NEET UG 2024 Zoology R6 Question Paper with Solutions

Section A

151. Match List I with List II:

	List I (Sub Phases of Prophase I)		List II (Specific Characters)
A.	Diakinesis	I.	Synaptonemal complex formation
B.	Pachytene	II.	Completion of terminalisation of chiasmata
C.	Zygotene	III.	Chromosomes look like thin threads
D.	Leptotene	IV.	Appearance of recombination nodules

Choose the correct answer from the options given below

(1) A-I, B-II, C-IV, D-III

(2) A-II, B-IV, C-I, D-III

(3) A-IV, B-III, C-II, D-I

(4) A-IV, B-II, C-III, D-I

Correct Answer: (2) A-II, B-IV, C-I, D-III

Solution:

Understanding the sub-phases of Prophase I.

- Diakinesis (A) is the final stage, where chiasmata terminalization completes, confirming A-II.
- Pachytene (B) is marked by the appearance of recombination nodules, ensuring B-IV.
- Zygotene (C) is identified by synaptonemal complex formation, making C-I correct.
- Leptotene (D) is the first stage, where chromosomes appear as thin threads, supporting D-III.

Conclusion: The correct answer is (2) A-II, B-IV, C-I, D-III.

Quick Tip

Prophase I is the longest and most crucial stage in meiosis, consisting of five sub-phases: Leptotene, Zygotene, Pachytene, Diplotene, and Diakinesis.

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152. Consider the following statements:

A. Annelids are true coelomates.

B. Poriferans are pseudocoelomates.

C. Aschelminthes are acoelomates.

D. Platyhelminthes are pseudocoelomates.

Choose the correct answer from the options given below :

(1) A only

(2) C only

(3) D only

(4) B only

Correct Answer: (1) A only

Solution:

Understanding Coelom in Animal Phyla.

- Annelids (A) are true coelomates, making Statement A correct.

- Poriferans (B) lack a body cavity entirely, so they are not pseudocoelomates, making Statement B incorrect.

- Aschelminthes (C) are pseudocoelomates, meaning Statement C is incorrect.

- Platyhelminthes (D) are acoelomates, not pseudocoelomates, making Statement D incorrect.

Conclusion: The correct answer is (1) A only.

Quick Tip

Coelomates have a true coelom (e.g., Annelida), pseudocoelomates have a false coelom (e.g., Nematoda), and acoelomates lack a coelom (e.g., Platyhelminthes).

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153. Match List I with List II:

	List I		List II
A.	Pons	I.	Provides additional space for Neurons, regulates posture and balance.
B.	Hypothalamus	II.	Controls respiration and gastric secretions.
C.	Medulla	III.	Connects different regions of the brain.
D.	Cerebellum	IV.	Neuro secretory cells

Choose the correct answer from the options given below :

(1) A-III, B-IV, C-II, D-I

(2) A-I, B-III, C-II, D-IV

(3) A-II, B-I, C-III, D-IV

(4) A-II, B-III, C-I, D-IV

Correct Answer: (1) A-III, B-IV, C-II, D-I

Solution:

Understanding Brain Functions.

- Pons (A) functions to connect different regions of the brain, making A-III correct.

- Hypothalamus (B) contains neurosecretory cells, controlling homeostasis, confirming B-IV.

- Medulla (C) regulates respiration and gastric secretions, making C-II correct.

- Cerebellum (D) helps in posture and balance, ensuring D-I is correct.

Conclusion: The correct answer is (1) A-III, B-IV, C-II, D-I.

Quick Tip

The brainstem (medulla and pons) controls involuntary functions, the hypothalamus maintains homeostasis, and the cerebellum regulates balance and coordination.

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154. Which of the following factors are favorable for the formation of oxyhaemoglobin in alveoli?

(1) High pO_2 and Lesser H^+ concentration

(2) Low pCO_2 and High H^+ concentration

(3) Low pCO_2 and High temperature

(4) High pO_2 and High pCO_2

Correct Answer: (1) High pO_2 and Lesser H^+ concentration

Solution:

Step 1: Understanding oxyhaemoglobin formation.

- In alveoli, oxygen binds to hemoglobin to form oxyhaemoglobin.

- The binding is favored by high partial pressure of oxygen (pO_2) and low hydrogen ion concentration (H^+).

Step 2: Effects of pCO_2 and H^+ on oxyhaemoglobin.

- Lower pCO_2 ensures efficient oxygen binding by reducing the Bohr effect.

- Less H^+ concentration prevents hemoglobin from releasing oxygen prematurely.

Conclusion: The correct answer is (1) High pO_2 and Lesser H^+ concentration.

Quick Tip

Oxyhaemoglobin formation in alveoli is favored by high oxygen levels and lower carbon dioxide levels, as these conditions shift hemoglobin's affinity towards oxygen.

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155. Following are the stages of cell division:

A. Gap 2 phase

B.Cytokinesis

C. Synthesis phase

D. Karyokinesis

E. Gap 1 phase

Choose the correct sequence of stages from the options given below:

(1) E-B-D-A-C

(2) B-D-E-A-C

(3) E-C-A-D-B

(4) C-E-D-A-B

Correct Answer: (3) E-C-A-D-B

Solution:

Understanding the sequence of cell cycle stages.

- Gap 1 (G1) phase (E): The first growth phase, where the cell prepares for DNA synthesis.
- Synthesis (S) phase (C): DNA replication occurs.
- Gap 2 (G2) phase (A): The cell continues to grow and prepares for mitosis.
- Karyokinesis (D): Nuclear division takes place.
- Cytokinesis (B): The final step where the cytoplasm divides, resulting in two daughter cells.

Conclusion: The correct sequence is E-C-A-D-B.

Quick Tip

The correct sequence of the cell cycle is: G1 (growth) → S (DNA replication) → G2 (preparation for mitosis) → M (karyokinesis cytokinesis).

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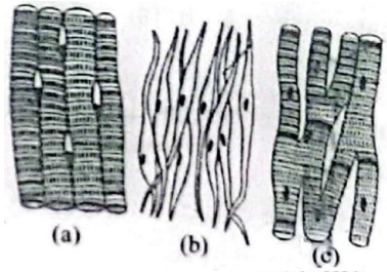
156. Three types of muscles are given as (a), (b), and (c). Identify the correct matching pair along with their location in the human body:



(1) (a) Skeletal – Triceps
(b) Smooth – Stomach
(c) Cardiac – Heart

(2) (a) Skeletal – Biceps
(b) Involuntary – Intestine
(c) Smooth – Heart

(3) (a) Involuntary – Nose tip
(b) Skeletal – Bone
(c) Cardiac – Heart

(4) (a) Smooth – Toes
(b) Skeletal – Legs
(c) Cardiac – Heart

Correct Answer: (1) (a) Skeletal – Triceps, (b) Smooth – Stomach, (c) Cardiac – Heart

Solution:

Step 1: Understanding muscle types.

- Skeletal muscles (voluntary) are attached to bones and responsible for movement (e.g., triceps).
- Smooth muscles (involuntary) are found in internal organs like the stomach.
- Cardiac muscles (involuntary) are found in the heart and control heartbeat.

Step 2: Matching muscle types with locations.

- Triceps are skeletal muscles responsible for arm movement.

- Stomach contains smooth muscles, which contract involuntarily for digestion.

- Heart contains cardiac muscles, which pump blood.

Conclusion: The correct answer is (1) Skeletal – Triceps, Smooth – Stomach, Cardiac – Heart.

Quick Tip

Skeletal muscles are voluntary, smooth muscles are involuntary, and cardiac muscles are involuntary but have automatic rhythmic contractions.

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157. Match List I with List II:

	List I		List II
A.	Down's syndrome	I.	11^{th} chromosome
B.	α-Thalassemia	II.	'X' chromosome
C.	β-Thalassemia	III.	21^{st} chromosome
D.	Klinefelter's syndrome	IV.	16^{th} chromosome

Choose the correct answer from the options given below :

(1) A-II, B-III, C-IV, D-I

(2) A-III, B-IV, C-I, D-II

(3) A-IV, B-I, C-II, D-III

(4) A-I, B-II, C-III, D-IV

Correct Answer: (2) A-III, B-IV, C-I, D-II

Solution:

Understanding Chromosomal Disorders.

- Down's syndrome (Trisomy 21) is caused by an extra copy of chromosome 21.

- α-Thalassemia is linked to mutations in chromosome 16 affecting hemoglobin production.

- β-Thalassemia results from defects in chromosome 11 impacting hemoglobin beta-chain.

- Klinefelter's syndrome (XXY condition) affects the X chromosome, leading to male infertility.

Conclusion: The correct matching is (2) A-III, B-IV, C-I, D-II.

Quick Tip

Genetic disorders like Down's syndrome and Klinefelter's syndrome arise due to chromosomal abnormalities, while Thalassemia is due to single-gene mutations.

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158. Which of the following are Autoimmune disorders?

A. Myasthenia gravis

B. Rheumatoid arthritis

C. Gout

D. Muscular dystrophy

E. Systemic Lupus Erythematosus (SLE)

Choose the most appropriate answer from the options given below:

(1) A, B E only

(2) B, C E only

(3) C, D E only

(4) A, B D only

Correct Answer: (1) A, B E only

Solution:

Understanding Autoimmune Disorders.

- Myasthenia gravis: A neuromuscular autoimmune disorder causing muscle weakness.
- Rheumatoid arthritis: An autoimmune disease where the immune system attacks joints.
- Systemic Lupus Erythematosus (SLE): An autoimmune disease affecting multiple organs.
- Gout and Muscular dystrophy are not autoimmune disorders; gout is a metabolic disorder while muscular dystrophy is genetic.

Conclusion: The correct answer is (1) A, B E only.

Quick Tip

Autoimmune diseases occur when the body's immune system mistakenly attacks its own tissues, leading to chronic inflammation and organ damage.

159. Given below are two statements:

Assertion A:FSH acts upon ovarian follicles in female and Leydig cells in male.

Reason R:Growing ovarian follicles secrete estrogen in female while interstitial cells secrete androgen in male human beings.

In the light of the above statements, choose the correct answer from the options given below :

(1) Both A and R are true but R is NOT the correct explanation of A

(2) A is true but R is false

(3) A is false but R is true

(4) Both A and R are true and R is the correct explanation of A

Correct Answer: (3) A is false but R is true

Solution:

Understanding the role of FSH and Leydig cells.

- Follicle Stimulating Hormone (FSH) stimulates ovarian follicles in females, but in males, it stimulates Sertoli cells, not Leydig cells.
- Leydig cells are stimulated by Luteinizing Hormone (LH) and are responsible for testosterone production.
- Estrogen is secreted by growing ovarian follicles, and testosterone is secreted by Leydig cells, which makes the Reason (R) true.

Conclusion: The correct answer is (3) A is false but R is true.

Quick Tip

FSH primarily acts on Sertoli cells in males, whereas LH stimulates Leydig cells to produce androgens.

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160. Given below are two statements:

Statement I:In the nephron, the descending limb of the loop of Henle is impermeable to water and permeable to electrolytes.

Statement II: The proximal convoluted tubule is lined by simple columnar brush

border epithelium and increases the surface area for reabsorption.

In the light of the above statements, choose the correct answer from the option given below :

(1) Both Statement I and Statement II are false

(2) Statement I is true but Statement II is false

(3) Statement I is false but Statement II is true

(4) Both Statement I and Statement II are true

Correct Answer: (1) Both Statement I and Statement II are false

Solution:

Understanding the Loop of Henle and Proximal Convoluted Tubule (PCT).

- Descending limb of Henle's loop is permeable to water and impermeable to electrolytes, so Statement I is false.

- Proximal Convoluted Tubule (PCT) is lined by simple cuboidal epithelium with brush borders, not simple columnar epithelium, so Statement II is also false.

Conclusion: The correct answer is (1) Both Statement I and Statement II are false.

Quick Tip

The descending limb of Henle's loop allows water reabsorption, while the PCT is lined by simple cuboidal brush border epithelium for nutrient reabsorption.

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161. Given below are two statements: One is labelled as Assertion A and the other is labelled as Reason R:

Assertion A: Breast-feeding during the initial period of infant growth is recommended by doctors for bringing up a healthy baby.

Reason R:Colostrum contains several antibodies absolutely essential to develop resistance for the newborn baby.

In the light of the above statements, choose the most appropriate answer from the options given below:

(1) Both A and R are correct but R is NOT the correct explanation of A

(2) A is correct but R is not correct

(3) A is not correct but R is correct

(4) Both A and R are correct and R is the correct explanation of A

Correct Answer: (4) Both A and R are correct and R is the correct explanation of A

Solution:

Step 1: Understanding the Importance of Breastfeeding.

- Breastfeeding is highly recommended for newborns as it provides essential nutrients and immunity.

- Colostrum, the first milk, is rich in antibodies such as IgA, which protect against infections.

Step 2: Relationship Between A and R.

- Since colostrum provides passive immunity to the baby, Reason R correctly explains Assertion A.

Conclusion: The correct answer is (4) Both A and R are correct and R is the correct explanation of A.

Quick Tip

Colostrum is rich in antibodies, particularly IgA, which helps develop the newborn's immune system and protects against infections.

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162. Match List I with List II:

List I (Drug)	List II (Source)
A. Cocaine	I. Effective sedative in surgery
B. Heroin	II.Cannabis sativa
C. Morphine	III. Erythroxylum
D. Marijuana	IV. Papaver somniferum

Choose the correct answer from the options given below:

(1) A-I, B-III, C-II, D-IV

(2) A-II, B-I, C-III, D-IV

(3) A-III, B-IV, C-I, D-II

(4) A-IV, B-III, C-I, D-II

Correct Answer: (3) A-III, B-IV, C-I, D-II

Solution:

Step 1: Understanding the Sources of These Drugs.

- Cocaine is derived from Erythroxylum coca and is a stimulant drug.

- Heroin is derived from Papaver somniferum and is a depressant.

- Morphine is used as a pain-relieving sedative in surgery.

- Marijuana comes from Cannabis sativa and has psychoactive effects.

Conclusion: The correct answer is (3) A-III, B-IV, C-I, D-II.

Quick Tip

Many drugs are derived from plants, such as Cocaine from Erythroxylum, Heroin from Opium poppy, and Marijuana from Cannabis.

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163. Match List I with List II:

List I (Fish Species)	List II (Type)
A. Pterophyllum	I. Hag fish
B. Myxine	II. Saw fish
C. Pristis	III. Angel fish
D. Exocoetus	IV. Flying fish

Choose the correct answer from the options given below :

(1) A-III, B-I, C-II, D-IV

(2) A-IV, B-I, C-II, D-III

(3) A-III, B-II, C-I, D-IV

(4) A-II, B-I, C-III, D-IV

Correct Answer: (1) A-III, B-I, C-II, D-IV

Solution:

Understanding the Classification of These Fishes.

- Pterophyllum is commonly known as the Angel fish.

- Myxine belongs to Hagfish, a jawless fish.

- Pristis is a type of Sawfish, which has a long, saw-like snout.

- Exocoetus is a Flying fish, capable of gliding over water surfaces.

Conclusion: The correct answer is (1) A-III, B-I, C-II, D-IV.

Quick Tip

Angel fish (Pterophyllum) is an aquarium fish, while Hagfish (Myxine) is a jawless marine species. Sawfish (Pristis) has a unique rostrum, and Flying fish (Exocoetus) can glide over water.

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164. Match List I with List II:

	List I		List II
A.	Pleurobrachia	I.	Mollusca
B.	Radula	II.	Ctenophora
C.	Stomochord	III.	Osteichthyes
D.	Air bladder	IV.	Hemichordata

Choose the correct answer from the options given below :

(1) A-II, B-I, C-IV, D-III

(2) A-II, B-IV, C-I, D-III

(3) A-IV, B-III, C-II, D-I

(4) A-IV, B-II, C-III, D-I

Correct Answer: (1) A-II, B-I, C-IV, D-III

Solution:

Understanding the Classification of These Organisms.

- Pleurobrachia belongs to Ctenophora, a phylum of marine comb jellies.

- Radula is a toothed feeding structure found in Mollusca.

- Stomochord is found in Hemichordata, a phylum that includes acorn worms.

- Air bladder is a characteristic of Osteichthyes (bony fishes) and helps with buoyancy.

Conclusion: The correct answer is (1) A-II, B-I, C-IV, D-III.

Quick Tip

Ctenophores like Pleurobrachia are jelly-like marine animals, Molluscs use radula for feeding, Hemichordates have stomochords, and bony fishes use air bladders for buoyancy.

165. In both sexes of cockroach, a pair of jointed filamentous structures called anal cerci are present on:

(1) 10th segment

(2) 8th and 9th segment

(3) 11th segment

(4) 5th segment

Correct Answer: (1) 10th segment

Solution:

Understanding Anal Cerci in Cockroaches.

- Cockroaches have anal cerci, a pair of jointed filamentous structures located on the 10th abdominal segment.

- These cerci help in detecting air movements and possible threats.

Conclusion: The correct answer is (1) 10th segment.

Quick Tip

Cockroaches have segmented abdomens, and anal cerci function as sensory organs to detect vibrations in the air.

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166. The flippers of the Penguins and Dolphins are an example of:

(1) Natural selection

(2) Convergent evolution

(3) Divergent evolution

(4) Adaptive radiation

Correct Answer: (2) Convergent evolution

Solution:

Understanding Convergent Evolution.

- Convergent evolution occurs when unrelated organisms develop similar traits due to adaptation to a similar environment.

- Penguins (birds) and Dolphins (mammals) have evolved streamlined bodies and flippers for swimming, but they belong to different taxonomic groups.

Conclusion: The correct answer is (2) Convergent evolution.

Quick Tip

Convergent evolution results in functionally similar structures (analogous organs) in unrelated species due to similar environmental pressures.

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167. Which of the following statements is incorrect about bio-reactors?

(1) Most commonly used bio-reactors are of stirring type

(2) Bio-reactors are used to produce small-scale bacterial cultures

(3) Bio-reactors have an agitator system, an oxygen delivery system, and a foam control system

(4) A bio-reactor provides optimal growth conditions for achieving the desired product

Correct Answer: (2) Bio-reactors are used to produce small-scale bacterial cultures

Solution:

Understanding Bio-reactors.

- Bio-reactors are large vessels used in industrial biotechnology for mass production of cells or bio-products.

- Statement (2) is incorrect because bio-reactors are used for large-scale production, not small-scale cultures.

Conclusion: The correct answer is (2) Bio-reactors are used to produce small-scale bacterial cultures.

Quick Tip

Bio-reactors provide controlled environments (temperature, pH, nutrients) to enhance microbial growth and product yield.

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168. Which one is the correct product of DNA-dependent RNA polymerase from the given template strand?

3'-TACATGGCAAATATCCATTCA-5'

(1) 5'-AUGUAAAGUUUAUAGGUAAGU-3'

(2) 5'-AUGUACCGUUUAUAGGGAAGU-3'

(3) 5'-ATGTACCGTTTATAGGTAAGT-3'

(4) 5'-AUGUACCGUUUAUAGGUAAGU-3'

Correct Answer: (4) 5'-AUGUACCGUUUAUAGGUAAGU-3'

Solution:

Understanding Transcription.

- The template strand (3' to 5') is used by RNA polymerase to synthesize an mRNA strand (5' to 3').

- The complementary RNA sequence follows A-U and G-C pairing rules.

Conclusion: The correct answer is (4) 5'-AUGUACCGUUUAUAGGUAAGU-3'.

Quick Tip

Transcription follows the base-pairing rules: Adenine (A) pairs with Uracil (U), Thymine (T) pairs with Adenine (A), and Cytosine (C) pairs with Guanine (G).

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169. Match List I with List II:

List I (Joint Type)	List II (Example)
A. Fibrous joints	I. Adjacent vertebrae, limited movement
B. Cartilaginous joints	II. Humerus and Pectoral girdle, rotational movement
C. Hinge joints	III. Skull, don't allow any movement
D. Ball and socket joints	IV. Knee, help in locomotion

Choose the correct answer from the options given below :

(1) A-I, B-III, C-II, D-IV

(2) A-II, B-III, C-I, D-IV

(3) A-III, B-I, C-IV, D-II

(4) A-IV, B-II, C-III, D-I

Correct Answer: (3) A-III, B-I, C-IV, D-II

Solution:

Understanding Joint Types.

- Fibrous joints (A) are immovable (e.g., skull sutures).

- Cartilaginous joints (B) allow limited movement (e.g., intervertebral discs).

- Hinge joints (C) allow movement in one plane (e.g., knee).

- Ball and socket joints (D) allow rotational movement (e.g., shoulder joint).

Conclusion: The correct answer is (3) A-III, B-I, C-IV, D-II.

Quick Tip

Joints are classified based on movement: Fibrous (immovable), Cartilaginous (partially movable), and Synovial (freely movable).

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170. Match List I with List II:

	List I		List II
A.	α –I antitrypsin	I.	Cotton bollworm
B.	Cry IAb	II.	ADA deficiency
C.	Cry IAc	III.	Emphysema
D	Enzyme replacement therapy	IV	Corn borer

Choose the correct answer form the options given below:

(1) A-III, B-I, C-II, D-IV

(2) A-III, B-IV, C-I, D-II

(3) A-II, B-IV, C-I, D-III

(4) A-II, B-I, C-IV, D-III

Correct Answer: (2) A-III, B-IV, C-I, D-II

Solution:

Understanding the Matching.

- α-I antitrypsin is used in treating emphysema.

- Cry IAb and Cry IAc are Bacillus thuringiensis (Bt) toxins used to control corn borers and cotton bollworms, respectively.

- Enzyme replacement therapy is used in treating Adenosine Deaminase (ADA) deficiency.

Conclusion: The correct answer is (2) A-III, B-IV, C-I, D-II.

Quick Tip

Bt crops like Bt cotton contain Cry proteins, which provide resistance against insects by forming pores in their gut lining.

171. Match List I with List II:

List I (Cell Structure)	List II (Function/Location)
A. Axoneme	I.Centriole
B. Cartwheel pattern	II.Cilia and flagella
C. Crista	III. Chromosome
D. Satellite	IV. Mitochondria

Choose the correct answer from the options given below :

(1) A-IV, B-II, C-III, D-I

(2) A-II, B-IV, C-I, D-III

(3) A-II, B-I, C-IV, D-III

(4) A-IV, B-III, C-II, D-I

Correct Answer: (3) A-II, B-I, C-IV, D-III

Solution:

Understanding the Matching.

- Axoneme forms the structural framework of cilia and flagella.

- Cartwheel pattern is observed in centrioles.

- Cristae are the folds of the inner mitochondrial membrane.

- Satellite regions are associated with chromosomes.

Conclusion: The correct answer is (3) A-II, B-I, C-IV, D-III.

Quick Tip

Mitochondria, the powerhouse of the cell, have cristae that increase the surface area for ATP production.

172. The correct sequence of pathway for conduction of an action potential through the heart is:

A. AV bundle

B. Purkinje fibres

C. AV node

D. Bundle branches

E. SA node

Choose the correct sequence of pathway from the options given below

(1) A-E-C-B-D

(2) B-D-E-C-A

(3) E-A-D-B-C

(4) E-C-A-D-B

Correct Answer: (4) E-C-A-D-B

Solution:

Understanding Heart's Electrical Conduction System.

- The Sinoatrial (SA) node (E) initiates the action potential.
- The signal passes to the Atrioventricular (AV) node (C).
- From the AV node, it moves through the AV bundle (A).
- Then it travels down the Bundle branches (D).
- Finally, it reaches the Purkinje fibers (B), causing ventricular contraction.

Conclusion: The correct answer is (4) E-C-A-D-B.

Quick Tip

The SA node is the natural pacemaker of the heart, maintaining rhythmic contractions.

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173. Given below are two statements:

Statement I: The presence or absence of the hymen is not a reliable indicator of virginity.

Statement II: The hymen is torn during the first coitus only.

In the light of the above statements, choose the correct answer from the options given below:

(1) Both Statement I and Statement II are false

(2) Statement I is true but Statement II is false

(3) Statement I is false but Statement II is true

(4) Both Statement I and Statement II are true

Correct Answer: (2) Statement I is true but Statement II is false

Solution:

Step 1: Understanding the Hymen and Its Significance

- The **hymen** is a thin membrane that partially covers the vaginal opening.
- Its presence or absence is **not a reliable indicator of virginity**, as it can be torn due to various activities such as **sports, cycling, physical activity, or medical procedures**.
- Hence, **Statement I is true**.

Step 2: Evaluating Statement II

- The hymen **does not always tear during first coitus**.
- It can stretch without tearing, and some individuals are born with **very little or no hymenal tissue**.
- Since the hymen can be lost due to non-sexual activities, **Statement II is false**.

Conclusion:

Since **Statement I is true** but **Statement II is false**, the correct answer is (2).

Quick Tip

The hymen is not a definitive indicator of virginity, and its tearing can result from various non-sexual activities. Medical professionals do not use it as a conclusive test.

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174. Match List I with List II:

List I (Disease)	List II (Cause/Pathogen)
A. Common cold	I. Plasmodium
B. Haemozoin	II. Typhoid
C. Widal test	III. Rhinoviruses
D. Allergy	IV. Dust mites

Choose the correct answer from the options given below :

(1) A-I, B-III, C-II, D-IV

(2) A-III, B-I, C-II, D-IV

(3) A-IV, B-II, C-III, D-I

(4) A-II, B-IV, C-III, D-I

Correct Answer: (2) A-III, B-I, C-II, D-IV

Solution:

Understanding the Matching.

- Common cold is caused by Rhinoviruses.

- Haemozoin is a byproduct of Plasmodium, the malarial parasite.

- Widal test is used for typhoid diagnosis.

- Allergies are triggered by dust mites and other allergens.

Conclusion: The correct answer is (2) A-III, B-I, C-II, D-IV.

Quick Tip

Malaria causes cyclic fever due to the periodic release of haemozoin from RBCs.

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175. Match List I with List II:

	List I		List II
A.	Typhoid	I.	Fungus
B.	Leishmaniasis	II.	Nematode
C.	Ringworm	III.	Protozoa
D.	Filariasis	IV.	Bacteria

Choose the correct answer from the options given below:

(1) A-IV, B-III, C-I, D-II

(2) A-III, B-I, C-IV, D-II

(3) A-II, B-IV, C-III, D-I

(4) A-I, B-III, C-II, D-IV

Correct Answer: (1) A-IV, B-III, C-I, D-II

Solution:

Understanding Disease Classification.

- Typhoid is caused by Salmonella typhi (Bacteria).

- Leishmaniasis is caused by Leishmania (Protozoa).

- Ringworm is a fungal infection caused by dermatophytes.

- Filariasis is caused by Wuchereria bancrofti (Nematode).

Conclusion: The correct answer is (1) A-IV, B-III, C-I, D-II.

Quick Tip

Leishmaniasis is transmitted by sandflies and causes skin ulcers or visceral infections.

---

176. Match List I with List II:

	List I		List II
A.	Expiratory capacity	I.	Expiratory reserve volume + Tidal volume + Inspiratory reserve volume
B.	Functional residual capacity	II.	Tidal volume + Expiratory reserve volume
C.	Vital capacity	III.	Tidal volume + Inspiratory reserve volume
D.	Inspiratory capacity	IV.	Expiratory reserve volume + Residual volume

Choose the correct answer from the options given below :

(1) A-III, B-II, C-IV, D-I

(2) A-II, B-I, C-IV, D-III

(3) A-I, B-III, C-II, D-IV

(4) A-II, B-IV, C-I, D-III

Correct Answer: (4) A-II, B-IV, C-I, D-III

Solution:

Understanding Lung Capacity.

- Expiratory Capacity includes Tidal volume + Expiratory reserve volume.

- Functional Residual Capacity includes Expiratory reserve volume + Residual volume.

- Vital Capacity includes Expiratory reserve volume + Tidal volume + Inspiratory reserve volume.

- Inspiratory Capacity includes Tidal volume + Inspiratory reserve volume.

Conclusion: The correct answer is (4) A-II, B-IV, C-I, D-III.

Quick Tip

Vital capacity is the maximum amount of air a person can exhale after a maximum inhalation.

177. Which one of the following factors will not affect the Hardy-Weinberg equilibrium?

(1) Genetic drift

(2) Gene migration

(3) Constant gene pool

(4) Genetic recombination

Correct Answer: (3) Constant gene pool

Solution:

Understanding Hardy-Weinberg Equilibrium.

- Hardy-Weinberg Equilibrium states that allele frequencies remain constant in a population unless acted upon by evolutionary forces.

- Factors affecting it include: Mutation, Natural Selection, Genetic Drift, Gene Flow, and Genetic Recombination.

- Constant gene pool implies no evolution, meaning no change in allele frequencies.

Conclusion: The correct answer is (3) Constant gene pool.

Quick Tip

If all Hardy-Weinberg conditions are met, evolution does not occur, maintaining genetic stability.

178. Match List I with List II:

	List-I		List-II
A.	Lipase	I.	Peptide bond
B.	Nuclease	II.	Ester bond
C.	Protease	III.	Glycosidic bond
D.	Amylase	IV.	Phosphodiester bond

Choose the correct answer from the options given below :

(1) A-III, B-II, C-I, D-IV

(2) A-II, B-IV, C-I, D-III

(3) A-IV, B-I, C-III, D-II

(4) A-IV, B-II, C-III, D-I

Correct Answer: (2) A-II, B-IV, C-I, D-III

Solution:

Understanding Enzyme Specificity.

- Lipase hydrolyzes ester bonds in fats.

- Nuclease hydrolyzes phosphodiester bonds in DNA/RNA.

- Protease hydrolyzes peptide bonds in proteins.

- Amylase hydrolyzes glycosidic bonds in starch.

Conclusion: The correct answer is (2) A-II, B-IV, C-I, D-III.

Quick Tip

Enzymes lower the activation energy of biochemical reactions, making them highly specific.

---

179. Which of the following is not a component of the Fallopian tube?

(1) Isthmus

(2) Infundibulum

(3) Ampulla

(4) Uterine fundus

Correct Answer: (4) Uterine fundus

Solution:

S Understanding the Fallopian Tube.

- The Fallopian tube consists of four parts:

Infundibulum, Ampulla, Isthmus, and Interstitial Part.

- The Uterine Fundus is part of the uterus, not the Fallopian tube.

Conclusion: The correct answer is (4) Uterine fundus.

Quick Tip

Fertilization usually occurs in the ampulla of the Fallopian tube.

---

180. Match List I with List II:

	List I		List II
A.	Non-medicated IUD	I.	Multiload 375
B.	Copper releasing IUD	II.	Progestogens
C.	Hormone releasing IUD	III.	Lippes loop
D.	Implants	IV.	LNG-20

Choose the correct answer from the option given below:

(1) A-I, B-III, C-IV, D-II

(2) A-IV, B-I, C-II, D-III

(3) A-III, B-I, C-IV, D-II

(4) A-III, B-I, C-II, D-IV

Correct Answer: (3) A-III, B-I, C-IV, D-II

Solution:

Understanding Different Types of IUDs.

- Non-medicated IUDs (e.g., Lippes loop) function as a physical barrier to implantation.

- Copper releasing IUDs (e.g., Multiload 375) release copper ions, which are toxic to sperm.

- Hormone-releasing IUDs (e.g., LNG-20) release hormones like levonorgestrel, preventing ovulation.

- Implants contain progestogens that provide long-term contraception.

Conclusion: The correct answer is (3) A-III, B-I, C-IV, D-II.

Quick Tip

Copper IUDs increase the uterine environment's spermicidal effect, making fertilization unlikely.

---

181. Which of the following is not a steroid hormone?

(1) Testosterone

(2) Progesterone

(3) Glucagon

(4) Cortisol

Correct Answer: (3) Glucagon

Solution:

Understanding Steroid Hormones.

- Steroid hormones are derived from cholesterol and include Testosterone, Progesterone, and Cortisol.

- Glucagon, however, is a peptide hormone that regulates blood glucose levels.

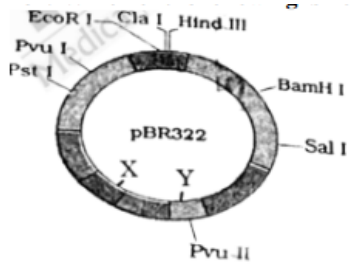
Conclusion: The correct answer is (3) Glucagon.

Quick Tip

Peptide hormones like glucagon act through second messengers, unlike steroid hormones which enter the cell.

---

182. The following diagram shows restriction sites in E. coli cloning vector pBR322. Find the role of 'X' and 'Y' genes:



(1) The gene 'X' is responsible for controlling the copy number of the linked DNA and 'Y' for protein involved in the replication of Plasmid.

(2) The gene 'X' is for protein involved in replication of Plasmid and 'Y' for resistance to antibiotics.

(3) Gene 'X' is responsible for recognition sites and 'Y' is responsible for antibiotic resistance.

(4) The gene 'X' is responsible for resistance to antibiotics and 'Y' for protein involved in the replication of Plasmid.

Correct Answer: (1) The gene 'X' is responsible for controlling the copy number of the linked DNA and 'Y' for protein involved in the replication of Plasmid.

Solution:

Understanding pBR322 Plasmid.

- pBR322 is a commonly used cloning vector.

- Gene ‘X’ (ori region) controls the copy number of the plasmid.

- Gene ‘Y’ (replication-related gene) helps in plasmid replication.

Conclusion: The correct answer is (1).

Quick Tip

Plasmids are self-replicating circular DNA molecules used in genetic engineering.

---

183. Which of the following is not a natural/traditional contraceptive method?

(1) Periodic abstinence

(2) Lactational amenorrhea

(3) Vaults

(4) Coitus interruptus

Correct Answer: (3) Vaults

Solution:

Understanding Natural and Artificial Contraception

Step 1: Identifying Natural Contraceptive Methods

- **Periodic Abstinence:** Avoiding intercourse during the **fertile window** (ovulation period).
- **Lactational Amenorrhea:** Temporary infertility occurring **post-childbirth** due to hormonal changes.
- **Coitus Interruptus:** The **withdrawal method**, where the male withdraws before ejaculation.

Step 2: Identifying Artificial Contraceptive Methods

- **Vaults (Diaphragms):**
  - Vaults are **artificial barrier methods** that physically prevent sperm from entering the uterus.
  - Since they are not natural methods, they do not belong to this category.

Conclusion:

The correct answer is (3) **Vaults**.

Quick Tip

Natural contraceptive methods are based on physiological cycles and behavioral patterns.

---

184. Given below are some stages of human evolution. Arrange them in correct sequence (Past to Recent):

A. Homo habilis

B. Homo sapiens

C. Homo neanderthalensis

D. Homo erectus

Choose the correct sequence of human evolution from the options given below: (1) B-A-D-C

(2) C-B-D-A

(3) A-D-C-B

(4) D-A-C-B

Correct Answer: (3) A-D-C-B

Solution:

Understanding Human Evolution.

- Homo habilis (2.4 to 1.4 million years ago) is considered the first species to use tools.

- Homo erectus (1.9 million to 110,000 years ago) was the first to use fire and migrate from Africa.

- Homo neanderthalensis (400,000 to 40,000 years ago) lived in Europe and adapted to cold climates.

- Homo sapiens (modern humans) evolved 300,000 years ago and developed advanced culture.

Conclusion: The correct sequence is A-D-C-B.

Quick Tip

Homo erectus is considered the longest surviving human species and was the first to migrate out of Africa.

---

185. The "Ti plasmid" of Agrobacterium tumefaciens stands for:

(1) Tumor independent plasmid

(2) Tumor inducing plasmid

(3) Temperature independent plasmid

(4) Tumor inhibiting plasmid

Correct Answer: (2) Tumor Inducing Plasmid

Solution:

Understanding Ti Plasmid

Step 1: Definition and Function

- The **Ti plasmid** (Tumor Inducing Plasmid) is found in **Agrobacterium tumefaciens**, a bacterium responsible for **crown gall disease** in plants.
- It contains a specific region called **T-DNA** (**transfer DNA**) that integrates into the **plant genome**, leading to tumor formation.

Conclusion:

The correct answer is (2) **Tumor Inducing Plasmid**.

Quick Tip

Ti plasmid is widely used in genetic engineering to introduce foreign genes into plant cells.

Section B

186. Match List I with List II:

List I (Enzyme/Region)	List II (Function)
A. RNA polymerase III	I. snRNPs
B. Termination of transcription	II. Promotor
C. Splicing of Exons	III. Rho factor
D. TATA box	IV. SnRNAs, tRNA

Choose the correct answer from the options given below :

(1) A-III, B-II, C-IV, D-I

(2) A-III, B-IV, C-I, D-II

(3) A-IV, B-III, C-I, D-II

(4) A-II, B-IV, C-I, D-III

Correct Answer: (3) A-IV, B-III, C-I, D-II

Solution:

Understanding Transcription Process

Step 1: Matching Components of Transcription

- **RNA Polymerase III (A-IV):**
  - Transcribes **tRNA** and **small nuclear RNAs** (snRNAs).
- **Termination of Transcription (B-III):**
  - The **Rho factor** aids in transcription termination in **prokaryotes**.
- **Splicing of Exons (C-I):**
  - **snRNPs** (small nuclear ribonucleoproteins) facilitate **exon splicing**.
- **TATA Box (D-II):**
  - A **promoter region** essential for **transcription initiation**.

Conclusion:

The correct match is:

$$A \to IV, \quad B \to III, \quad C \to I, \quad D \to II.$$

Quick Tip

Eukaryotic transcription is more complex than prokaryotic transcription due to post-transcriptional modifications.

---

187. Regarding catalytic cycle of an enzyme action, select the correct sequential steps:

A. Substrate enzyme complex formation.

B. Free enzyme ready to bind with another substrate.

C. Release of products.

D. Chemical bonds of the substrate broken.

E. Substrate binding to active site.

Choose the correct answer from the options given below :

(1) A, E, B, D, C

(2) B, A, C, D, E

(3) E, D, C, B, A

(4) E, A, D, C, B

Correct Answer: (4) E, A, D, C, B

Solution:

Understanding the Enzyme Catalytic Cycle

Step 1: Sequence of the Enzymatic Reaction

1. **Substrate Binding (E):** The substrate binds to the **enzyme's active site**.
2. **Formation of Enzyme-Substrate Complex (A):** This forms a temporary **enzyme-substrate complex**.
3. **Catalysis (D):** The chemical bonds of the substrate **break**, leading to product formation.
4. **Product Release (C):** The **products are released** from the enzyme.
5. **Enzyme Reusability (B):** The free enzyme is now **ready to bind** with another substrate.

Conclusion:

The correct order is:

$$E \to A \to D \to C \to B.$$

Quick Tip

Enzymes function by lowering the activation energy of reactions, allowing biological processes to occur rapidly.

---

188. Choose the correct statement given below regarding juxta medullary nephron:

(1) Renal corpuscle of juxta medullary nephron lies in the outer portion of the renal medulla.

(2) Loop of Henle of juxta medullary nephron runs deep into medulla.

(3) Juxta medullary nephrons outnumber the cortical nephrons.

(4) Juxta medullary nephrons are located in the columns of Bertini.

Correct Answer: (2) Loop of Henle of juxta medullary nephron runs deep into medulla.

Solution:

Understanding Nephron Types

Step 1: Classification of Nephrons

- Nephrons are classified into **cortical** and **juxta medullary nephrons** based on their **location** in the kidney.
- **Cortical nephrons** have their **glomeruli in the outer cortex** and shorter loops of Henle.
- **Juxta medullary nephrons** have their **glomeruli closer to the medulla** and **long loops of Henle** that extend deep into the medulla, aiding in **water reabsorption and urine concentration**.

Conclusion:

The correct answer is (2) **Loop of Henle of juxta medullary nephron runs deep into the medulla**.

Quick Tip

Juxta medullary nephrons help in the concentration of urine by creating a hyperosmotic medullary interstitium.

189. Given below are two statements: Statement I: Mitochondria and chloroplasts both double membrane-bound organelles.

Statement II: Inner membrane of mitochondria is relatively less permeable, as compared to chloroplast.

In the light of the above statements, choose the mis appropriate answer from the options given below:

(1) Both Statement I and Statement II are incorrect.

(2) Statement I is correct but Statement II is incorrect.

(3) Statement I is incorrect but Statement II is correct.

(4) Both Statement I and Statement II are correct.

Correct Answer: (2) Statement I is correct but Statement II is incorrect.

Solution:

Understanding Mitochondria and Chloroplasts

Step 1: Structural Features of Mitochondria and Chloroplasts

- Both **mitochondria** and **chloroplasts** have a **double membrane** and contain their own **DNA**, making them **semi-autonomous organelles**.
- The **inner membrane of mitochondria** contains **cristae** and is highly **impermeable** due to the presence of **cardiolipin**.
- In contrast, **chloroplast inner membranes** are relatively **more permeable** and contain **thylakoids** instead of cristae.

Conclusion:

The correct answer is (2) **Statement I is correct but Statement II is incorrect**.

Quick Tip

Mitochondria are the powerhouses of the cell, while chloroplasts are responsible for photosynthesis in plants.

---

190. Given below are two statements:

Statement I:Gause's competitive exclusion principle states that two closely related species competing for different resources cannot exist indefinitely.

Statement II: According to Gause's principle, during competition, the inferior species will be eliminated. This may be true if resources are limiting.

In the light of the above statements, choose the correct answer from the options given below :

(1) Both Statement I and Statement II are false.

(2) Statement I is true but Statement II is false.

(3) Statement I is false but Statement II is true.

(4) Both Statement I and Statement II are true.

Correct Answer: (3) Statement I is false but Statement II is true.

Solution:

Understanding Gause's Competitive Exclusion Principle

Step 1: Defining Gause's Principle

- **Gause's Competitive Exclusion Principle** states that **two species** competing for the **same limited resource** cannot coexist indefinitely in the **same ecological niche**.

Step 2: Evaluating the Statements

- **Statement I (Incorrect):**
  - Competing species **can coexist** if they evolve mechanisms for **resource partitioning** or occupy **slightly different niches**.
- **Statement II (Correct):**
  - The **inferior species** may be **eliminated** only if resources are **truly limiting** and **no adaptation or niche differentiation** occurs.

Conclusion:

The correct answer is (3) **Statement I is false but Statement II is true**.

Quick Tip

Species coexistence can occur if they use different resources or occupy different ecological niches.

191. The following are the statements about non-chordates:

A. Pharynx is perforated by gill slits.

B. Notochord is absent.

C. Central nervous system is dorsal.

D. Heart is dorsal if present.

E. Post-anal tail is absent.

Choose the most appropriate answer from the options given below:

(1) A, B & D only

(2) B, D & E only

(3) B, C & D only

(4) A & C only

Correct Answer: (2) B, D & E only

Solution:

Understanding Non-Chordate Characteristics

Step 1: Identifying Correct Statements

- **Absence of Notochord (B - Correct):**
  - Non-chordates **lack a notochord**, which is a defining feature of chordates.
- **Ventral Heart (D - Correct):**
  - Non-chordates have a **ventral heart**, whereas chordates have a **dorsal heart**.
- **Absence of Post-Anal Tail (E - Correct):**
  - Non-chordates **do not have a post-anal tail**, unlike chordates.

Step 2: Identifying Incorrect Statements

- **Presence of Pharyngeal Gill Slits (A - Incorrect):**
  - Pharyngeal gill slits are a characteristic of **chordates**, not non-chordates.

- **Dorsal Central Nervous System (C - Incorrect):**
  - Non-chordates have a **ventral nervous system**, while chordates have a **dorsal central nervous system**.

Conclusion:

The correct answer is (2) **B, D & E only**.

Quick Tip

Chordates are characterized by a dorsal nerve cord, notochord, and post-anal tail, whereas non-chordates lack these features.

---

192. Match List I with List II:

	List I		List II
A.	Exophthalmic goiter	I.	Excess secretion of cortisol, moon face & hypergylcemia.
B.	Acromegaly	II.	Hypo-secretion of thyroid hormone and stunted growth.
C.	Cushing's syndrome	III.	Hyper secretion of thyroid hormone & protruding eye balls.
D.	Cretinism	IV.	Excessive secretion of growth hormone.

Choose the correct answer from the options given below :

(1) A-IV, B-II, C-I, D-III

(2) A-III, B-IV, C-II, D-I

(3) A-III, B-IV, C-I, D-II

(4) A-I, B-III, C-II, D-IV

Correct Answer: (3) A-III, B-IV, C-I, D-II

Solution:

Understanding Endocrine Disorders

Step 1: Matching Endocrine Disorders with Their Causes

- **Exophthalmic Goiter (A-III):**
  - Also known as **Graves' disease**, it occurs due to **excess thyroid hormone**.
  - It leads to **protruding eyeballs** (exophthalmos) and increased metabolism.
- **Acromegaly (B-IV):**
  - Caused by **excess secretion of growth hormone** in adults.

- Results in **enlargement of facial bones, hands, and feet**.

- **Cushing's Syndrome (C-I):**
  - Results from **excess cortisol secretion**.
  - Causes **a moon-shaped face, obesity, and hypertension**.

- **Cretinism (D-II):**
  - Occurs due to **thyroid hormone deficiency** in infants.
  - Leads to **stunted growth, mental retardation, and delayed puberty**.

Conclusion:

The correct answer is (3) **A-III, B-IV, C-I, D-II**.

Quick Tip

Hormonal imbalances cause distinct syndromes; understanding their effects is key in diagnosing endocrine disorders.

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193. Match List I with List II:

List I	List II
A. Mesozoic Era	I. Lower invertebrates
B. Proterozoic Era	II. Fish Amphibia
C. Cenozoic Era	III. Birds Reptiles
D. Paleozoic Era	IV.Mammals

Choose the correct answer from the options given below :

(1) A-III, B-I, C-II, D-IV

(2) A-I, B-II, C-IV, D-III

(3) A-III, B-I, C-IV, D-II

(4) A-II, B-I, C-III, D-IV

Correct Answer: (3) A-III, B-I, C-IV, D-II

Solution:

Understanding Geological Eras

Step 1: Matching Geological Eras with Their Characteristics

- **Mesozoic Era (A-III):**
  - Known as the **Age of Reptiles**, it was dominated by **dinosaurs** and the first **birds**.
- **Proterozoic Era (B-I):**
  - Featured **early invertebrates** such as **sponges and algae**.
- **Cenozoic Era (C-IV):**
  - Known as the **Age of Mammals**, it saw the evolution and diversification of **modern mammals**.
- **Paleozoic Era (D-II):**
  - Marked the emergence of the first **vertebrates**, including **fish and amphibians**.

Conclusion:

The correct answer is (3) **A-III, B-I, C-IV, D-II**.

Quick Tip

Understanding geological eras helps in tracing evolutionary history. The Cenozoic Era is the current era of mammals.

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194. Match List I with List II:

List I	List II
A. Unicellular glandular epithelium	I. Salivary glands
B. Compound epithelium	II. Pancreas
C. Multicellular glandular epithelium	III. Goblet cells of alimentary canal
D. Endocrine glandular epithelium	IV. Moist surface of buccal cavity

Choose the correct answer from the options given below:

(1) A-IV, B-III, C-I, D-II

(2) A-III, B-IV, C-I, D-II

(3) A-II, B-I, C-IV, D-III

(4) A-II, B-I, C-III, D-IV

Correct Answer: (2) A-III, B-IV, C-I, D-II

Solution:

Understanding Epithelial Tissue Types

Step 1: Identifying Different Types of Epithelial Tissues

- **Goblet Cells (A-III):**
  - Goblet cells are **unicellular glandular epithelium** found in the **alimentary canal**, where they secrete mucus for lubrication.
- **Moist Buccal Cavity Lining (B-IV):**
  - The lining of the **buccal cavity** consists of **compound epithelium**, which provides **protection against mechanical stress**.
- **Salivary Glands (C-I):**
  - Salivary glands are **multicellular glandular epithelium**, responsible for the secretion of **saliva**.
- **Pancreas (D-II):**
  - The pancreas has **endocrine glandular epithelium**, which secretes hormones such as **insulin and glucagon**.

Conclusion:

The correct answer is (2) **A-III, B-IV, C-I, D-II**.

Quick Tip

Epithelial tissues serve diverse roles in secretion, protection, and absorption, forming glandular structures in the body.

---

195. As per ABO blood grouping system, the blood group of father is B^+, mother is A^+ and child is O^+. Their respective genotype can be

(A) $I^Bi/I^Ai/ii$

(B) $I^BI^B/I^Ai/ii$

(C) $I^AI^B/ii/I^Bi$

(D) $I^Ai/I^Bi/I^Ai$

(E) $ii^B/ii/I^AI^B$

Choose the most appropriate answer from the options given below:

(1) B only

(2) C & B only

(3) D & E only

(4) A only

Correct Answer: (4) A only

Solution:

Step 1: Understanding Blood Group Inheritance

- The ABO blood grouping system is determined by the alleles I^A, I^B, and i.
- Individuals with blood group O must have the genotype ii, meaning they receive one i allele from each parent.

Step 2: Genotype Analysis

- **Father's Genotype (B^+):** - Blood group B can be either I^BI^B or I^Bi. - Since the child has blood group O (ii), the father must have an i allele. - Thus, the father's genotype must be I^Bi.
- **Mother's Genotype (A^+):** - Blood group A can be either I^AI^A or I^Ai. - Since the child has blood group O (ii), the mother must also have an i allele. - Thus, the mother's genotype must be I^Ai.

Step 3: Evaluating the Given Options

- The correct parental genotype is I^Bi (father) and I^Ai (mother), producing a child with genotype ii (O blood group).
- Option **(A)** $I^Bi/I^Ai/ii$ correctly represents this combination.
- Other options do not match the inheritance pattern.

Conclusion:

Since only option A is correct, the correct answer is (4) **A only**.

Quick Tip

Tip for Blood Group Inheritance:

- Blood group O individuals must have the genotype ii (homozygous recessive).
- Parents with blood groups A and B can have an O blood group child only if both carry the recessive i allele (i.e., genotypes I^Ai and I^Bi).
- Use a Punnett square to determine possible offspring blood groups based on parental genotypes.

196. Match List I with List II related to the digestive system of cockroach:

	List I		List II
A.	The structures used for storing of food	I.	Gizzard
B.	Ring of 6-8 blind tubules at junction of foregut and midgut.	II.	Gastric Caeca
C.	Ring of 100-150 yellow coloured thin filaments at junction of midgut and hindgut.	III.	Malpighian tubules
D.	The structures used for grinding the food.	IV.	Crop

(1) A-I, B-II, C-III, D-IV

(2) A-IV, B-III, C-II, D-I

(3) A-III, B-II, C-IV, D-I

(4) A-IV, B-II, C-III, D-I

Correct Answer: (4) A-IV, B-II, C-III, D-I

Solution:

Understanding the Digestive System of Cockroach

Step 1: Matching Digestive System Components with Their Functions

- **Crop (A-IV):**
  - The crop serves as a **storage organ** where food is temporarily held before digestion begins.
- **Gastric Caeca (B-II):**
  - These structures **secrete digestive enzymes** into the midgut to aid in digestion.

- **Malpighian Tubules (C-III):**
  - These function in **excretion** by removing nitrogenous wastes from the hemolymph at the **junction of the midgut and hindgut**.
- **Gizzard (D-I):**
  - The gizzard is responsible for **grinding food particles** before they move to the midgut for digestion.

Conclusion:

The correct answer is (4) **A-IV, B-II, C-III, D-I**.

Quick Tip

In cockroaches, food is stored in the crop, ground in the gizzard, digested with the help of gastric caeca, and waste is excreted by Malpighian tubules.

---

197. Given below are two statements:

Statement I: Bone marrow is the main lymphoid organ where all blood cells including lymphocytes are produced.

Statement II: Both bone marrow and thymus provide microenvironments for the development and maturation of T-lymphocytes.

In the light of the above statements, choose the most appropriate answer from the options given below:

(1) Both Statement I and Statement II are incorrect.

(2) Statement I is correct but Statement II is incorrect.

(3) Statement I is incorrect but Statement II is correct.

(4) Both Statement I and Statement II are correct.

Correct Answer: (4) Both Statement I and Statement II are correct.

Solution:

Step 1: Understanding the Role of Bone Marrow

- Bone marrow is a **primary lymphoid organ** responsible for the **production of all blood cells**, including **lymphocytes** (both B and T cells).

- The process of blood cell formation in the bone marrow is known as **hematopoiesis**.
- Thus, **Statement I is correct**.

Step 2: Understanding the Role of Bone Marrow and Thymus in T-lymphocyte Maturation

- **Bone marrow:** Produces immature **T-lymphocytes**, which migrate to the thymus for maturation.
- **Thymus:** Provides a **specialized microenvironment** for the **development and maturation of T-lymphocytes**.
- Both bone marrow and thymus play essential roles in **T-cell development and maturation**.
- Thus, **Statement II is also correct**.

Conclusion:

Since both statements are correct, the correct answer is (4) **Both Statement I and Statement II are correct**.

Quick Tip

Primary lymphoid organs (bone marrow and thymus) are responsible for the formation and maturation of lymphocytes.

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198. Given below are two statements:

Statement I: The cerebral hemispheres are connected by a nerve tract known as the corpus callosum.

Statement II: The brain stem consists of the medulla oblongata, pons, and cerebrum.

(1) Both Statement I and Statement II are incorrect.

(2) Statement I is correct but Statement II is incorrect.

(3) Statement I is incorrect but Statement II is correct.

(4) Both Statement I and Statement II are correct.

Correct Answer: (2) Statement I is correct but Statement II is incorrect.

Solution:

Understanding Brain Structures.

- The corpus callosum is a thick band of nerve fibers connecting the two cerebral hemispheres.

- The brain stem includes the medulla oblongata, pons, and midbrain, but not the cerebrum.

Conclusion: The correct answer is (2) Statement I is correct but Statement II is incorrect.

Quick Tip

The brain stem consists of the midbrain, pons, and medulla oblongata, controlling involuntary functions like heartbeat and respiration.

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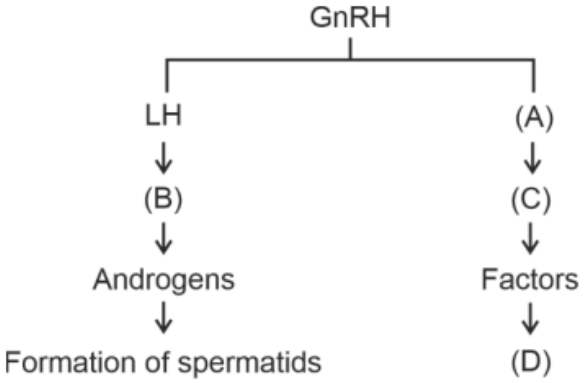
199. Identify the correct option (A), (B), (C), (D) with respect to spermatogenesis:



(1) ICSH, Interstitial cells, Leydig cells, spermiogenesis.

(2) FSH, Sertoli cells, Leydig cells, spermatogenesis.

(3) ICSH, Leydig cells, Sertoli cells, spermatogenesis.

(4) FSH, Leydig cells, Sertoli cells, spermiogenesis.

Correct Answer: (4) FSH, Leydig cells, Sertoli cells, spermiogenesis.

Solution:

Understanding Spermatogenesis

Step 1: Role of Hormones in Spermatogenesis

- **Follicle Stimulating Hormone (FSH):**
  - FSH stimulates **Sertoli cells**, which provide **nourishment** and support to developing sperm cells.

- **Luteinizing Hormone (LH) and Leydig Cells:**
  - LH stimulates **Leydig cells** to produce **testosterone**, which is essential for sperm production.

Step 2: Maturation of Sperm Cells

- **Sertoli Cells:**
  - Provide **structural and metabolic support** to developing spermatozoa.
- **Spermiogenesis:**
  - The final step of spermatogenesis, where **spermatids mature into spermatozoa (sperm cells)**.

Conclusion:

The correct answer is (4) **FSH, Leydig cells, Sertoli cells, spermiogenesis**.

Quick Tip

FSH activates Sertoli cells, LH stimulates Leydig cells to produce testosterone, and spermiogenesis is the final stage in sperm maturation.

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200. Match List I with List II:

List I	List II
A. P wave	I. Heart muscles are electrically silent.
B. QRS complex	II. Depolarisation of ventricles.
C. T wave	III.Depolarisation of atria.
D. T-P gap	IV. Repolarisation of ventricles.

Choose the correct answer from the options given below :

(1) A-III, B-II, C-IV, D-I

(2) A-II, B-III, C-I, D-IV

(3) A-IV, B-II, C-I, D-III

(4) A-I, B-III, C-IV, D-II

Correct Answer: (1) A-III, B-II, C-IV, D-I

Solution:

Understanding ECG Waves

Step 1: Identifying the Components of an ECG Wave

- **P Wave (A-III):**
  - Represents **atrial depolarization**, leading to **atrial contraction**.
- **QRS Complex (B-II):**
  - Represents **ventricular depolarization**, which causes the **ventricles to contract**.
- **T Wave (C-IV):**
  - Represents **ventricular repolarization**, restoring the **resting potential** of the ventricles.
- **T-P Gap (D-I):**
  - Represents a **silent period** when the heart is at rest between beats.

Conclusion:

The correct answer is (1) **A-III, B-II, C-IV, D-I**.

Quick Tip

ECG waves reflect electrical activity of the heart: P wave (atrial depolarization), QRS complex (ventricular depolarization), T wave (ventricular repolarization), and T-P interval (heart at rest).
