs: - **Fertilized eggs** develop into **female bees** (workers or queens). - **Unfertilized eggs** develop into **male bees** (drones).

Step 2: Chromosome Determination.

- In females (workers and queens), the egg is fertilized by sperm from the male drone. The fertilized egg receives one chromosome set from the mother and one from the father, making it diploid. - In males (drones), the egg is not fertilized, so the egg only contains the mother's genetic material, making the male haploid (one set of chromosomes).

Step 3: Queen and Drone Differentiation.

- The queen bee and worker bees are both female, but their roles are determined by **diet** during the larval stage. A female larva that is fed a special diet called **royal jelly** will develop into a queen, while the others develop into worker bees.

Final Answer: In honeybees, males are haploid (developing from unfertilized eggs), while females are diploid (developing from fertilized eggs). The queen's fate is determined by diet during the larval stage.

Quick Tip

The haplodiploid system of sex determination in honeybees is key to understanding the social structure of the colony.

Q25. Present a well-labelled neat and clean diagram of recombinant technology.

Solution:

Recombinant technology involves the manipulation of an organism's genetic material to introduce new genes, enabling the production of desired proteins or traits. Below is a simple diagram illustrating the process of recombinant DNA technology.

Step 1: Key Steps in Recombinant DNA Technology.

1. **Gene Isolation**: The desired gene is isolated from the organism's DNA using restriction enzymes. 2. **Gene Insertion**: The isolated gene is inserted into a vector (often

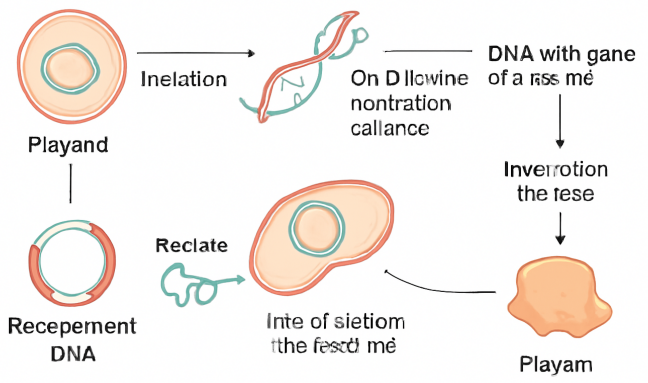

Figure 2: Diagram of Recombinant DNA Technology

a plasmid) using ligase enzymes. 3. **Transformation**: The recombinant DNA is introduced into a host organism (often bacteria) for replication. 4. **Selection**: The transformed cells are selected, usually using an antibiotic resistance marker. 5. **Expression**: The host organism expresses the inserted gene, producing the desired protein.

Final Answer: The diagram above illustrates the key steps in recombinant DNA technology, including gene isolation, insertion into a vector, transformation, selection, and protein expression.

Quick Tip

Recombinant DNA technology is a powerful tool for genetic engineering, enabling the production of pharmaceuticals, crops, and other valuable products.

Q26. Describe biofortification in brief.

Solution:

Biofortification is the process of increasing the nutritional value of food crops through biological methods, such as breeding, genetic modification, or fertilization. The goal is to

enhance the levels of essential nutrients such as vitamins, minerals, and amino acids in staple foods that are consumed by large populations.

Step 1: Methods of Biofortification.

- **Conventional Breeding**: This involves selecting and breeding crop varieties that naturally have higher nutrient content. - **Genetic Engineering**: Involves altering the genetic makeup of crops to increase their nutrient content. - **Agronomic Practices**: Using specific fertilizers or soil management practices to increase the nutrient uptake by crops.

Step 2: Importance of Biofortification.

- **Fighting Malnutrition**: It helps address micronutrient deficiencies, such as vitamin A, iron, and zinc, especially in regions where people rely on staple foods with low nutrient content. - **Sustainability**: Unlike fortification, which adds nutrients after harvest, biofortification naturally enhances the nutritional content of food crops, providing a sustainable solution to malnutrition.

Final Answer: Biofortification is the process of enhancing the nutritional value of food crops through breeding, genetic modification, or agronomic practices, with the aim of combating malnutrition in populations that rely on staple foods.

Quick Tip

Biofortification offers a sustainable solution to address micronutrient deficiencies in populations that lack access to diverse and nutrient-rich foods.
