BITSAT Biology Sample Paper-14

Duration: 60 Minutes **Maximum Marks: 120**

Instructions

- This paper contains **40** Multiple Choice Questions (Single Correct).
- Each correct answer carries **+3 marks**. Each incorrect answer carries **-1 mark**. Unattempted question carries **0 marks**.
- Only **one** option is correct for each question.
- Use of mobile phones, smartwatches, or any electronic gadgets is strictly prohibited.

Q1. A botanist observed that a mutant plant failed to perform cyclic photophosphorylation efficiently, although non-cyclic photophosphorylation continued normally. Which component of the photosynthetic apparatus is most likely defective in this mutant?

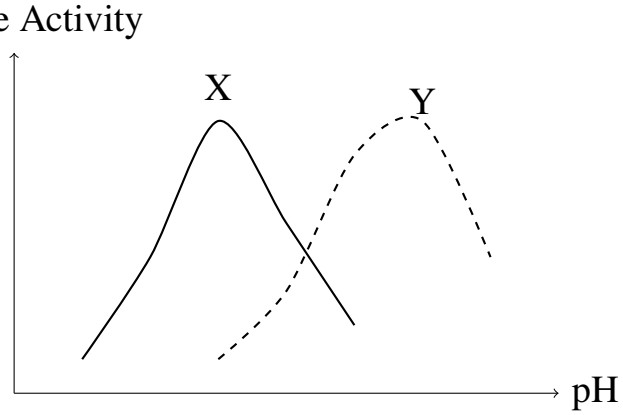
(A) Photosystem II only

(B) Cytochrome complex associated with Photosystem I

(C) Oxygen-evolving complex exclusively

(D) RuBisCO enzyme in stroma

Q2. The following graph represents the relationship between pH and activity of two digestive enzymes.



Enzymes X and Y are most likely:

(A) Trypsin and pepsin respectively

(B) Pepsin and trypsin respectively

(C) Salivary amylase and pepsin respectively

(D) Lipase and nuclease respectively

Q3. A student discovered that a particular membrane transport protein moved glucose molecules across the plasma membrane only when sodium ions simultaneously moved down their electrochemical gradient. This transport mechanism is best classified as:

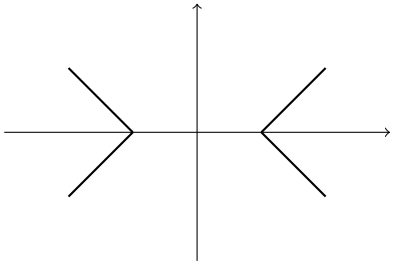
(A) Simple diffusion

(B) Primary active transport

(C) Secondary active cotransport

(D) Osmosis

Q4. The following figure represents chromosome movement during a stage of meiosis.



Pole

The stage illustrated above is most likely:

(A) Metaphase I

(B) Anaphase I

(C) Telophase II

(D) Prophase II

Q5. A researcher found that a DNA sample contained 32% adenine. According to Chargaff's rule, the percentage of guanine in the sample should be:

(A) 18

(B) 32

(C) 36

(D) 64

Q6. During muscle contraction, calcium ions released from the sarcoplasmic reticulum bind directly to:

(A) Tropomyosin

(B) Troponin

(C) Myosin heads

(D) Actin monomers

Q7. In an ecosystem, a sudden decline in the population of top predators resulted in rapid increase of herbivore populations and subsequent destruction of vegetation. This ecological phenomenon best demonstrates:

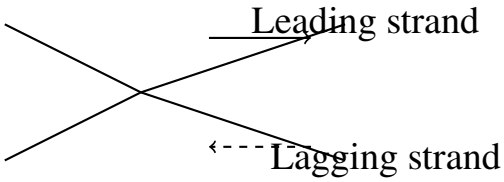
(A) Competitive exclusion

(B) Ecological succession

(C) Trophic cascade

(D) Genetic isolation

Q8. The diagram below shows a section of DNA undergoing replication.



Why are Okazaki fragments formed on the lagging strand?

(A) DNA polymerase can synthesize DNA only in the 3' to 5' direction

(B) DNA ligase blocks continuous synthesis

(C) DNA polymerase synthesizes DNA only in the 5' to 3' direction

(D) Helicase prevents strand elongation

Q9. A person consuming a protein-deficient diet for several months is most likely to develop edema primarily because:

(A) Blood glucose concentration rises excessively

(B) Plasma osmotic pressure decreases due to reduced albumin

(C) Water absorption from intestine completely stops

(D) Sodium ions are absent from extracellular fluid

Q10. Which of the following statements correctly explains the significance of crossing over during meiosis?

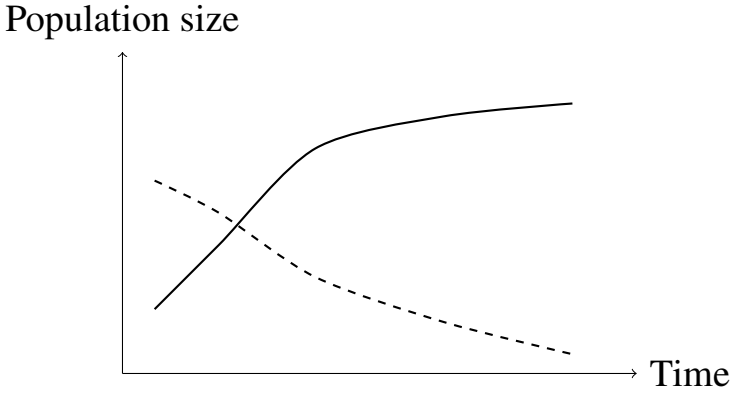
(A) It prevents segregation of homologous chromosomes

(B) It produces genetically identical gametes

(C) It increases genetic variation by exchanging chromosomal segments

(D) It doubles chromosome number before fertilization

Q11. The graph below represents changes in population size over time for two competing species.



The outcome illustrated above best supports:

(A) Mutualism

(B) Competitive exclusion principle

(C) Resource partitioning

(D) Predator-prey equilibrium

Q12. A mutation changes a codon from UAU to UAA during translation. What would be the most likely consequence of this mutation?

(A) Addition of tyrosine at the same position

(B) Premature termination of polypeptide synthesis

(C) Insertion of valine into the protein chain

(D) No change in amino acid sequence

Q13. The oxygen released during photosynthesis originates from water molecules through a process that occurs in:

(A) Photosystem I

(B) Calvin cycle

(C) Oxygen-evolving complex of Photosystem II

(D) Stroma during carbon fixation

Q14. In humans, destruction of beta cells of pancreatic islets would directly reduce secretion of:

(A) Glucagon

(B) Insulin

(C) Somatotropin

(D) Adrenaline

Q15. A biotechnologist inserted a human insulin gene into bacterial plasmid DNA. The resulting DNA molecule is best termed:

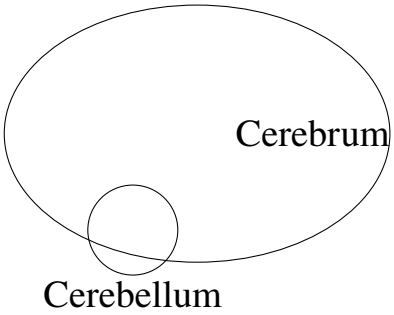
(A) Satellite DNA

(B) Recombinant DNA

(C) Messenger RNA

(D) Okazaki fragment

Q16. The following diagram represents a section of the human brain.



Damage to the cerebellum would most directly affect:

(A) Memory formation only

(B) Regulation of heartbeat exclusively

(C) Coordination of muscular movements and balance

(D) Hormonal secretion from pituitary gland

Q17. Which of the following adaptations helps desert plants minimize water loss most effectively?

(A) Large intercellular spaces

(B) Thin cuticle and broad leaves

(C) CAM photosynthesis with nocturnal stomatal opening

(D) Absence of vascular tissues

Q18. The first stable product formed during carbon fixation in C_4 plants is:

(A) 3-phosphoglycerate

(B) Oxaloacetic acid

(C) Ribulose bisphosphate

(D) Pyruvic acid

Q19. In a pedigree chart, a trait appears in every generation and affected individuals usually have at least one affected parent. The inheritance pattern is most likely:

(A) Autosomal recessive

(B) X-linked recessive

(C) Autosomal dominant

(D) Y-linked inheritance

Q20. The movement of sucrose from source leaves into phloem sieve tubes against a concentration gradient requires:

(A) Passive diffusion only

(B) Active transport using ATP

(C) Osmotic water loss exclusively

(D) Root pressure alone

Q21. A mutation in a bacterial cell resulted in complete absence of functional ribosomes. Which of the following cellular activities would be affected most immediately?

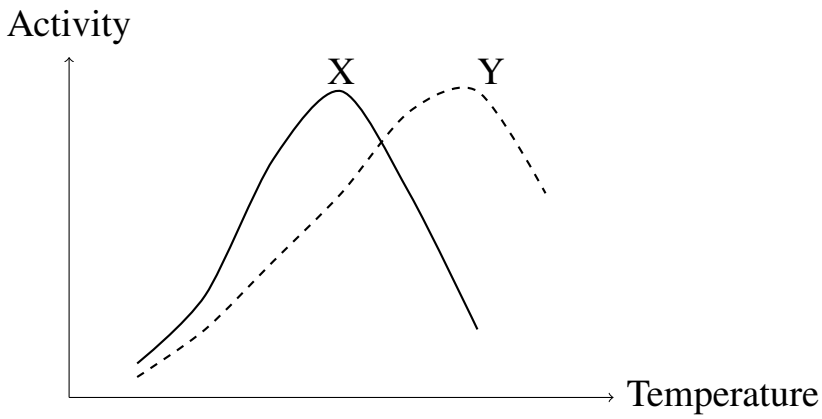
(A) DNA replication

(B) ATP synthesis

(C) Protein synthesis

(D) Cell wall formation

Q22. The graph below represents enzyme activity at different temperatures for two enzymes, X and Y.



Which conclusion is most appropriate from the graph?

(A) Enzyme X is adapted to higher temperatures than enzyme Y

(B) Enzyme Y denatures at low temperatures

(C) Enzyme X has a lower optimum temperature than enzyme Y

(D) Both enzymes function identically at all temperatures

Q23. In a certain flowering plant, pollen grains fail to germinate on the stigma of the same flower but germinate successfully on another genetically different flower of the same species. This mechanism primarily promotes:

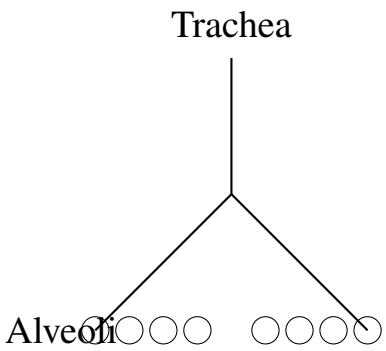
(A) Vegetative propagation

(B) Self-fertilization

(C) Cross-pollination and genetic variation

(D) Formation of triploid endosperm

Q24. The following diagram represents a portion of the human respiratory system.



The primary significance of the structures labelled alveoli is that they:

(A) Secrete mucus into bronchi

(B) Increase surface area for gaseous exchange

(C) Pump oxygen actively into blood

(D) Prevent collapse of trachea

Q25. Which of the following events occurs during the dark reaction of photosynthesis?

(A) Photolysis of water

(B) Excitation of chlorophyll electrons

(C) Fixation of carbon dioxide into carbohydrates

(D) Release of oxygen from Photosystem II

Q26. A scientist observed that homologous chromosomes failed to separate during meiosis I in a human female. This abnormality is termed:

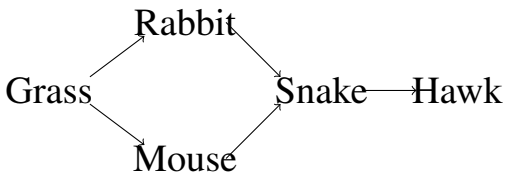
(A) Crossing over

(B) Nondisjunction

(C) Mutation

(D) Translocation

Q27. The following food web contains several interconnected food chains.



If the mouse population suddenly decreases drastically, which immediate effect is most likely?

(A) Grass population will decrease sharply

(B) Snake population may temporarily decline

(C) Hawk population will become producers

(D) Rabbit population will become extinct immediately

Q28. A patient exhibits excessive thirst and excretion of large amounts of dilute urine due to deficiency of antidiuretic hormone. The disorder is known as:

(A) Diabetes mellitus

(B) Diabetes insipidus

(C) Addison's disease

(D) Graves' disease

Q29. In recombinant DNA technology, sticky ends generated by restriction enzymes are useful because they:

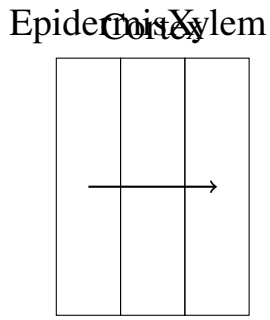
(A) Prevent DNA replication completely

(B) Facilitate pairing with complementary DNA fragments

(C) Destroy plasmid vectors permanently

(D) Synthesize proteins directly

Q30. The following figure represents transport of water through root tissues.



The upward movement of water in xylem is mainly explained by:

(A) Root pressure alone

(B) Cohesion-tension mechanism

(C) Active pumping by xylem cells

(D) Diffusion through sieve tubes

Q31. A scientist observed that when oxygen availability in muscle cells became insufficient, pyruvate produced during glycolysis was converted into lactic acid. The primary advantage of this conversion is that it:

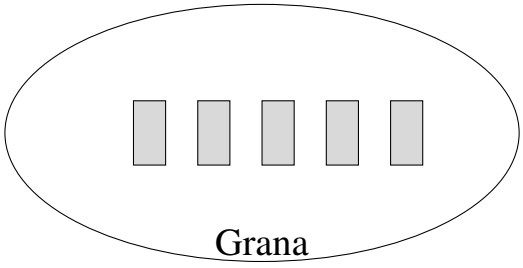
(A) Produces large amounts of ATP rapidly

(B) Regenerates NAD^+ required for glycolysis

(C) Completely oxidizes glucose into carbon dioxide

(D) Prevents formation of pyruvate permanently

Q32. The following diagram represents the internal structure of a chloroplast.



The light-dependent reactions of photosynthesis occur primarily in:

(A) Stroma matrix only

(B) Grana thylakoid membranes

(C) Outer chloroplast membrane

(D) Chloroplast ribosomes

Q33. In humans, colour blindness is inherited as an X-linked recessive trait. A colour-blind male marries a heterozygous normal female. What fraction of their sons is expected to be colour blind?

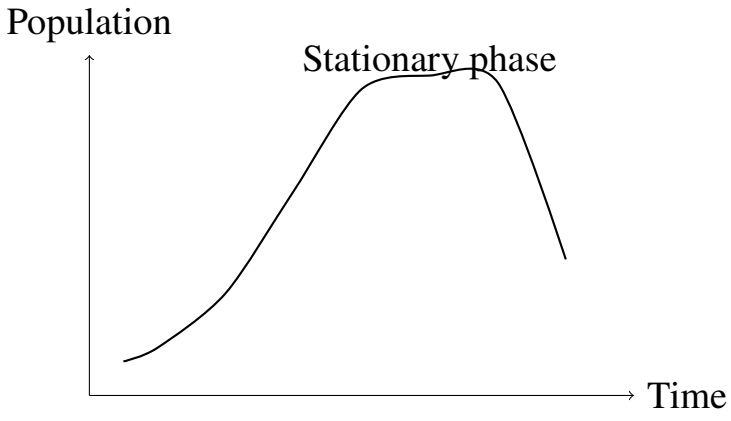
(A) 0%

(B) 25%

(C) 50%

(D) 100%

Q34. The graph below represents bacterial growth in a nutrient medium.



The decline phase observed near the end of the graph occurs mainly because:

(A) Mutation rate becomes zero

(B) Nutrients become depleted and toxic wastes accumulate

(C) DNA replication completely stops in all bacteria

(D) Cell membranes become impermeable to water

Q35. Which of the following structures in angiosperms develops into the fruit after fertilization?

(A) Ovule

(B) Endosperm

(C) Ovary

(D) Synergid

Q36. A researcher discovered that a membrane-bound organelle contained hydrolytic enzymes active at acidic pH. The organelle is most likely involved in:

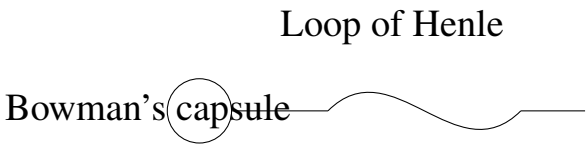
(A) Intracellular digestion

(B) ATP production

(C) Protein translation

(D) Spindle formation

Q37. The following diagram represents the structure of a nephron.



The primary function of the Loop of Henle is to:

(A) Filter blood plasma directly

(B) Maintain concentration gradient for urine concentration

(C) Secrete insulin into blood

(D) Produce erythrocytes

Q38. In ecological succession, lichens are often considered pioneer species because they:

(A) Require highly fertile soil initially

(B) Can colonize bare rocks and initiate soil formation

(C) Consume large herbivores for nutrition

(D) Prevent growth of all other organisms permanently

Q39. A mutation causing replacement of one amino acid by another in a protein chain is termed:

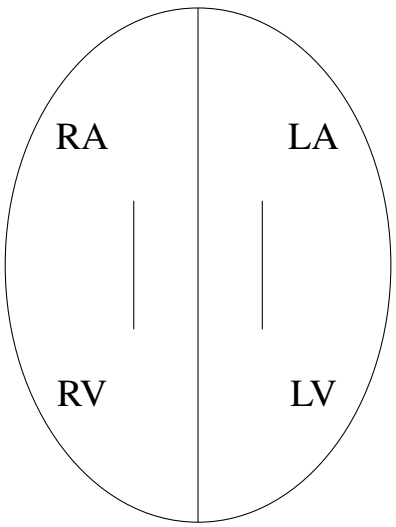
(A) Silent mutation

(B) Missense mutation

(C) Nonsense mutation

(D) Inversion

Q40. The figure below represents a section through the human heart.



Which chamber labelled above possesses the thickest muscular wall due to its function?

(A) RA

(B) LA

(C) RV

(D) LV

Detailed Solutions

Q1.

Solution

Concept: Photophosphorylation in chloroplasts occurs via two pathways during the light-dependent reactions of photosynthesis: non-cyclic (linear) photophosphorylation and cyclic photophosphorylation.

Solution: Step 1: Analyze the differences between the two photophosphorylation pathways:

- **Non-cyclic photophosphorylation** utilizes both Photosystem II (PSII) and Photosystem I (PSI). It splits water to generate electrons, produces oxygen and NADPH, and synthesizes ATP.
- **Cyclic photophosphorylation** utilizes only Photosystem I (PSI). Electrons excited from the reaction center (P700) of PSI are recycled back to the electron transport chain (via ferredoxin and the cytochrome complex) instead of being used to reduce $NADP^+$. This generates a proton gradient to synthesize ATP without producing oxygen or NADPH.

Step 2: Evaluate the mutant's phenotype:

- Non-cyclic photophosphorylation continues normally, meaning Photosystem II, the oxygen-evolving complex, and the core components of the linear electron transport chain are completely functional.
- Since only cyclic photophosphorylation is defective, the mutation must affect a component uniquely required for the alternative, circular routing of electrons around Photosystem I.
- Among the options, a defect in the specific cytochrome complex pathway or accessory proteins (such as the ferredoxin-plastoquinone reductase or NDH-like pathways) associated with cyclic flow around Photosystem I is the most logical cause.

Step 3: Therefore, the defective component is the cytochrome complex associated with Photosystem I.

Final Answer: Cytochrome complex associated with Photosystem I

Answer: (B)

Go Back to Question 1

Q2.

Solution

Concept: Enzymes are highly sensitive to pH, and each enzyme has an optimum pH at which its catalytic activity is maximized. Extreme pH levels denature the enzyme's tertiary structure by disrupting hydrogen and ionic bonds.

Solution: Step 1: Analyze the graph's curves:

- **Enzyme X (solid line):** Reaches peak catalytic activity at a highly acidic pH of approximately 2–3.
- **Enzyme Y (dashed line):** Reaches peak catalytic activity at an alkaline pH of approximately 7.5–8.5.

Step 2: Match the pH optima with known digestive enzymes:

- **Pepsin** is a proteolytic enzyme secreted in the stomach, where gastric juice creates a highly acidic environment. Its optimum pH is 1.5–2.5.
- **Trypsin** is a proteolytic enzyme secreted by the pancreas into the small intestine, where bicarbonate ions create a slightly alkaline environment. Its optimum pH is 7.5–8.5.

Step 3: Therefore, X is pepsin and Y is trypsin.

Final Answer: Pepsin and trypsin respectively

Answer: (B)

Go Back to Question 2

Q3.

Solution

Concept: Membrane transport can be classified based on energy source and directionality. Active transport moves substances against their concentration gradient and is divided into primary and secondary active transport.

Solution: Step 1: Analyze the mechanism described:

- Glucose is transported across the plasma membrane, often moving against its concentration gradient.
- This transport is strictly coupled to the movement of sodium ions (Na^+).
- Sodium ions move *down* their electrochemical gradient, releasing free energy.

Step 2: Determine the transport type:

- **Simple diffusion** (Option A) and **osmosis** (Option D) are passive, non-carrier-mediated or water-specific processes.
- **Primary active transport** (Option B) directly hydrolyzes ATP to power transport (e.g., the Na^+/K^+ ATPase).
- **Secondary active cotransport** (Option C) utilizes the electrochemical gradient established by primary active transport as its indirect energy source. Because both glucose and sodium ions move in the same direction through the same carrier protein, this is a symport mechanism.

Step 3: Therefore, this mechanism is classified as secondary active cotransport.

Final Answer: Secondary active cotransport

Answer: (C)

Go Back to Question 3

Q4.

Solution

Concept: Meiosis is a reductional cell division consisting of two stages: meiosis I and meiosis II. The movement and separation of genetic material during the anaphase stages are highly characteristic.

Solution: Step 1: Analyze the chromosome behavior in the diagram:

- Chromosomes are being pulled apart toward opposite spindle poles. This immediately indicates an **anaphase** stage.
- In a mitotic anaphase or anaphase II, sister chromatids separate and move to opposite poles as individual, single-chromatid chromosomes.
- In **anaphase I** of meiosis, homologous chromosomes (each still consisting of two sister chromatids joined at the centromere) separate and move toward opposite poles. These double-chromatid structures form characteristic V-shapes or dyads as they are dragged by the spindle fibers.

Step 2: Match with the provided options: The options include Metaphase I, Anaphase I, Telophase II, and Prophase II. The only stage characterized by active poleward movement of chromosomes is **Anaphase I**.

Final Answer: Anaphase I

Answer: (B)

Go Back to Question 4

Q5.

Solution

Concept: According to Chargaff's rules for double-stranded DNA, the abundance of purines equals the abundance of pyrimidines, and specifically, the molar ratio of adenine to thymine is 1 : 1, and guanine to cytosine is 1 : 1.

Solution: Step 1: Set up the equations representing Chargaff's rules:

$$A = T \quad \text{and} \quad G = C$$

$$A + T + G + C = 100\%$$

Step 2: Substitute the given percentage of Adenine ($A = 32\%$): Since $A = T$:

$$T = 32\%$$

$$A + T = 32\% + 32\% = 64\%$$

Step 3: Calculate the remaining percentage for Guanine and Cytosine:

$$G + C = 100\% - (A + T)$$

$$G + C = 100\% - 64\% = 36\%$$

Step 4: Solve for Guanine (G), knowing $G = C$:

$$G = \frac{36\%}{2} = 18\%$$

Final Answer: $\boxed{18\%}$

Answer: (A)

Go Back to Question 5

Q6.

Solution

Concept: Skeletal muscle contraction is regulated by the intracellular concentration of calcium ions (Ca^{2+}). This process is mediated by regulatory proteins bound to the actin filament.

Solution: Step 1: Understand the state of resting muscle: In relaxed muscle, the long protein strand **tropomyosin** physically covers the active myosin-binding sites on the actin filament, preventing cross-bridge formation.

Step 2: Identify the action of calcium ions: Upon stimulation, calcium ions (Ca^{2+}) are released from the sarcoplasmic reticulum into the sarcoplasm. These ions bind directly to **troponin** (specifically the troponin C subunit), which is a complex of three regulatory proteins bound to tropomyosin.

Step 3: Analyze the resulting conformational change: The binding of calcium triggers a conformational shift in the troponin complex, which physically pulls tropomyosin away from the binding sites on the actin filament. This exposes the sites, allowing myosin heads to bind and initiate the sliding filament mechanism.

Final Answer: Troponin

Answer: (B)

Go Back to Question 6

Q7.

Solution

Concept: In community ecology, species interact across multiple trophic levels. Direct and indirect interactions within a food web can regulate the structure and composition of an entire ecosystem.

Solution: Step 1: Analyze the sequence of events described:

(a) Direct removal or decline of top predators (the highest trophic level).

(b) A subsequent release of herbivores (the secondary trophic level) from predatory suppression, causing a massive population spike.

(c) Extreme overgrazing by herbivores, resulting in the destruction and loss of primary producers (vegetation).

Step 2: Identify the ecological concept:

- This top-down indirect effect of predators on primary producers is called a **trophic cascade**. It demonstrates how predators indirectly control plant communities by regulating herbivore numbers.
- **Competitive exclusion** (Option A) refers to niche competition between two species.
- **Ecological succession** (Option B) refers to gradual changes in community structure over time.

Step 3: Thus, Option C is the correct description.

Final Answer: Trophic cascade

Answer: (C)

Go Back to Question 7

Q8.

Solution

Concept: The double-stranded DNA molecule is antiparallel, meaning one strand runs in the 5′ to 3′ direction, while the complementary template strand runs in the 3′ to 5′ direction.

Solution: Step 1: Understand the catalytic constraints of DNA polymerase: All known DNA polymerases can add new nucleotides only to the free 3′-OH group of a growing nucleotide strand. Therefore, DNA synthesis can only occur in the **5' to 3' direction**.

Step 2: Analyze replication at the fork: As the DNA double helix is unwound by helicase:

- On the **leading strand** template (3′ to 5′), DNA polymerase can synthesize a complementary strand continuously in the 5′ to 3′ direction, moving *toward* the replication fork.
- On the **lagging strand** template (5′ to 3′), the polymerase must work *away* from the replication fork. Because the replication fork continues to open behind it, synthesis must occur discontinuously in short segments, known as **Okazaki fragments**, each synthesized in the 5′ to 3′ direction.

Step 3: Therefore, the discontinuous synthesis of Okazaki fragments is directly caused by the biochemical constraint that DNA polymerase can only synthesize DNA in the 5′ to 3′ direction.

Final Answer: DNA polymerase synthesizes DNA only in the 5' to 3' direction

Answer: (C)

Go Back to Question 8

Q9.

Solution

Concept: Edema is the abnormal accumulation of fluid in the interstitial spaces of tissues. The balance of fluid exchange between blood capillaries and interstitial fluid is governed by Starling forces, which include hydrostatic pressure and colloid osmotic (oncotic) pressure.

Solution: Step 1: Understand the physiological role of plasma proteins: **Albumin** is the most abundant plasma protein synthesized by the liver. It cannot easily cross the capillary membrane, thereby creating a colloid osmotic pressure (oncotic pressure) that draws water from the interstitial space back into the capillaries.

Step 2: Relate protein deficiency to fluid balance: Prolonged protein deficiency (such as in Kwashiorkor) deprives the liver of amino acids needed to synthesize albumin, leading to hypoproteinemia.

$$\text{Protein Deficiency} \longrightarrow \text{Reduced Albumin Synthesis} \longrightarrow \text{Decreased Plasma Osmotic Pressure}$$

Step 3: Explain the mechanism of edema: Because the blood's oncotic pressure is severely reduced, it can no longer counteract the outward hydrostatic pressure. Water leaks out of the capillaries and remains in the interstitial tissues, resulting in swelling and abdominal edema.

Final Answer: Plasma osmotic pressure decreases due to reduced albumin

Answer: (B)

Go Back to Question 9

Q10.

Solution

Concept: Crossing over (homologous recombination) is a critical genetic process that occurs during Prophase I of meiosis.

Solution: Step 1: Analyze the process of crossing over: During Prophase I, homologous chromosomes pair up closely to form tetrads (synapsis). Non-sister chromatids of homologous chromosomes break and exchange corresponding segments of DNA.

Step 2: Determine the genetic outcome: This exchange shuffles alleles between maternal and paternal chromosomes, creating entirely new combinations of alleles on the chromatids (recombinant chromatids).

Step 3: Relate to the options:

- It does not prevent segregation of homologous chromosomes (Option A).
- It produces genetically unique gametes rather than identical ones (Option B).
- It significantly increases genetic variation by exchanging chromosomal segments, which is essential for evolutionary adaptation (Option C).

Final Answer: It increases genetic variation by exchanging chromosomal segments

Answer: (C)

Go Back to Question 10

Q11.

Solution

Concept: When two species compete for the exact same limiting resource, their ecological niches overlap. The dynamics of this competition are described by ecological principles.

Solution: Step 1: Interpret the graph:

- Initially, both species are present in the environment.
- Over time, the population of one species (solid line) increases and stabilizes at its carrying capacity.
- Concurrently, the population of the competing species (dashed line) steadily declines to near zero (local extinction).

Step 2: Identify the ecological rule represented: According to the **competitive exclusion principle** (Gause's Law), two species with identical ecological niches cannot coexist in the same habitat indefinitely. The species that is slightly more efficient at utilizing the limiting resource will eventually outcompete and exclude the other.

Step 3: Therefore, the graph illustrates the competitive exclusion principle.

Final Answer: Competitive exclusion principle

Answer: (B)

Go Back to Question 11

Q12.

Solution

Concept: Mutations in the coding sequence of mRNA can alter the translation of proteins depending on how the altered codon is read by ribosomes.

Solution: Step 1: Identify the roles of the initial and mutated codons:

- The original codon **UAU** codes for the amino acid tyrosine.
- The mutated codon **UAA** is a stop codon (ochre), which does not code for any amino acid.

Step 2: Determine the effect on translation: During translation, when the ribosome encounters a stop codon (UAA, UAG, or UGA), release factors bind to the site, triggering the hydrolysis and release of the completed polypeptide chain.

Step 3: Analyze the biological consequence: Because a codon for an amino acid has been mutated into a stop codon, translation stops prematurely at this site, leading to the premature termination of polypeptide synthesis (a nonsense mutation).

Final Answer: Premature termination of polypeptide synthesis

Answer: (B)

Go Back to Question 12

Q13.

Solution

Concept: The splitting of water (photolysis) is a key light-dependent step in photosynthesis that replenishes electrons lost by reaction centers during light absorption.

Solution: Step 1: Understand the photolysis reaction:

$$2H_2O \longrightarrow 4H^+ + 4e^- + O_2 \uparrow$$

Step 2: Locate the biochemical machinery responsible: This reaction is catalyzed by a specialized manganese-containing enzyme cluster known as the **oxygen-evolving complex (OEC)**.

Step 3: Identify the system association: The OEC is physically associated with the lumenal side of **Photosystem II** (PSII). The electrons generated by splitting water are used to reduce the oxidized reaction center chlorophyll P^+_{680}, and the byproduct, molecular oxygen (O_2), is released.

Final Answer: Oxygen-evolving complex of Photosystem II

Answer: (C)

Go Back to Question 13

Q14.

Solution

Concept: The endocrine portion of the pancreas consists of the islets of Langerhans, which contain distinct endocrine cell types responsible for regulating blood glucose levels.

Solution: Step 1: Identify the cell types within the pancreatic islets and their secretions:

- **Alpha cells (α-cells):** Produce and secrete **glucagon**, which increases blood glucose levels.
- **Beta cells (β-cells):** Produce and secrete **insulin**, which decreases blood glucose levels.
- **Delta cells (δ-cells):** Produce and secrete **somatostatin**, which inhibits both insulin and glucagon.

Step 2: Relate the destruction of beta cells to hormone levels: If the beta cells of the pancreatic islets are selectively destroyed (as occurs in Type 1 Diabetes Mellitus due to an autoimmune response), the body's capacity to synthesize and secrete **insulin** is directly and severely compromised.

Step 3: Evaluate other options:

- Somatotropin (growth hormone, Option C) is secreted by the anterior pituitary gland.
- Adrenaline (epinephrine, Option D) is secreted by the adrenal medulla.

Final Answer: Insulin

Answer: (B)

Go Back to Question 14

Q15.

Solution

Concept: Genetic engineering involves splicing genetic material from different organisms to construct novel genetic sequences with useful properties.

Solution: Step 1: Understand the composition of the modified molecule: The biotechnologist has physically joined:

- A human gene (the coding sequence for insulin)
- A bacterial vector (plasmid DNA)

Step 2: Identify the terminology:

- Any DNA molecule formed by laboratory methods of genetic recombination that brings together genetic material from multiple sources is termed **recombinant DNA** (Option B).
- **Satellite DNA** (Option A) refers to highly repetitive, non-coding genomic sequences.
- **Messenger RNA** (Option C) is a single-stranded RNA transcript of a gene.
- **Okazaki fragments** (Option D) are short, newly synthesized DNA fragments on the lagging strand during replication.

Step 3: Therefore, the molecule is classified as recombinant DNA.

Final Answer: Recombinant DNA

Answer: (B)

Go Back to Question 15

Q16.

Solution

Concept: Different regions of the human brain have evolved to coordinate distinct biological, motor, and cognitive functions.

Solution: Step 1: Analyze the function of the cerebellum: The cerebellum (located at the back of the brain, below the cerebrum) is primarily involved in motor control. It integrates sensory inputs from the vestibular system, muscle spindles, and eyes to coordinate voluntary muscle movements, maintain posture, and regulate body balance.

Step 2: Evaluate the effects of damage to this region: Damage to the cerebellum leads to a loss of muscular coordination (ataxia), resulting in clumsy movements, slurred speech, and an inability to maintain balance, while higher-order cognitive functions (like cerebrum-mediated memory, Option A) remain largely intact.

Step 3: Evaluate other options:

- Heartbeat regulation (Option B) is primarily controlled by the medulla oblongata in the brainstem.
- Pituitary hormone secretion (Option D) is regulated by the hypothalamus.

Final Answer: Coordination of muscular movements and balance

Answer: (C)

Go Back to Question 16

Q17.

Solution

Concept: Desert plants (xerophytes) have evolved physiological and structural adaptations to survive extreme drought and high temperatures by minimizing water loss from transpiration.

Solution: Step 1: Evaluate the adaptations listed:

- **Large intercellular spaces** (Option A) and **thin cuticles/broad leaves** (Option B) facilitate rapid gas exchange and transpiration, which is highly detrimental in arid environments.
- **CAM (Crassulacean Acid Metabolism) photosynthesis** (Option C) is a metabolic adaptation where plants keep their stomata closed during the hot, dry day to prevent water loss. Instead, they open their stomata at night (nocturnal opening) when temperatures are cooler and relative humidity is higher, allowing them to capture and store carbon dioxide as malate.

Step 2: Therefore, nocturnal stomatal opening via CAM photosynthesis is the most effective adaptation for minimizing transpirational water loss in dry habitats.

Final Answer: CAM photosynthesis with nocturnal stomatal opening

Answer: (C)

Go Back to Question 17

Q18.

Solution

Concept: C_4 plants have evolved an alternative carbon fixation pathway to bypass the inefficiencies of photorespiration, using a spatial separation of initial carbon capture and the Calvin cycle.

Solution: Step 1: Identify the initial carbon fixation step in C_4 plants: In the mesophyll cells of C_4 plants, atmospheric carbon dioxide (CO_2, in the form of HCO_3^-) is captured by the enzyme phosphoenolpyruvate carboxylase (PEPCase).

Step 2: Formulate the reaction:

$$\text{Phosphoenolpyruvate (3C)} + CO_2 \xrightarrow{\text{PEPCase}} \text{Oxaloacetic acid (4C)}$$

Step 3: Identify the characteristics of the product: The first stable chemical intermediate formed is oxaloacetic acid (OAA), which is a 4-carbon dicarboxylic acid (hence the term "C_4"). In contrast, the first stable product of C_3 plants is 3-phosphoglycerate (3-PGA).

Final Answer: Oxaloacetic acid

Answer: (B)

Go Back to Question 18

Q19.

Solution

Concept: Pedigree analysis is used to determine the mode of inheritance of genetic traits in humans across multiple generations.

Solution: Step 1: Analyze the key clues provided in the pedigree description:

- **"The trait appears in every generation":** Dominant traits typically do not skip generations because a single copy of the dominant allele is sufficient to express the phenotype. (Recessive traits frequently skip generations through unaffected heterozygous carriers).
- **"Affected individuals usually have at least one affected parent":** This confirms that the allele is dominant, as an affected offspring must inherit the dominant disease-causing allele from a parent who also expresses the trait.

Step 2: Match with the modes of inheritance:

- **Autosomal dominant** matches both clues perfectly.
- **Autosomal recessive** (Option A) and **X-linked recessive** (Option B) require carrier parents who may be unaffected, leading to skipped generations.
- **Y-linked inheritance** (Option D) only affects males, which is not specified here.

Final Answer: Autosomal dominant

Answer: (C)

Go Back to Question 19

Q20.

Solution

Concept: The translocation of organic solutes (like sucrose) in plants occurs through the phloem. Moving solutes from the site of synthesis (source) into the transport tissue (phloem sieve tubes) is called phloem loading.

Solution: Step 1: Identify the concentration gradient: The concentration of sucrose inside the phloem sieve tubes is significantly higher than in the surrounding photosynthesizing source mesophyll cells.

Step 2: Determine the transport mechanism: To move sucrose up/against its concentration gradient into the sieve element-companion cell complex, the plant cannot rely on passive diffusion. Instead, it must utilize an **active transport** mechanism.

Step 3: Detail the active process: This involves a secondary active transport system (proton-sucrose symport) where a H^+-ATPase pump in the companion cell membrane hydrolyzes **ATP** to pump protons into the apoplast, creating an electrochemical gradient that drives sucrose transport.

Final Answer: Active transport using ATP

Answer: (B)

Go Back to Question 20

Q21.

Solution

Concept: Each cellular organelle or structure has a dedicated, vital role in maintaining the physiology and life of a cell.

Solution: Step 1: Identify the function of ribosomes: Ribosomes are the macromolecular complexes responsible for translating messenger RNA (mRNA) into polypeptide chains. They are the universal sites of **protein synthesis** in all living cells.

Step 2: Analyze the effect of a mutation causing a complete absence of functional ribosomes: Without functional ribosomes, a cell is entirely unable to translate mRNA into proteins.

Step 3: Determine the most immediate consequence: Although replication, ATP generation, and cell wall assembly are essential, they all rely on enzyme proteins. Thus, halting the cell's capacity to synthesize proteins will shut down translation immediately and lead to cell death.

Final Answer: Protein synthesis

Answer: (C)

Go Back to Question 21

Q22.

Solution

Concept: The rate of an enzyme-catalyzed reaction is temperature-dependent. Each enzyme has an optimum temperature at which its reaction rate is highest; beyond this point, thermal denaturation occurs.

Solution: Step 1: Analyze the graph's horizontal axis (Temperature):

- **Enzyme X (solid line):** Reaches its maximum activity at a lower temperature value (at horizontal coordinate 4).
- **Enzyme Y (dashed line):** Reaches its maximum activity at a higher temperature value (at horizontal coordinate 6).

Step 2: Evaluate the options based on this analysis:

- Option A is incorrect because Enzyme Y, not X, is adapted to function at higher temperatures.
- Option B is incorrect because there is no evidence of permanent denaturation at low temperatures shown in the graph.
- Option C is correct because the peak of Enzyme X's activity curve occurs at a lower temperature coordinate than the peak of Enzyme Y's curve.

Final Answer: Enzyme X has a lower optimum temperature than enzyme Y

Answer: (C)

Go Back to Question 22

Q23.

Solution

Concept: Plants have evolved various physiological and genetic adaptations to prevent self-fertilization, which leads to inbreeding depression, and to encourage genetic recombination.

Solution: Step 1: Analyze the biological observation: The pollen grain cannot germinate on the stigma of the same flower (or same plant). This phenomenon is known as **self-incompatibility** (or self-sterility), a genetically controlled mechanism that prevents self-pollen from successfully fertilizing its own ovules.

Step 2: Determine the consequence: Since fertilization can only occur when pollen is transferred to a genetically different flower of the same species, this mechanism strictly enforces **cross-pollination** (allogamy).

Step 3: Relate to evolutionary benefit: Cross-pollination results in the mixing of different gene pools, which drastically increases the **genetic variation** of the offspring.

Final Answer: Cross-pollination and genetic variation

Answer: (C)

Go Back to Question 23

Q24.

Solution

Concept: The human respiratory system is structurally adapted to maximize the efficiency of gas exchange between the external atmosphere and the blood.

Solution: Step 1: Define the function of alveoli: Alveoli are tiny, balloon-like, hollow air sacs at the terminus of the bronchioles in the lungs.

Step 2: Explain their primary anatomical significance:

- The presence of hundreds of millions of alveoli provides an extraordinarily large combined surface area (approximately 70–100 m^2 in an adult human) in a small physical volume.
- They have extremely thin walls (one cell layer thick) and are surrounded by a dense network of capillaries. This structure minimizes the diffusion distance, dramatically increasing the rate of passive gaseous exchange (O_2 into the blood and CO_2 out).

Step 3: Evaluate the options: Option B accurately describes their primary biological significance.

Final Answer: Increase surface area for gaseous exchange

Answer: (B)

Go Back to Question 24

Q25.

Solution

Concept: Photosynthesis consists of two main stages: the light-dependent reactions (light reaction) and the light-independent reactions (dark reaction or Calvin cycle).

Solution: Step 1: Differentiate between the light and dark reactions of photosynthesis:

- **Light-dependent reactions** occur in the thylakoid membranes. They include the excitation of chlorophyll electrons by light, the photolysis of water to release oxygen, and the generation of chemical energy in the form of ATP and NADPH.
- **Light-independent reactions (dark reaction)** occur in the stroma of the chloroplast. This phase utilizes the ATP and NADPH generated in the light reactions to fix atmospheric carbon dioxide (CO_2) into organic carbohydrates (such as glucose).

Step 2: Match with the options:

- Photolysis of water (Option A), excitation of chlorophyll electrons (Option B), and the release of oxygen (Option D) are all events of the light-dependent reaction.
- **Fixation of carbon dioxide into carbohydrates** (Option C) is the defining event of the dark reaction.

Final Answer: Fixation of carbon dioxide into carbohydrates

Answer: (C)

Go Back to Question 25

Q26.

Solution

Concept: During cell division (mitosis or meiosis), chromosomes must segregate evenly into the resulting daughter cells. This separation is highly regulated.

Solution: Step 1: Define the chromosome separation error: When homologous chromosomes fail to separate during meiosis I, or sister chromatids fail to separate during meiosis II (or mitosis), the error is called **nondisjunction**.

Step 2: Analyze the consequences of nondisjunction:

- It leads to the production of gametes with abnormal numbers of chromosomes (aneuploidy), resulting in offspring with conditions such as trisomy (e.g., Down syndrome, 47, XX, +21) or monosomy (e.g., Turner syndrome, 45, XO).

Step 3: Evaluate other options:

- **Crossing over** (Option A) is the normal exchange of genetic material between non-sister chromatids.
- **Mutation** (Option B) is a general term for any change in the nucleotide sequence of DNA.
- **Translocation** (Option D) is the rearrangement of parts between non-homologous chromosomes.

Step 4: Therefore, the described failure to separate is termed nondisjunction.

Final Answer: Nondisjunction

Answer: (B)

Go Back to Question 26

Q27.

Solution

Concept: A food web is a network of interconnected food chains. The removal or decline of a species at one trophic level can cause ripples that affect both direct predators and alternative prey.

Solution: Step 1: Analyze the interactions in the provided food web:

- **Producers:** Grass
- **Primary Consumers (Herbivores):** Rabbit and Mouse (both eat Grass)
- **Secondary Consumers (Carnivores):** Snake (eats both Rabbit and Mouse)
- **Tertiary Consumers (Top Carnivores):** Hawk (eats Snake)

Step 2: Trace the effects of a drastic decrease in the mouse population:

- A decrease in mice means less grazing pressure on Grass, so the Grass population would likely increase or remain stable (ruling out Option A).
- Hawks are consumers, so they cannot become producers (ruling out Option C).
- Rabbits will not become extinct immediately, although predation pressure on them from snakes might increase (ruling out Option D).
- Since the Snake relies heavily on both rabbits and mice for food, the sudden loss of mice drastically reduces its food supply. Consequently, the **snake population may temporarily decline** as it adjusts to a single prey source (Option B).

Final Answer: Snake population may temporarily decline

Answer: (B)

Go Back to Question 27

Q28.

Solution

Concept: Antidiuretic hormone (ADH, also known as vasopressin) is synthesized in the hypothalamus and released by the posterior pituitary. It acts on the collecting ducts of the kidneys to increase water reabsorption.

Solution: Step 1: Analyze the physiological consequences of ADH deficiency: When ADH is deficient (or if the kidneys fail to respond to it), the collecting ducts of the kidneys become impermeable to water. As a result, water cannot be reabsorbed back into the bloodstream.

Step 2: Identify the clinical symptoms: This leads to the excretion of massive volumes of highly dilute, tasteless urine (polyuria) and compensatory excessive thirst (polydipsia) to replace the lost fluids.

Step 3: Distinguish between the endocrine disorders:

- **Diabetes mellitus** (Option A) is caused by insulin deficiency or resistance, characterized by high blood sugar and glucose in the urine.
- **Diabetes insipidus** (Option B) is the specific disorder caused by a deficiency or lack of response to ADH.
- **Addison's disease** (Option C) and **Graves' disease** (Option D) are thyroid and adrenal disorders, respectively, with completely different symptoms.

Final Answer: Diabetes insipidus

Answer: (B)

Go Back to Question 28

Q29.

Solution

Concept: In recombinant DNA technology, restriction endonucleases are used to cleave DNA. Some of these enzymes make staggered cuts that leave short, single-stranded nucleotide overhangs called "sticky ends."

Solution: Step 1: Understand the nature of sticky ends: A restriction enzyme like *Eco*RI cuts DNA at a specific palindromic sequence, producing complementary single-stranded tails:

5′—G AATTC—3′

3′—CTTAA G—5′

Step 2: Identify why sticky ends are highly advantageous: These transiently single-stranded regions can form complementary hydrogen bonds (base-pair) with any other DNA fragment cut by the same restriction enzyme, regardless of the biological source.

Step 3: Describe the molecular outcome: This matching overhang greatly **facilitates the pairing and hybridization** of the foreign insert DNA with the plasmid vector, making the subsequent covalent joining by the enzyme DNA ligase highly efficient.

Final Answer: Facilitate pairing with complementary DNA fragments

Answer: (B)

Go Back to Question 29

Q30.

Solution

Concept: The transport of water and dissolved minerals from the roots to the topmost leaves of plants (ascent of sap) must overcome gravity, especially in tall trees.

Solution: Step 1: Evaluate the mechanisms of water transport:

- **Root pressure** (Option A) is a positive pressure generated in the roots by active ion transport. While it can push water up short distances in small plants, it is completely insufficient to transport water to the tops of tall trees.
- **Cohesion-tension mechanism** (Option B), proposed by Dixon and Joly, is the universally accepted model for water transport.

Step 2: Explain the cohesion-tension model:

- **Transpiration:** Evaporation of water from leaves creates a negative pressure (tension) in the leaf xylem.
- **Cohesion:** Strong hydrogen bonding between water molecules keeps them held together in a continuous, unbroken water column.
- **Adhesion:** Attraction between water molecules and the hydrophilic cellulose walls of xylem vessels prevents the water column from slipping downward.

This continuous column of water is pulled upward through the xylem as a direct result of transpiration.

Final Answer: Cohesion-tension mechanism

Answer: (B)

Go Back to Question 30

Q31.

Solution

Concept: Glycolysis is a universal pathway that breaks down glucose into pyruvate, yielding a net of 2 ATP and reducing NAD^+ to NADH. Under anaerobic conditions, cells must find a way to maintain this pathway.

Solution: Step 1: Understand the cofactor limitation of glycolysis: The conversion of glyceraldehyde-3-phosphate to 1, 3-bisphosphoglycerate in glycolysis requires a continuous supply of oxidized **NAD^+**. If all cellular NAD^+ is reduced to NADH, glycolysis will completely halt, and the cell will cease to generate any ATP.

Step 2: Describe the role of lactic acid fermentation: In the absence of oxygen, pyruvate is reduced to lactic acid by the enzyme lactate dehydrogenase:

$$\text{Pyruvate} + \text{NADH} + H^+ \longrightarrow \text{Lactic Acid} + NAD^+$$

Step 3: Identify the primary benefit of this reaction: The reaction does not yield any additional ATP directly, nor does it oxidize glucose completely. Its crucial, immediate survival advantage is that it **regenerates NAD^+**, allowing glycolysis to continue in the absence of oxygen and keep producing a modest 2 ATP per glucose molecule.

Final Answer: Regenerates NAD^+ required for glycolysis

Answer: (B)

Go Back to Question 31

Q32.

Solution

Concept: Chloroplasts have a highly organized internal structure with compartmentalized domains that separate the different stages of photosynthesis.

Solution: Step 1: Map the photosynthetic steps to chloroplast compartments:

- **Grana (stacks of disc-like thylakoids):** The thylakoid membranes contain the photosynthetic pigments (chlorophylls, carotenoids), photosystems (PSII and PSI), electron transport chain complexes, and ATP synthase. Thus, the **light-dependent reactions** occur here.
- **Stroma (the fluid-filled matrix):** Contains the enzymes of the Calvin cycle (such as RuBisCO) responsible for carbon fixation. Thus, the dark reactions occur here.

Step 2: Based on this, the light-dependent reactions occur primarily within the grana thylakoid membranes (Option B).

Final Answer: Grana thylakoid membranes

Answer: (B)

Go Back to Question 32

Q33.

Solution

Concept: Red-green color blindness is an X-linked recessive trait. Because males are hemizygous (XY), they express the trait if they inherit a single copy of the mutated allele on their X chromosome.

Solution: Step 1: Set up the genotypes of the parents:

- Colour-blind male: X^cY (where X^c carries the recessive mutation)
- Heterozygous normal female: X^CX^c (where X^C is the dominant normal allele)

Step 2: Determine the possible genotypes of the sons: Sons inherit the Y chromosome from their father and one of the two X chromosomes from their mother.

- Son inheriting X^C from mother: X^CY (Normal vision)
- Son inheriting X^c from mother: X^cY (Colour blind)

Step 3: Calculate the expected fraction of colour-blind sons: Among the male offspring (sons), there is a $1/2$ (or 50%) probability that they will inherit the X^c allele and be colour blind.

Final Answer: 50%

Answer: (C)

Go Back to Question 33

Q34.

Solution

Concept: Bacterial growth in a closed, batch culture system follows a predictable four-phase curve: the lag phase, the log (exponential) phase, the stationary phase, and the decline (death) phase.

Solution: Step 1: Analyze the physiological state of the decline phase: During the stationary phase, the rate of cell division equals the rate of cell death. As the culture ages and progresses into the decline/death phase, the rate of cell death dramatically exceeds the rate of new cell formation.

Step 2: Identify the primary environmental factors driving this decline: In a finite batch culture, no fresh media is added, and no waste products are removed. Over time:

- Essential **nutrients become completely depleted**.
- Toxic metabolic byproducts (such as organic acids and alcohols) **accumulate** to lethal concentrations.

This hostile environment causes the rapid death and lysis of the bacterial population.

Final Answer: Nutrients become depleted and toxic wastes accumulate

Answer: (B)

Go Back to Question 34

Q35.

Solution

Concept: Following double fertilization in angiosperms, the floral organs undergo coordinated developmental transformations to form the seed and the fruit.

Solution: Step 1: Understand post-fertilization changes in the flower:

- The diploid zygote develops into the **embryo**.
- The triploid primary endosperm nucleus develops into the **endosperm** (nutritive tissue).
- The integuments of the ovule mature to form the protective **seed coat**.
- The entire **ovule** develops into the **seed** (Option A).
- The surrounding maternal **ovary** wall (pericarp) swells and ripens to form the wall of the **fruit** (Option C).

Step 2: Based on these developmental pathways, the ovary is the structure that matures into the fruit after fertilization.

Final Answer: Ovary

Answer: (C)

Go Back to Question 35

Q36.

Solution

Concept: Eukaryotic cells contain specialized membrane-bound organelles that isolate metabolic processes to optimize biochemical efficiency.

Solution: Step 1: Identify the organelle based on the described characteristics: The organelle that is bound by a single membrane and filled with a collection of hydrolytic enzymes (such as proteases, nucleases, and glycosidases) active specifically at an acidic pH ($\approx$ 4.5–5.0) is the **lysosome**.

Step 2: Understand the function of this organelle:

- Lysosomes act as the cellular recycling system. They digest macromolecules, old or worn-out organelles (autophagy), and foreign substances engulfed by the cell (phagocytosis).
- Therefore, these organelles are primarily involved in **intracellular digestion** (Option A).

Step 3: Evaluate other options:

- ATP production (Option B) is localized in mitochondria.
- Protein translation (Option C) occurs on ribosomes in the cytoplasm or on the rough endoplasmic reticulum.
- Spindle formation (Option D) is organized by centrosomes/centrioles.

Final Answer: Intracellular digestion

Answer: (A)

Go Back to Question 36

Q37.

Solution

Concept: The nephron is the functional unit of the kidney. Its different segments (glomerulus, Bowman's capsule, proximal tubule, Loop of Henle, distal tubule, and collecting duct) perform distinct functions to regulate blood volume and composition.

Solution: Step 1: Analyze the specific role of the Loop of Henle: The Loop of Henle consists of a descending limb and an ascending limb. It functions as a countercurrent multiplier to pump salts (Na^+ and Cl^-) into the renal medulla.

Step 2: Describe the physiological outcome of this process: This active and passive transport mechanism establishes and maintains a high osmotic concentration gradient in the medullary interstitium (ranging from 300 mOsm/L near the cortex to 1200 mOsm/L deep in the medulla).

Step 3: Relate the gradient to urine concentration: This concentration gradient is essential for the osmotic reabsorption of water from the collecting duct under the influence of antidiuretic hormone (ADH), enabling the excretion of concentrated urine when needed.

Final Answer: Maintain concentration gradient for urine concentration

Answer: (B)

Go Back to Question 37

Q38.

Solution

Concept: Ecological succession is the progressive change in species composition in a community over time. Primary succession starts in virtually lifeless areas, such as bare rock left by a retreating glacier or volcanic eruption.

Solution: Step 1: Define a pioneer species: A pioneer species is the first organism to colonize a barren environment where no soil is present.

Step 2: Analyze the adaptation of lichens:

- Lichens are symbiotic associations between fungi and photosynthetic algae or cyanobacteria. This allows them to survive on bare rock without soil, relying on photosynthesis for energy and the fungus for moisture and mineral absorption.
- They secrete organic acids (such as lichen acids) that chemically weather the rock surface.
- As the rock breaks down and the lichens die and decay, they add organic matter, initiating the first thin layer of soil. This allows mosses, followed by herbs and shrubs, to colonize.

Step 3: Thus, lichens are pioneer species because they can colonize bare rocks and initiate soil formation (Option B).

Final Answer: Can colonize bare rocks and initiate soil formation

Answer: (B)

Go Back to Question 38

Q39.

Solution

Concept: Point mutations are genetic alterations where a single nucleotide base pair in DNA is replaced, deleted, or inserted. The phenotypic outcome depends on how the codon is translated.

Solution: Step 1: Define the types of point mutations:

- **Silent mutation:** A nucleotide change that alters a codon but, due to the degeneracy of the genetic code, still specifies the same amino acid.
- **Missense mutation:** A nucleotide change that alters a codon so that it specifies a *different* amino acid in the resulting protein chain.
- **Nonsense mutation:** A nucleotide change that alters a sense codon into a premature stop codon, terminating translation.
- **Inversion:** A structural chromosomal mutation where a segment of a chromosome is reversed end-to-end.

Step 2: Match with the description: The replacement of one amino acid by another in a protein chain is the definition of a missense mutation (Option B).

Final Answer: Missense mutation

Answer: (B)

Go Back to Question 39

Q40.

Solution

Concept: The mammalian heart is a four-chambered muscular pump designed to move blood through two distinct circulatory circuits: the pulmonary circuit (to the lungs) and the systemic circuit (to the rest of the body).

Solution: Step 1: Analyze the workload of each chamber:

- **Right Atrium (RA) and Left Atrium (LA):** Act as receiving chambers that only pump blood a short distance into the ventricles under very low pressure.
- **Right Ventricle (RV):** Pumps deoxygenated blood through the pulmonary artery to the nearby lungs. This pulmonary circuit exhibits low resistance and requires lower pressures.
- **Left Ventricle (LV):** Pumps oxygenated blood through the aorta into the entire systemic circulation to reach all body organs. This systemic circuit has high resistance and requires high pressures.

Step 2: Relate function to structure: To generate the high pressures required to pump blood throughout the entire body, the myocardium of the Left Ventricle (LV) is significantly thicker (about three times thicker) than that of the right ventricle.

Final Answer: LV

Answer: (D)

Go Back to Question 40

Answer Key

Q	Ans	Q	Ans	Q	Ans	Q	Ans	Q	Ans
1	B	2	B	3	C	4	B	5	A
6	B	7	C	8	C	9	B	10	C
11	B	12	B	13	C	14	B	15	B
16	C	17	C	18	B	19	C	20	B
21	C	22	C	23	C	24	B	25	C
26	B	27	B	28	B	29	B	30	B
31	B	32	B	33	C	34	B	35	C
36	A	37	B	38	B	39	B	40	D