

UP Board Biology - 348 (KL) - 2025 Question Paper with Solutions

Time Allowed :3 Hours	Maximum Marks :70	Total questions :35
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General Instructions

Instruction:

- i) *All* questions are compulsory. Marks allotted to each question are given in the margin.
- ii) In numerical questions, give all the steps of calculation.
- iii) Give relevant answers to the questions.
- iv) Give chemical equations, wherever necessary.

Q1(a). The ability to regenerate is found in

- (A) Amoeba
- (B) Paramoecium
- (C) Hydra
- (D) Sponge

Correct Answer: ((C) Hydra

Solution:

Step 1: Regeneration in animals.

Regeneration is the ability of an organism to regrow lost body parts or regenerate from a part of the body.

Step 2: Organisms capable of regeneration.

In this case, Hydra is known for its remarkable ability to regenerate any part of its body, making it one of the most common examples.

Step 3: Conclusion.

Thus, the correct answer is ((C) Hydra.

Final Answer:

Hydra

Quick Tip

Hydra has the ability to regenerate entire organisms from small parts, which is a unique feature among some invertebrates.

Q1(b). Turner syndrome occurs due to

- (A) XO
- (B) XXY
- (C) XYY
- (D) XXX

Correct Answer: ((A) XO

Solution:

Step 1: Understanding Turner Syndrome.

Turner syndrome occurs when one of the X chromosomes is missing or partially missing. This is represented by the karyotype XO.

Step 2: The genetic cause.

In Turner syndrome, females have only one full X chromosome and no second sex chromosome.

Step 3: Conclusion.

Thus, the correct answer is ((A) XO.

Final Answer:

XO

Quick Tip

Turner syndrome is a chromosomal disorder caused by a missing X chromosome.

Q1(c). Which enzyme joins DNA fragments?

- (A) Polymerase
- (B) Ligase
- (C) Exonuclease
- (D) Endonuclease

Correct Answer: ((B) Ligase

Solution:

Step 1: Role of ligase in DNA repair.

DNA ligase is an enzyme that plays a crucial role in the repair and replication of DNA by joining DNA fragments together.

Step 2: How ligase functions.

Ligase works by catalyzing the formation of a phosphodiester bond between the 3' hydroxyl group and the 5' phosphate group of adjacent nucleotides.

Step 3: Conclusion.

Thus, the correct answer is ((B) Ligase.

Final Answer:

Ligase

Quick Tip

Ligase is essential for sealing nicks and joining DNA fragments during replication and repair.

Q1(d). The study of mutual relations between the organism and its environment is called

- (A) Phytogeography
- (B) Autecology
- (C) Ecology
- (D) Population

Correct Answer: ((C) Ecology

Solution:

Step 1: Understanding Ecology.

Ecology is the scientific study of interactions between organisms and their environment, including the distribution and abundance of organisms.

Step 2: Focus of Ecology.

Ecology focuses on the relationships between organisms and the biotic and abiotic components of their environment.

Step 3: Conclusion.

Thus, the correct answer is ((C) Ecology.

Final Answer:

Ecology

Quick Tip

Ecology encompasses the study of ecosystems, organism-environment interactions, and environmental factors.

Q2(a). By which is the hormone named relaxin secreted?

Solution:

Step 1: What is relaxin?

Relaxin is a hormone involved in pregnancy and childbirth. It helps in softening and relaxing the cervix and the pelvic ligaments during labor.

Step 2: Where is relaxin secreted?

Relaxin is primarily secreted by the ovaries during the early stages of pregnancy, and later by the placenta as well.

Step 3: Conclusion.

Thus, the correct answer is ((A) Ovaries.

Final Answer:

Ovaries

Quick Tip

Relaxin plays a crucial role in preparing the body for labor by relaxing the cervix and pelvic ligaments.

Q2(b). What is the total number of chromosomes in humans?

Solution:

Step 1: Chromosomes in humans.

Humans have a total of 46 chromosomes, which are arranged in 23 pairs.

Step 2: Karyotype of humans.

One of these 23 pairs is made up of sex chromosomes, and the remaining 22 pairs are autosomes.

Step 3: Conclusion.

Thus, the correct answer is ((B) 23 pairs.

Final Answer:

23 pairs

Quick Tip

Humans have 23 pairs of chromosomes, with one pair determining the sex (XX for females, XY for males).

Q2(c). How many contrasting characters were there in the pea plant studied by Mendel?

Solution:**Step 1: Mendel's Pea Plant Experiment.**

Mendel's experiment on pea plants focused on seven pairs of contrasting traits, such as seed shape, flower color, and pod shape.

Step 2: Traits studied by Mendel.

The seven contrasting traits studied by Mendel were: seed shape, seed color, pod shape, pod color, flower color, flower position, and plant height.

Step 3: Conclusion.

Thus, the correct answer is ((D) 7.

Final Answer:

7

Quick Tip

Mendel studied seven contrasting traits in pea plants, which laid the foundation for modern genetics.

Q2(d). A typical nucleosome contains how many base pairs of DNA helix?

Solution:

Step 1: Understanding nucleosomes.

A nucleosome is a structural unit of chromatin in eukaryotic cells. It consists of a segment of DNA wrapped around histone proteins.

Step 2: DNA wrapping in nucleosomes.

Each nucleosome contains about 200 base pairs of DNA wrapped around histone proteins.

Step 3: Conclusion.

Thus, the correct answer is ((B) 200 base pairs.

Final Answer:

200 base pairs

Quick Tip

Nucleosomes consist of 200 base pairs of DNA wrapped around histones, forming the basic structural unit of chromatin.

Q2(e). State two distinctive properties of any population.

Solution:

Step 1: Understanding population characteristics.

A population refers to a group of individuals of the same species living in a particular area.

Step 2: Distinctive properties.

Two distinctive properties of a population are: 1. **Population Density**: The number of individuals per unit area or volume. 2. **Population Growth**: The increase or decrease in the number of individuals in a population over time.

Step 3: Conclusion.

Thus, the two distinctive properties of any population are population density and population growth.

Final Answer:

Population Density, Population Growth

Quick Tip

Population density and growth are fundamental characteristics used to study the dynamics of populations.

Q3(a). What is the difference between dominance and recessiveness? .

Solution:

Step 1: Understanding Dominance and Recessiveness.

Dominance is a genetic phenomenon where the dominant allele expresses its trait in a heterozygous pair, while the recessive allele only expresses its trait when two recessive alleles are present.

Step 2: Explanation.

For example, in pea plants, the allele for tall plants (T) is dominant, and the allele for short plants (t) is recessive. A plant with genotype Tt (heterozygous) will be tall because the dominant T allele masks the effect of the recessive t allele.

Step 3: Conclusion.

Thus, the correct answer is ((A)).

Final Answer:

Dominance refers to the allele that expresses its effect even in the presence of a different allele; recessive

Quick Tip

In genetics, dominant traits are always expressed when present, while recessive traits need two copies to be visible.

Q3(b). State the main features of human genome.

Solution:

Step 1: Understanding the Human Genome.

The human genome is the complete set of genetic information for humans. It consists of approximately 3 billion base pairs of DNA, organized into 23 pairs of chromosomes.

Step 2: Key Features.

1. **Chromosomal Structure**: Humans have 23 pairs of chromosomes, 22 autosomes and 1 pair of sex chromosomes (XX for females, XY for males). 2. **Genes and Non-Coding DNA**: The human genome contains about 20,000–25,000 genes, but a significant portion of the genome does not code for proteins (non-coding DNA). 3. **Genetic Variation**: There is significant genetic variation between individuals, contributing to diversity in traits.

Step 3: Conclusion.

The human genome contains all the instructions for the development, functioning, and reproduction of humans, and it plays a key role in inheritance.

Final Answer:

23 pairs of chromosomes, 20,000–25,000 genes, and significant non-coding DNA.

Quick Tip

The human genome contains both coding and non-coding regions, with about 3 billion base pairs in total.

Q3(c). What are fermented beverages? Write their names.

Solution:**Step 1: What are Fermented Beverages?**

Fermented beverages are drinks that are produced through the fermentation process, where microorganisms like bacteria, yeast, or molds convert sugars into alcohol or acids.

Step 2: Examples of Fermented Beverages.

Some examples of fermented beverages include: 1. **Wine** – made by fermenting grapes. 2. **Beer** – made from barley and hops through the fermentation process. 3. **Kefir** – a fermented milk drink. 4. **Cider** – made by fermenting apples.

Step 3: Conclusion.

Fermented beverages have been consumed for centuries and have a variety of flavors and alcohol contents depending on the type and fermentation process.

Final Answer:

Wine, Beer, Kefir, Cider

Quick Tip

Fermented beverages are rich in probiotics and often have distinct flavors due to the fermentation process.

Q3(d). Write a note on Biosphere.

Solution:**Step 1: What is the Biosphere?**

The biosphere is the zone of life on Earth, which includes the land, water, and atmosphere where living organisms can be found. It encompasses all ecosystems on Earth.

Step 2: Components of the Biosphere.

The biosphere consists of: 1. **Biotic Components**: All living organisms such as plants, animals, and microbes. 2. **Abiotic Components**: Non-living factors like sunlight, temperature, air, water, and soil.

Step 3: Conclusion.

The biosphere is critical to sustaining life on Earth, as it contains the ecosystems that regulate essential processes like nutrient cycling, climate, and energy flow.

Final Answer:

The biosphere is the zone of life on Earth, encompassing both living and non-living components.

Quick Tip

The biosphere includes all life forms and is influenced by various physical, chemical, and biological factors.

Q3(e). Explain the difference between in-situ and ex-situ conservations.

Solution:

Step 1: Understanding In-situ Conservation.

In-situ conservation is the conservation of species in their natural habitat. It involves protecting ecosystems and natural habitats to ensure the survival of species in the wild. Examples include national parks and wildlife sanctuaries.

Step 2: Understanding Ex-situ Conservation.

Ex-situ conservation is the conservation of species outside their natural habitats. This method involves preserving species in places like zoos, botanical gardens, and seed banks.

Step 3: Key Differences.

- **In-situ conservation**: Protects species in their natural environment. - **Ex-situ conservation**: Involves preserving species in controlled environments away from their natural habitat.

Step 4: Conclusion.

Thus, in-situ conservation focuses on habitat protection, while ex-situ conservation involves maintaining species outside of their natural surroundings.

Final Answer:

In-situ conservation protects species in their natural habitat, while ex-situ conservation involves preserv

Quick Tip

Both in-situ and ex-situ conservation methods are crucial for maintaining biodiversity.

Q4(a). Describe the structure of microsporangium with diagram.

Solution:

Step 1: What is a Microsporangium?

A microsporangium is the pollen sac in seed plants where male gametes (pollen grains) are produced. It is a part of the male reproductive organ (stamen) in angiosperms and conifers.

Step 2: Structure of Microsporangium.

The microsporangium consists of: 1. **Epidermis**: The outermost layer, which is protective. 2. **Tapetum**: The innermost layer that nourishes the developing microspores. 3. **Microspore Mother Cells (PMC)**: These cells undergo meiosis to form microspores (pollen grains).

Step 3: Diagram (if applicable).

(Include diagram of microsporangium)

A diagram would show the layers of the microsporangium and the arrangement of the microspore mother cells.

Step 4: Conclusion.

The microsporangium is vital for the formation of pollen, which is necessary for fertilization in seed plants.

Final Answer:

Microsporangium consists of epidermis, tapetum, and microspore mother cells.

Quick Tip

Microsporangium is essential for male gamete formation in plants.

Q4(b). What is placenta? Write its functions.

Solution:

Step 1: What is Placenta?

The placenta is an organ that forms during pregnancy in mammals. It connects the developing fetus to the uterine wall to allow nutrient uptake, waste elimination, and gas exchange via the mother's blood supply.

Step 2: Functions of Placenta.

1. **Nutrient Transfer**: It provides nutrients such as glucose, amino acids, and vitamins to the developing fetus. 2. **Gas Exchange**: Oxygen is transferred from the mother's blood to the fetus, while carbon dioxide is transferred from the fetus to the mother. 3. **Waste Removal**: Removes metabolic waste products from the fetus. 4. **Hormone Production**: It produces hormones such as progesterone and hCG to maintain pregnancy.

Step 3: Conclusion.

Thus, the placenta is essential for maintaining pregnancy and ensuring fetal development.

Final Answer:

The placenta facilitates nutrient transfer, gas exchange, waste removal, and hormone production.

Quick Tip

The placenta is vital for fetal nourishment and maintaining pregnancy in mammals.

Q4(c). State the characteristics of genetic code.

Solution:

Step 1: What is Genetic Code?

The genetic code is a set of rules that dictates how sequences of nucleotides in DNA and RNA are translated into amino acids, which make up proteins.

Step 2: Characteristics of Genetic Code.

1. **Universal**: The genetic code is the same in almost all organisms. 2. **Degenerate**: Multiple codons can code for the same amino acid. 3. **Unambiguous**: Each codon

specifies only one amino acid. 4. ****Non-overlapping****: Codons are read in a sequence without overlap. 5. ****Commaless****: The genetic code does not contain punctuation marks between codons. 6. ****Start and Stop Signals****: There are specific codons (AUG for start, UAA, UAG, UGA for stop) that signal the beginning and end of protein synthesis.

Step 3: Conclusion.

Thus, the genetic code is a key feature of life, enabling the accurate translation of genetic information into functional proteins.

Final Answer:

The genetic code is universal, degenerate, unambiguous, non-overlapping, and contains start and stop codons.

Quick Tip

The genetic code ensures that the information in DNA is accurately translated into proteins for cellular function.

Q4(d). What do you understand by biopiracy?

Solution:

Step 1: What is Biopiracy?

Biopiracy refers to the exploitation of natural resources, especially genetic resources and traditional knowledge, without proper authorization or compensation to the indigenous people or countries who are the original source.

Step 2: Key Examples of Biopiracy.

1. ****Patent of Medicinal Plants****: Many pharmaceutical companies have patented medicinal compounds derived from plants native to specific regions without compensating the communities that used them. 2. ****Genetic Material****: The use of genetic material from indigenous species without consent or fair compensation.

Step 3: Conclusion.

Biopiracy undermines the rights of indigenous communities and threatens biodiversity conservation efforts.

Final Answer:

Biopiracy is the unauthorized use and exploitation of natural resources and traditional knowledge.

Quick Tip

Biopiracy violates ethical, legal, and environmental standards by exploiting resources without fair compensation.

Q5(a). Why did Mendel choose pea plants for his experiments?

Solution:**Step 1: Characteristics of Pea Plants.**

Mendel chose pea plants for his experiments because they have several distinct advantages:

1. ****Clear-cut Traits****: Pea plants have easily distinguishable characteristics such as flower color, seed shape, and pod color. 2. ****Short Generation Time****: They reproduce quickly, allowing Mendel to observe multiple generations in a short period. 3. ****Self-pollination****: Pea plants can self-pollinate, ensuring that traits remain consistent unless cross-pollination is deliberately induced. 4. ****Ease of Cross-Pollination****: Mendel could manually control the cross-pollination between different pea plants to study inheritance patterns.

Step 2: Conclusion.

Thus, the pea plant was an ideal model organism for studying the inheritance of traits, as it allowed Mendel to observe clear, predictable patterns of inheritance.

Final Answer:

Mendel chose pea plants due to their clear-cut traits, short generation time, and ability to self-pollinate.

Quick Tip

The pea plant's traits are easy to track across generations, making it an ideal choice for genetic experiments.

Q5(b). Describe the common diseases found in humans.

Solution:

Step 1: Infectious Diseases.

Common infectious diseases in humans include: 1. **Tuberculosis (TB)**: Caused by *Mycobacterium tuberculosis*, affecting the lungs and causing coughing and chest pain. 2. **Malaria**: Caused by *Plasmodium* parasites and transmitted through the bite of infected mosquitoes, leading to fever and chills. 3. **Influenza (Flu)**: Caused by influenza viruses, leading to fever, fatigue, and respiratory symptoms.

Step 2: Non-Infectious Diseases.

Common non-infectious diseases include: 1. **Diabetes**: A metabolic disorder that affects how the body uses blood sugar. 2. **Hypertension (High Blood Pressure)**: A condition where the force of the blood against the artery walls is too high, leading to various cardiovascular problems. 3. **Cancer**: A group of diseases characterized by the uncontrolled division of abnormal cells.

Step 3: Conclusion.

These diseases can be caused by a variety of factors, including infections, genetic predisposition, lifestyle choices, and environmental factors.

Final Answer:

Common diseases include tuberculosis, malaria, diabetes, hypertension, and cancer.

Quick Tip

Both infectious and non-infectious diseases are prevalent, affecting various body systems and requiring diverse treatment approaches.

Q5(c). Explain the difference between exonuclease and endonuclease enzymes.

Solution:

Step 1: Exonuclease.

Exonucleases are enzymes that remove nucleotides from the ends of a DNA strand. They can remove one nucleotide at a time from either the 3' or 5' end of a DNA strand. Exonucleases are important for DNA repair and replication processes.

Step 2: Endonuclease.

Endonucleases are enzymes that cleave the phosphodiester bond within a DNA molecule, making cuts within the DNA strand. These enzymes are important in DNA repair, recombination, and restriction digestion.

Step 3: Key Differences.

- **Exonuclease**: Removes nucleotides from the ends of the DNA strand. -

Endonuclease: Cuts DNA at specific internal sites within the strand.

Step 4: Conclusion.

Thus, exonucleases and endonucleases differ in their action on the DNA strand, with exonucleases working at the ends and endonucleases making internal cuts.

Final Answer:

Exonucleases remove nucleotides from the ends of DNA, while endonucleases cut at internal sites.

Quick Tip

Exonucleases and endonucleases play critical roles in DNA repair and modification by cleaving nucleotides in different ways.

Q5(d). What are biofertilizers? State the role of microorganisms in their production.

Solution:**Step 1: What are Biofertilizers?**

Biofertilizers are natural fertilizers that contain living microorganisms which help in enhancing the soil's nutrient content, especially nitrogen, phosphorus, and potassium. They promote plant growth by increasing soil fertility.

Step 2: Role of Microorganisms in Biofertilizers.

Microorganisms such as nitrogen-fixing bacteria (e.g., *Rhizobium*), mycorrhizal fungi, and phosphate-solubilizing bacteria play crucial roles in biofertilizers. 1. **Nitrogen Fixation**: Nitrogen-fixing bacteria convert atmospheric nitrogen into a form usable by plants. 2. **Phosphorus Solubilization**: Some microorganisms convert insoluble phosphates into soluble forms, making them available to plants. 3. **Symbiotic Relationships**: Fungi like mycorrhizae form symbiotic relationships with plant roots, enhancing nutrient absorption.

Step 3: Conclusion.

Microorganisms in biofertilizers help plants access essential nutrients and promote sustainable agriculture.

Final Answer:

Biofertilizers are natural fertilizers containing microorganisms that enhance soil fertility and plant growth.

Quick Tip

Biofertilizers are environmentally friendly alternatives to chemical fertilizers and support sustainable farming practices.

Q6(a). How does elephantiasis (Filariasis) occur?

Solution:

Step 1: What is Elephantiasis (Filariasis)?

Elephantiasis, also known as filariasis, is a disease caused by parasitic worms, primarily *Wuchereria bancrofti* and *Brugia malayi*, which are transmitted through mosquito bites.

Step 2: How the Disease Occurs.

1. **Mosquito Transmission**: The female mosquito carrying the filarial larvae bites a human, introducing the larvae into the bloodstream. 2. **Larvae Development**: The larvae travel through the bloodstream to the lymphatic system, where they mature into adult worms. 3. **Blockage of Lymphatic Vessels**: The adult worms cause blockages in the lymphatic system, leading to fluid accumulation and swelling in the affected body parts, commonly the legs.

Step 3: Symptoms and Effects.

The disease causes extreme swelling (elephantiasis) and can lead to permanent disability if not treated.

Step 4: Conclusion.

Thus, elephantiasis occurs due to parasitic infections transmitted by mosquito bites, leading to lymphatic system damage.

Final Answer:

Elephantiasis is caused by filarial worms transmitted through mosquito bites, affecting the lymphatic system.

Quick Tip

Prevention involves controlling mosquito populations and using insect repellent to avoid bites.

Q6(b). What do you understand by Bt? Explain by giving an example of Bt-cotton.

Solution:

Step 1: What is Bt?

Bt stands for *Bacillus thuringiensis*, a bacterium that produces proteins toxic to certain insects. These proteins are used as a biological pesticide.

Step 2: Bt-cotton.

Bt-cotton is a genetically modified cotton plant that has been engineered to include the gene from *Bacillus thuringiensis*. This gene allows the plant to produce a protein toxic to certain pests, particularly the cotton bollworm.

Step 3: How It Works.

1. **Pest Resistance**: The cotton plant produces a toxin that is harmful to specific insect pests but harmless to humans, animals, and other beneficial insects. 2. **Reduced Pesticide Use**: By using Bt-cotton, farmers reduce the need for chemical pesticides, which helps lower environmental impact and reduces costs.

Step 4: Conclusion.

Bt-cotton is an example of genetic engineering in agriculture that provides a natural defense against pests, reducing the need for chemical pesticides.

Final Answer:

Bt refers to a bacterium that produces insecticidal proteins, and Bt-cotton is genetically modified to produce these proteins.

Quick Tip

Bt-cotton helps reduce pesticide use by providing natural resistance to pests.

Q6(c). What are the effects of drug and alcohol abuse on the body?

Solution:

Step 1: Drug and Alcohol Abuse.

Drug and alcohol abuse refers to the excessive consumption of substances that can alter mental and physical functions.

Step 2: Effects on the Body.

1. **Liver Damage**: Alcohol abuse can lead to liver diseases such as cirrhosis and hepatitis. 2. **Heart Problems**: Both alcohol and certain drugs can cause cardiovascular diseases, including hypertension, heart attacks, and strokes. 3. **Mental Health Disorders**: Substance abuse can contribute to mental health issues like depression, anxiety, and psychosis. 4. **Addiction**: Drugs and alcohol can lead to physical and psychological dependence, making it difficult to quit. 5. **Weakened Immune System**: Long-term abuse weakens the immune system, making the body more susceptible to infections.

Step 3: Conclusion.

Both drugs and alcohol have serious long-term effects on the body, impacting various organs and overall health.

Final Answer:

Drug and alcohol abuse can damage organs, cause mental health disorders, and lead to addiction.

Quick Tip

Avoiding excessive drug and alcohol use is crucial for maintaining long-term health and well-being.

Q6(d). Explain the reasons for ozone depletion in the stratosphere.

Solution:

Step 1: Ozone Layer and Its Importance.

The ozone layer is a region in the stratosphere that contains a high concentration of ozone (O₃). It is crucial for blocking harmful ultraviolet (UV) radiation from the sun.

Step 2: Causes of Ozone Depletion.

1. **Chlorofluorocarbons (CFCs)**: CFCs are chemicals that, when released into the atmosphere, break down ozone molecules. They are commonly found in refrigerants, aerosols, and solvents. 2. **Halons**: These are chemicals used in fire extinguishers that also contribute to ozone depletion. 3. **Nitrous Oxide**: Emissions from fertilizers and vehicles can lead to the breakdown of ozone.

Step 3: How Ozone Is Depleted.

CFCs and other ozone-depleting substances reach the stratosphere, where UV radiation breaks them down. The chlorine atoms released by these chemicals react with ozone molecules, causing them to break apart, leading to a thinning of the ozone layer.

Step 4: Conclusion.

Ozone depletion is primarily caused by human-made chemicals like CFCs and halons, which break down ozone molecules in the stratosphere.

Final Answer:

Ozone depletion is caused by chemicals like CFCs and halons, which break down ozone molecules in the stratosphere.

Quick Tip

Reducing the use of ozone-depleting substances like CFCs is essential for protecting the ozone layer.

Q7(a). What is megasporogenesis? Describe with a diagram the development of the female gametophyte in angiospermic plants.

Solution:

Step 1: What is Megasporogenesis?

Megasporogenesis is the process by which megaspores are formed in the ovule of an angiosperm plant. These megaspores eventually develop into the female gametophyte, also known as the embryo sac.

Step 2: Development of Female Gametophyte.

1. **Formation of Megaspores**: In the ovule, the megaspore mother cell undergoes meiosis to form four haploid megaspores, but only one of these megaspores survives. 2. **Mitotic Division**: The surviving megaspore undergoes three rounds of mitotic divisions to form the eight nuclei of the female gametophyte. 3. **Embryo Sac Formation**: The nuclei arrange themselves into a structure known as the embryo sac, consisting of the egg cell, two synergids, one central cell with two polar nuclei, and three antipodal cells.

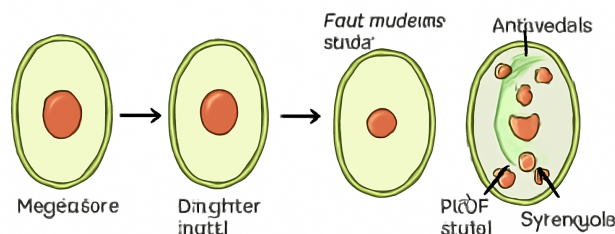
Step 3: Diagram (if applicable).

(Include diagram of megasporogenesis and embryo sac formation)

A diagram would show the stages of megasporogenesis and the development of the female gametophyte in the ovule.

Step 4: Conclusion.

Thus, megasporogenesis results in the formation of a female gametophyte, which plays a key role in fertilization.



**DEVELOPMENT OF FEMALE GAMETOPHYTE
IN ANGIOSPERMIC PLANTS**

Final Answer:

Megasporogenesis is the formation of megaspores, which develop into the female gametophyte in angio

Quick Tip

Megasporogenesis is essential for producing the egg cell that will fuse with the male gamete during fertilization.

Q7(b). Write notes on the following:

((A) Diagram of transverse section of female ovary.

Solution:**Step 1: Transverse Section of Female Ovary.**

The transverse section of the female ovary reveals the structure of the ovary, which contains several ovules. Key components include: 1. **Ovary Wall**: The outer layer that protects the ovary. 2. **Ovules**: Located in the ovary, each ovule contains the female gametophyte. 3. **Stigma and Style**: The ovary connects to the stigma via the style.

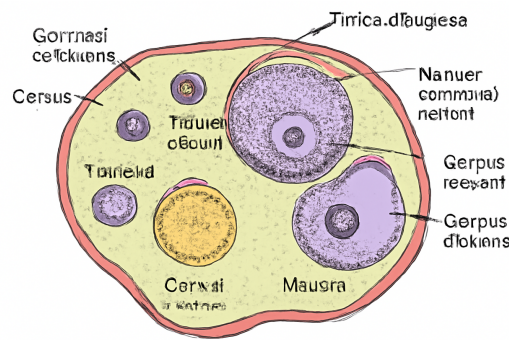
Step 2: Diagram (if applicable).

(Include diagram of transverse section of the female ovary)

A diagram would show the structure of the ovary, including the ovules, ovary wall, and surrounding tissues.

Step 3: Conclusion.

The transverse section of the ovary provides insight into the arrangement of ovules and the process of ovule development.



TRANSVERSE SECTION OF FEMALE OVARY

Final Answer:

The transverse section of the female ovary includes the ovary wall, ovules, and surrounding tissues.

Quick Tip

The ovary structure is essential for understanding fertilization and seed development in plants.

((B) Structure of Human Sperm.

Solution:

Step 1: Structure of Human Sperm.

The structure of a human sperm consists of three main parts: 1. **Head**: Contains the nucleus, which holds the genetic material (haploid chromosome number). The acrosome, a cap-like structure, contains enzymes that help the sperm penetrate the egg. 2. **Midpiece**: Contains mitochondria that provide energy for the sperm to move. 3. **Tail (Flagellum)**: The tail provides the propulsion necessary for the sperm to swim toward the egg during fertilization.

Step 2: Conclusion.

The sperm is designed to carry genetic material to the egg and provides motility through its tail, allowing fertilization to occur.

Final Answer:

The human sperm consists of a head (containing the nucleus and acrosome), midpiece (with mitochondria), and tail (with flagellum).

Quick Tip

The sperm's structure is specialized for its role in fertilization, with key features for motility and genetic delivery.

Q8. Describe the structure of double helical DNA given by Watson and Crick with a diagram.

Solution:**Step 1: Introduction to DNA Structure.**

The structure of DNA (Deoxyribonucleic Acid) was first described by Watson and Crick in 1953. They proposed a double helix model for the DNA molecule, which is now widely accepted as the standard model.

Step 2: Components of DNA.

DNA consists of two long chains of nucleotides coiled around each other to form the double helix. Each nucleotide is made up of: 1. **A phosphate group** 2. **A deoxyribose sugar** 3. **A nitrogenous base** (Adenine, Thymine, Cytosine, or Guanine).

The two strands of the helix are held together by hydrogen bonds between the nitrogenous bases, with adenine (A) pairing with thymine (T), and cytosine (C) pairing with guanine (G).

Step 3: The Double Helix Structure.

The two strands of DNA are anti-parallel, meaning one strand runs in a 5' to 3' direction and the other runs 3' to 5'. The double helix structure resembles a twisted ladder, with the sugar-phosphate backbone forming the sides of the ladder and the base pairs forming the rungs.

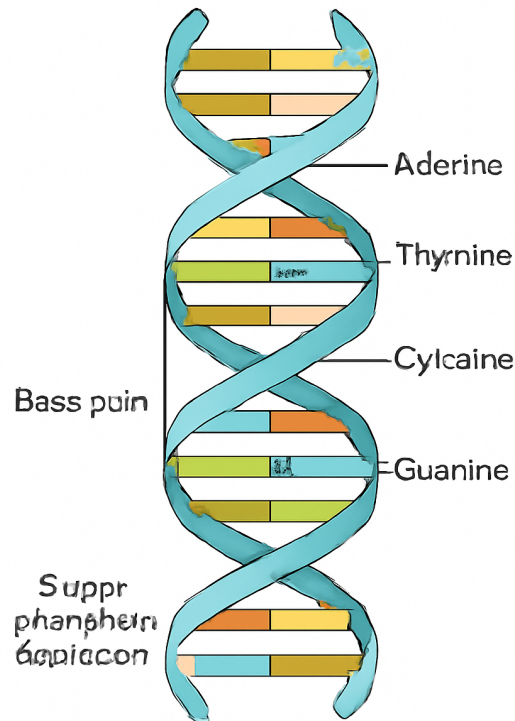
Step 4: Diagram (if applicable).

(Include diagram of the double helical structure of DNA)

A diagram would show two intertwined strands with base pairs between them.

Step 5: Conclusion.

The double helical structure of DNA is crucial for its function in storing genetic information and facilitating replication.



**STRUCTURE OF DOUBLE HELICAL
DNA GIVEN BY WATSON AND CRICK**

Final Answer:

DNA has a double helical structure with two strands connected by complementary base pairs.

Quick Tip

The complementary base pairing (A with T, C with G) ensures accurate DNA replication.

Q8(b). Write notes on the following:

((A) Colourblindness.

Solution:

Step 1: What is Colourblindness?

Colourblindness is a visual impairment where an individual is unable to perceive certain colors or differentiate between them. This condition is often inherited and affects a significant portion of the population.

Step 2: Types of Colourblindness.

1. **Red-Green Colourblindness**: The most common form, where individuals cannot distinguish between red and green hues. 2. **Blue-Yellow Colourblindness**: A less common form where individuals have difficulty distinguishing between blue and yellow hues. 3. **Complete Colourblindness**: A rare condition where individuals cannot perceive any colors and see the world in shades of gray.

Step 3: Genetic Cause.

Colourblindness is often caused by a mutation in the X chromosome, making it more common in males. It is a recessive genetic trait, meaning males with one mutated gene on the X chromosome will express the condition.

Step 4: Conclusion.

Colourblindness is a genetic condition that primarily affects males and can be diagnosed through various color vision tests.

Final Answer:

Colourblindness is a genetic condition where individuals have difficulty perceiving certain colors.

Quick Tip

Colourblindness is often inherited as an X-linked recessive trait and affects primarily males.

((B) Haemophilia.

Solution:

Step 1: What is Haemophilia?

Haemophilia is a genetic disorder where the blood does not clot properly, leading to excessive bleeding even from minor injuries.

Step 2: Types of Haemophilia.

1. **Haemophilia A**: Caused by a deficiency of clotting factor VIII. 2. **Haemophilia B**: Caused by a deficiency of clotting factor IX.

Step 3: Inheritance of Haemophilia.

Haemophilia is inherited as an X-linked recessive trait, meaning it primarily affects males. Females are carriers and may pass the mutated gene to their offspring.

Step 4: Symptoms.

Individuals with haemophilia may experience frequent and prolonged bleeding, easy bruising, joint pain, and internal bleeding.

Step 5: Treatment.

Haemophilia can be managed through the administration of the missing clotting factors, either as a preventive measure or during bleeding episodes.

Step 6: Conclusion.

Haemophilia is a serious bleeding disorder that can be managed with medical treatment, although there is no known cure.

Final Answer:

Haemophilia is a genetic disorder that impairs the blood clotting process, leading to excessive bleeding.

Quick Tip

Haemophilia is treatable through the administration of clotting factor replacements, but it is a lifelong condition.

Q9. Describe different population growth models in brief.

Solution:**Step 1: Introduction to Population Growth Models.**

Population growth models are used to describe how populations grow and change over time. These models are essential in ecology for understanding species dynamics and environmental impact.

Step 2: Types of Population Growth Models.

1. **Exponential Growth Model (J-shaped Curve)**: - This model assumes unlimited resources, with a population growing at a constant rate. - The growth rate is proportional to the current population size, resulting in rapid, unrestricted growth. - Formula:

$$N(t) = N_0 e^{rt}$$

where $N(t)$ is the population size at time t , N_0 is the initial population, r is the growth rate, and e is Euler's number.

2. **Logistic Growth Model (S-shaped Curve)**: - This model considers environmental limits (carrying capacity). - The population grows exponentially at first, but as it approaches the carrying capacity of the environment, the growth rate slows down and stabilizes. - Formula:

$$N(t) = \frac{K N_0}{N_0 + (K - N_0)e^{-rt}}$$

where K is the carrying capacity of the environment.

3. **Allee Effect**: - This model explains a population's growth when the population size is low and the growth rate is negatively impacted. - The Allee effect shows that at low densities, individuals may not be able to find mates, decreasing the population's growth rate.

Step 3: Conclusion.

These models provide insight into how populations grow in different environments and under different conditions. The logistic model is more realistic as it accounts for environmental carrying capacities.

Final Answer:

The main population growth models include exponential growth, logistic growth, and the Allee effect.

Quick Tip

Exponential growth is idealized and not typically seen in nature due to resource limitations, while logistic growth is more common as it accounts for environmental limits.

OR

Q9. Write an essay on biodiversity and its conservation.

Solution:

Step 1: Introduction to Biodiversity.

Biodiversity refers to the variety of life on Earth, including the diversity of species, ecosystems, and genetic diversity within species. Biodiversity is crucial for the stability and resilience of ecosystems, which provide essential services like pollination, climate regulation, and water purification.

Step 2: Types of Biodiversity.

1. ****Species Diversity****: Refers to the variety of species in a given area. It includes both the number of species and the relative abundance of each species. 2. ****Genetic Diversity****: This refers to the variation of genes within a species, which helps populations adapt to changing environments and ensures their survival. 3. ****Ecosystem Diversity****: This refers to the variety of ecosystems, such as forests, grasslands, wetlands, and marine ecosystems, each supporting distinct types of life.

Step 3: Importance of Biodiversity.

Biodiversity is essential for human survival as it contributes to food security, medicine, and the overall health of ecosystems. It also helps in climate change mitigation and provides cultural, recreational, and aesthetic benefits.

Step 4: Threats to Biodiversity.

1. ****Habitat Destruction****: Urbanization, agriculture, and deforestation are the major causes of habitat loss. 2. ****Climate Change****: Changing climate patterns affect species' habitats, migration, and reproduction. 3. ****Pollution****: Air, water, and soil pollution have devastating effects on wildlife and ecosystems. 4. ****Over-exploitation****: Overfishing, hunting, and deforestation lead to the depletion of species.

Step 5: Conservation of Biodiversity.

Conserving biodiversity is essential for maintaining the health of ecosystems. Strategies include: 1. ****Protected Areas****: Establishing national parks, wildlife reserves, and marine protected areas to conserve habitats. 2. ****Sustainable Use****: Promoting sustainable

agriculture, forestry, and fishing to reduce exploitation. 3. **Restoration Projects**:

Reforestation areas, restoring wetlands, and repairing ecosystems that have been degraded. 4.

Legislation and Policies: Implementing laws such as the Endangered Species Act and international agreements like the Convention on Biological Diversity.

Step 6: Conclusion.

Biodiversity conservation is a critical global issue that requires coordinated efforts at the national and international levels. Protecting biodiversity ensures the long-term stability of ecosystems and the survival of species, including humans.

Final Answer:

Biodiversity is crucial for ecosystem health, and its conservation is necessary for the survival of species

Quick Tip

Sustainable development and conservation efforts are essential to maintaining biodiversity for future generations.