

NEET UG 2024 Zoology (Q5) Question Paper With Solutions

SECTION-A

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

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 being.

Choose the correct answer from the options given below:

- (1) Both A and R are true and R is the correct explanation of A
- (2) Both A and R are true but R is NOT the correct explanation of A
- (3) A is true but R is false
- (4) A is false but R is true

Correct Answer: (4) A is false but R is true

Solution: FSH primarily stimulates the Sertoli cells in males, not the Leydig cells as stated in Assertion A, making it false. Reason R correctly describes the hormonal functions in males and females, making it true.

Quick Tip

Understanding hormone actions is crucial for grasping physiological interactions in both reproductive and non-reproductive contexts.

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

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

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

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

Solution: - A, Pons controls respiration and other autonomic functions.

- B, Hypothalamus is known for housing neuro secretory cells that regulate hormonal activities.

- C, Medulla connects different brain regions and involves in reflex actions.

- D, Cerebellum aids in balance, coordination, and motor control.

Quick Tip

The brain's complexity is mirrored in the specialized functions of its various parts, understanding which helps in both medical and psychological contexts.

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

(1) Cortisol

(2) Testosterone

(3) Progesterone

(4) Glucagon

Correct Answer: (4) Glucagon

Solution: Glucagon is a peptide hormone, not a steroid hormone. It is produced by the pancreas and increases blood glucose levels.

Quick Tip

Differentiating between steroid and peptide hormones is fundamental for understanding their mechanisms of action and implications for treatments.

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

(1) Uterine fundus

(2) Isthmus

(3) Infundibulum

(4) Ampulla

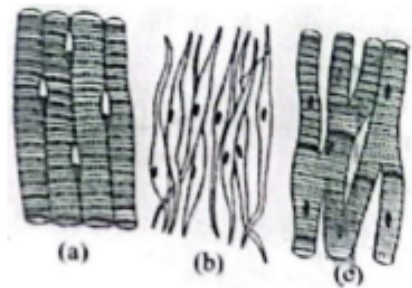
Correct Answer: (1) Uterine fundus

Solution: The uterine fundus is part of the uterus, not a component of the Fallopian tube. The Fallopian tube includes the isthmus, infundibulum, and ampulla.

Quick Tip

Understanding the anatomical structures of the female reproductive system is crucial for studying reproductive health and related medical conditions.

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



Choose the correct answer from the options given below:

- (1) (a) Smooth - Toes, (b) Skeletal - Legs, (c) Cardiac - Heart
- (2) (a) Skeletal - Triceps, (b) Smooth - Stomach, (c) Cardiac - Heart
- (3) (a) Skeletal - Biceps, (b) Involuntary - Intestine, (c) Smooth - Heart
- (4) (a) Involuntary - Nose tip, (b) Skeletal - Bone, (c) Cardiac - Heart

Correct Answer: (2) (a) Skeletal - Triceps, (b) Smooth - Stomach, (c) Cardiac - Heart

Solution: Smooth muscle is found in organs like the stomach, skeletal muscle in areas like the triceps, and cardiac muscle in the heart. This categorization reflects the typical locations and functions of these muscle types.

Quick Tip

Muscle types are distinguished by their structure and function: smooth muscles for involuntary movements, skeletal muscles for voluntary movements, and cardiac muscles for heart contractions.

156. 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-II, B-I, C-IV, D-III
- (2) A-I, B-III, C-II, D-IV
- (3) A-II, B-IV, C-I, D-III
- (4) A-III, B-II, C-IV, D-I

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

Solution: Step 1: Understanding the respiratory volumes and capacities.

Expiratory capacity (A) is the total volume of air that can be exhaled after a normal inhalation. This includes tidal volume and expiratory reserve volume, so A-II.

Functional residual capacity (B) is the volume of air remaining in the lungs after normal exhalation. It is the sum of expiratory reserve volume and residual volume, hence B-IV.

Vital capacity (C) is the total volume of air that can be exhaled after a maximum inhalation, which is the sum of tidal volume, inspiratory reserve volume, and expiratory reserve volume, so C-I.

Inspiratory capacity (D) is the maximum amount of air that can be inhaled after a normal exhalation, which is the sum of tidal volume and inspiratory reserve volume, hence D-III.

Quick Tip

Understanding lung capacities and volumes is crucial for assessing respiratory health and diagnosing pulmonary conditions.

157. The flippers of the Penguins and Dolphins are the example of the:

- (1) Adaptive radiation
- (2) Natural selection
- (3) Convergent evolution
- (4) Divergent evolution

Correct Answer: (3) Convergent evolution

Solution: The flippers of penguins and dolphins represent convergent evolution where unrelated species develop similar traits due to similar environmental pressures, despite different evolutionary backgrounds.

Quick Tip

Convergent evolution is an important concept in evolutionary biology, highlighting how similar environmental pressures can lead to similar adaptations in different species.

158. 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-IV, B-II, C-III, D-I
- (2) A-II, B-III, C-I, D-IV
- (3) A-II, B-IV, C-I, D-III
- (4) A-IV, B-I, C-III, D-II

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

- Solution:** - A, Lipase, breaks down fats and matches with II, ester bond.
 - B, Nuclease, breaks down nucleic acids and matches with IV, phosphodiester bond.
 - C, Protease, breaks down proteins and matches with I, peptide bond.
 - D, Amylase, breaks down starch and matches with III, glycosidic bond.

Quick Tip

Knowing the substrate specificities of various enzymes helps in understanding their roles in digestion and metabolism.

159. The "Ti plasmid" of *Agrobacterium tumefaciens* stands for:

Choose the correct answer from the options given below:

- (1) Tumour inhibiting plasmid
- (2) Tumor independent plasmid
- (3) Tumor inducing plasmid
- (4) Temperature independent plasmid

Correct Answer: (3) Tumor inducing plasmid

Solution: The "Ti plasmid" of *Agrobacterium tumefaciens* is known for its ability to induce tumors in plants. It is utilized in genetic engineering for gene insertion due to its natural ability to transfer genes to plant cells.

Quick Tip

The Ti plasmid is a key tool in plant genetic engineering, enabling the introduction of new traits into plant genomes.

160. Match List I with List II:

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

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

Solution: - A, Axoneme, is the structural framework of cilia and flagella, matching with II.
- B, Cartwheel pattern, is characteristic of the centriole, matching with I.
- C, Crista, is a feature of mitochondria, involved in cellular respiration, matching with IV.
- D, Satellite, pertains to specific regions on chromosomes, thus matching with III.

Quick Tip

Understanding cell structure components like axonemes and cristae is crucial for grasping cell function and organellar roles.

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

Choose the correct answer from the options given below:

- (1) Genetic recombination
- (2) Genetic drift
- (3) Gene migration
- (4) Constant gene pool

Correct Answer: (4) Constant gene pool

Solution: A constant gene pool, implying no changes in allele frequencies due to migration, mutation, or selection, will not disrupt Hardy-Weinberg equilibrium, which assumes a closed population.

Quick Tip

The Hardy-Weinberg principle is foundational in population genetics, helping to understand how evolutionary pressures influence allele frequencies.

162. Given below are two statements:

Statement I: In the nephron, the descending limb of 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.

- (1) Both Statement I and Statement II are true
- (2) Both Statement I and Statement II are false
- (3) Statement I is true but Statement II is false
- (4) Statement I is false but Statement II is true

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

Solution: Step 1: Analyzing Statement I.

Statement I says that the descending limb of the loop of Henle is impermeable to water and permeable to electrolytes. This is false because the descending limb is permeable to water but impermeable to electrolytes. The primary function of the descending limb is to allow water to be reabsorbed into the bloodstream.

Step 2: Analyzing Statement II.

Statement II mentions that the proximal convoluted tubule (PCT) is lined by simple columnar brush border epithelium and increases the surface area for reabsorption. This statement is also false. The proximal convoluted tubule is lined by simple cuboidal epithelium with a brush border of microvilli that increase the surface area for reabsorption. However, it is not columnar epithelium.

Thus, both statements are false.

Quick Tip

The nephron's structure is specialized for different functions in the kidney; understanding these can aid in comprehending renal physiology.

163. Match List I with List II:

List I		List II	
A.	α -1 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 from the options given below:

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

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

Solution:

- **A, α -1 antitrypsin**, is associated with **Emphysema** due to its deficiency leading to lung damage, matching with **III**.
- **B, Cry IAb** and **C, Cry IAc**, are Bt toxin genes used in genetically modified crops to target pests like the **Corn borer (IV)** and **Cotton bollworm (I)**, respectively.
- **D, Enzyme replacement therapy**, is a treatment for **ADA deficiency**, matching with **II**.

Quick Tip

Bt toxins such as Cry IAb and Cry IAc are specific to their target pests and are important tools in agricultural biotechnology for pest resistance.

164. 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) C-E-D-A-B

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

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

Solution: The correct sequence for cell division phases is:

- E, Gap 1 phase, initial growth phase before DNA synthesis.
- C, Synthesis phase, where DNA is replicated.
- A, Gap 2 phase, preparation for mitosis.
- D, Karyokinesis, division of the cell's nucleus.
- B, Cytokinesis, division of the cell's cytoplasm.

Quick Tip

Understanding the cell cycle phases is crucial for appreciating cellular growth, replication, and division mechanisms.

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

- (1) 5th segment
- (2) 10th segment
- (3) 8th and 9th segment
- (4) 11th segment

Correct Answer: (2) 10th segment

Solution: Anal cerci in cockroaches are located on the 10th segment of the abdomen, serving as sensory structures to detect air movements.

Quick Tip

Anal cerci are significant in the study of entomology as they provide insights into insect anatomy and sensory adaptations.

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

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

Solution: A, Down's syndrome, is characterized by an extra copy of chromosome 21, matching with III.

B, α -Thalassemia, and C, β -Thalassemia, involve the 16th chromosome (IV) and 11th chromosome (I), respectively, affecting hemoglobin production.

D, Klinefelter's syndrome, involves the presence of an extra 'X' chromosome in males, matching with II.

Quick Tip

Genetic disorders such as Down's syndrome and thalassemia highlight the importance of chromosomes in genetic health and disease.

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

- (1) Coitus interruptus
- (2) Periodic abstinence
- (3) Lactational amenorrhea
- (4) Vaults

Correct Answer: (4) Vaults

Solution: Step 1: Understanding the concept of natural/traditional contraceptive methods.

Natural or traditional contraceptive methods rely on behavioral and biological practices to prevent pregnancy without the use of medical or chemical products. Examples include coitus interruptus (withdrawal method), periodic abstinence (avoiding intercourse during fertile periods), and lactational amenorrhea (postpartum infertility that occurs when a woman is breastfeeding).

Step 2: Identifying the incorrect option.

Vaults, which are mentioned in option (D), refer to cervical caps, a type of barrier contraceptive device and not a natural method. Hence, (D) Vaults is not a natural/traditional contraceptive method.

Quick Tip

Remember, traditional methods usually involve timing or certain behaviors, not physical devices or pharmaceuticals.

168. 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-I, B-III, C-II, D-IV
- (2) A-IV, B-III, C-I, D-II
- (3) A-III, B-I, C-IV, D-II
- (4) A-II, B-IV, C-III, D-I

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

Solution: Matching diseases with their causative agents.

- A. Typhoid is caused by a bacterium, so A-IV.
- B. Leishmaniasis is caused by a protozoan, so B-III.
- C. Ringworm is caused by fungi, making C-I.
- D. Filariasis is caused by a nematode (worm), thus D-II.

Quick Tip

Linking diseases to their pathogens can help simplify these types of matching questions.

169. 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-IV, B-II, C-III, D-I
- (2) A-II, B-I, C-IV, D-III
- (3) A-II, B-IV, C-I, D-III
- (4) A-IV, B-III, C-II, D-I

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

Solution: Matching items from List I with List II.

- A. Pleurobrachia belongs to the phylum Ctenophora, so A-II.
B. Radula is a characteristic of mollusks, making B-I.
C. Stomochord is found in Hemichordata, thus C-IV.
D. Air bladder is associated with bony fishes (Osteichthyes), so D-III.

Quick Tip

When matching organisms with characteristics or classifications, knowing unique features linked to each group helps in quick identification.

170. Match List I with List II:

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

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

Solution: Matching the medical terms with their relevant causes or tests.

A. Common cold is primarily caused by Rhinoviruses, so A-III.

B. Haemozoin is a byproduct of the malaria parasite, Plasmodium, thus B-I.

C. Widal test is used for the diagnosis of Typhoid, making C-II.

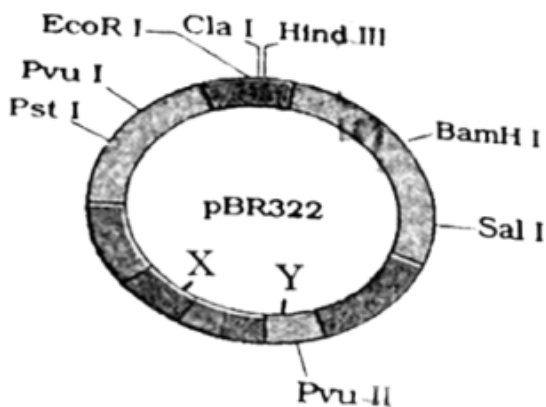
D. Allergies can be triggered by various allergens, including dust mites, hence D-IV.

Quick Tip

Familiarity with common medical tests and their associated diseases is crucial for accurate diagnosis and treatment.

171. The following diagram showing restriction sites in *E. coli* cloning vector pBR322.

Find the role of 'X' and 'Y' genes:



- (1) The gene 'X' is responsible for resistance to antibiotics and 'Y' for protein involved in the replication of Plasmid.
- (2) The gene 'X' is responsible for controlling the copy number of the linked DNA and 'Y' for protein involved in the replication of Plasmid.
- (3) The gene 'X' is for protein involved in replication of Plasmid and 'Y' for resistance to antibiotics.
- (4) Gene 'X' is responsible for recognitions sites and 'Y' is responsible for antibiotic resistance.

Correct Answer: (2) 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: Step 1: Analyzing the diagram and understanding the functions of genes 'X' and 'Y' in pBR322.

pBR322 is a commonly used plasmid vector in genetic engineering with multiple restriction sites. It contains two key genes, 'X' and 'Y', which are essential for its function as a cloning vector.

Step 2: Identifying the roles of 'X' and 'Y'.

The gene 'X' in pBR322 is known for controlling the copy number of the plasmid itself within the bacterial cell, which is crucial for ensuring the plasmid is replicated efficiently. The gene 'Y', on the other hand, is involved in the replication process of the plasmid, assisting in the replication mechanism.

Quick Tip

Understanding the genetic makeup and function of cloning vectors like pBR322 is crucial for effective genetic manipulation and cloning practices.

172. Given below are two statements:

Statement I: The presence or absence of 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 true

- (2) Both Statement I and Statement II are false
- (3) Statement I is true but Statement II is false
- (4) Statement I is false but Statement II is true

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

Solution: Step 1: Analyzing Statement I. The hymen's condition can be affected by various non-sexual activities such as physical exercise or tampon use, making it an unreliable indicator of virginity. Therefore, Statement I is true.

Step 2: Analyzing Statement II. The hymen can tear during various activities, not just during the first coitus. It may remain intact even after sexual intercourse. Thus, Statement II is false.

Quick Tip

Understanding human anatomy and the variability of physiological features is essential for accurate medical and societal perceptions.

173. Following are the stages of pathway for conduction of an action potential through the heart:

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

Correct Answer: (1) E-C-A-D-B

Solution: Understanding the pathway of the cardiac conduction system.

The sequence of action potential conduction in the heart starts at the SA node, moves to the

AV node, then to the AV bundle, through the bundle branches, and finally to the Purkinje fibers. This ensures the coordinated contraction of the heart chambers.

Quick Tip

The SA node is known as the pacemaker of the heart because it initiates the heartbeat and controls the heart rate.

174. 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) D-A-C-B

(2) B-A-D-C

(3) C-B-D-A

(4) A-D-C-B

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

Solution: Arranging the stages of human evolution in chronological order.

The correct sequence from the earliest to the most recent is:

- Homo habilis

- Homo erectus

- Homo neanderthalensis

- Homo sapiens

This order reflects the evolutionary development from more primitive to more advanced forms of early humans.

Quick Tip

Always arrange evolutionary stages based on fossil evidence and chronological findings in paleontology.

175. Which of the following factors are favourable for the formation of oxyhaemoglobin in alveoli?

- (1) Low $p\text{CO}_2$ and High H^+ concentration
- (2) Low $p\text{CO}_2$ and High temperature
- (3) High $p\text{O}_2$ and High $p\text{CO}_2$
- (4) High $p\text{O}_2$ and Lesser H^+ concentration

Correct Answer: (4) High $p\text{O}_2$ and Lesser H^+ concentration

Solution: Understanding the Factors Influencing Oxyhaemoglobin Formation:

The formation of oxyhaemoglobin, the complex of oxygen and hemoglobin, is influenced by several physiological factors. This process is essential for transporting oxygen from the lungs to the tissues.

Analysis of Each Factor:

Partial Pressure of Oxygen $p\text{O}_2$: Higher $p\text{O}_2$ increases the affinity of hemoglobin for oxygen, facilitating the formation of oxyhaemoglobin. In the alveoli, where oxygen concentration is high due to fresh air intake, the $p\text{O}_2$ is naturally higher, promoting this binding.

Partial Pressure of Carbon Dioxide $p\text{CO}_2$: Lower $p\text{CO}_2$ reduces the competition between carbon dioxide and oxygen for binding sites on hemoglobin, further enhancing oxygen binding.

Hydrogen Ion Concentration H^+ : Lower H^+ concentration, or a higher pH, shifts the oxygen-hemoglobin dissociation curve to the left (known as the Bohr effect). This shift increases hemoglobin's affinity for oxygen, facilitating the formation of oxyhaemoglobin.

Detailed Analysis of Options: Option (1) Low $p\text{CO}_2$ and High H^+ concentration is not favorable because high H^+ concentration (or low pH) would decrease hemoglobin's oxygen affinity.

Option (2) Low $p\text{CO}_2$ and High temperature: While lower $p\text{CO}_2$ is favorable, higher temperatures actually decrease the affinity of hemoglobin for oxygen, promoting oxygen release rather than uptake in tissues.

Option (3) High $p\text{O}_2$ and High $p\text{CO}_2$: While high $p\text{O}_2$ is favorable, high $p\text{CO}_2$ would lower hemoglobin's oxygen affinity due to competitive inhibition and a shift in pH.

Option (4) High pO_2 and Lesser H^+ concentration: This is the most favorable condition in the alveoli for oxyhaemoglobin formation. High pO_2 enhances oxygen loading, and lesser H^+ concentration increases hemoglobin's affinity for oxygen, facilitating efficient oxygen transport.

Quick Tip

Remember that oxyhaemoglobin formation is influenced by the oxygen-hemoglobin dissociation curve, which shifts based on conditions like pO_2 , pCO_2 , pH, and temperature.

176. 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-IV, B-II, C-I, D-III
- (2) A-I, B-II, C-IV, D-III
- (3) A-II, B-IV, C-I, D-III
- (4) A-IV, B-III, C-II, D-I

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

Solution: Step 1: Matching the subphases of Prophase I with their specific characteristics.

- Leptotene: Chromosomes appear as thin threads, so D-III. - Zygotene: Synaptonemal complex forms, marking the pairing of homologous chromosomes, so C-I.

- Pachytene: Recombination nodules appear, indicating the occurrence of genetic recombination, so B-IV.

- Diakinesis: Terminalisation of chiasmata completes, where the chiasma move to the ends of the chromosomes, so A-II.

Quick Tip

Understanding the sequence and characteristics of meiotic phases can aid in comprehending genetic variation and inheritance.

177. Which of the following statements is incorrect?

- (A) A bio-reactor provides optimal growth conditions for achieving the desired product.
- (B) Most commonly used bio-reactors are of stirring type.
- (C) Bio-reactors are used to produce small scale bacterial cultures.
- (D) Bio-reactors have an agitator system, an oxygen delivery system, and foam control system.

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

Solution: Step 1: Identifying the incorrect statement about bio-reactors. Bio-reactors are designed for both small and large-scale production of cultures, not exclusively for small scale as suggested in statement (C). They are highly versatile and can be adapted for various sizes and types of production, making (C) the incorrect statement.

Quick Tip

Bio-reactors are critical in biotechnological applications where precise control of the environment is necessary to optimize the growth and productivity of biological systems.

178. 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) B only
- (2) A only
- (3) C only

(4) D only

Correct Answer: (2) A only

Solution: Evaluating each statement based on animal classification.

A. True - Annelids possess a well-formed coelom and are classified as true coelomates.

B. False - Poriferans do not have a body cavity and are neither coelomates nor pseudocoelomates.

C. False - Aschelminthes are pseudocoelomates, not acoelomates. They have a body cavity that is not lined with mesoderm on all sides.

D. False - Platyhelminthes are acoelomates, having no body cavity at all.

Quick Tip

Understanding the anatomical characteristics of different phyla helps in correctly categorizing them as coelomates, pseudocoelomates, or acoelomates.

179. 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-III, B-I, C-IV, D-II

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

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

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

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

Solution: Matching the types of IUDs and Implants with their specific categories.

Non-medicated IUD: Lippes loop, so A-III.

Copper releasing IUD: Multiload 375, so B-I.

Hormone releasing IUD: LNG-20, so C-IV.

Implants: These typically release progestogens, so D-II.

Quick Tip

Understanding the different types of IUDs and their active components can help in providing appropriate contraceptive advice.

180. Which one is the correct product of DNA dependent RNA polymerase to the given template?

DNA Template: 3'TACATGGCAAATATCCATTCA5'

- (1) 5' AUGUACCGUUUAAUGGUUAAG3'
- (2) 5' AUUGUAAAGUUUAUGGUAAGU3'
- (3) 5' AUUGUACCGUUUAAUGGGAAGU3'
- (4) 5' ATGTACCGTTTATAGGTAAGT3'

Correct Answer: (1) 5' AUGUACCGUUUAAUGGUUAAG3'

Solution: Step 1: Transcribing the DNA template to RNA.

The RNA polymerase reads the DNA template strand and synthesizes an RNA strand by replacing thymine (T) with uracil (U) and complementing the other bases accordingly:

- A -> U
- T -> A
- C -> G
- G -> C

Quick Tip

Remember that RNA polymerase reads the DNA template from 3' to 5', producing an RNA strand from 5' to 3'.

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

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

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

- (1) Both A and R are correct and R is the correct explanation of A
- (2) Both A and R are correct but R is NOT the correct explanation of A
- (3) A is correct but R is not correct
- (4) A is not correct but R is correct

Correct Answer: (1) Both A and R are correct and R is the correct explanation of A

Solution: Evaluating the relationship between Assertion A and Reason R.

The assertion highlights the importance of breast-feeding in early infant development, while the reason correctly states that colostrum, which is rich in antibodies, is crucial for developing the baby’s immune system. This makes the reason a correct and direct explanation of the assertion.

Quick Tip

Colostrum, the first form of milk produced by the mammary glands, is sometimes referred to as "liquid gold" for its nutritional and antibody-rich composition.

182. Match List I with List II:

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

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

Solution: Matching the types of joints with their descriptions.

- Fibrous joints: Found in the skull, these joints allow no movement, so A-III.
- Cartilaginous joints: Commonly found between adjacent vertebrae, allowing limited movement, so B-I.

- Hinge joints: Example includes the knee, which assists in locomotion, so C-IV.
- Ball and socket joints: Example includes the humerus and pectoral girdle, allowing rotational movement, so D-II.

Quick Tip

Knowing the mechanical functionality and anatomical location of different joint types is crucial for understanding their role in the human body's mobility.

183. Match List I with List II:

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

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

Solution: Matching the species with their common names.

Pterophyllum: Known as the angel fish, so A-III.

Myxine: Known as the hag fish, so B-I.

Pristis: Commonly referred to as the saw fish, so C-II.

Exocoetus: Known as the flying fish, so D-IV.

Quick Tip

Familiarizing yourself with the common names of species helps in easier identification and understanding of their ecological roles and adaptations.

184. Match List I with List II:

List I		List II	
A.	Cocaine	I.	Effective sedative in surgery
B.	Heroin	II.	Cannabis sativa
C.	Morphine	III.	Erythroxyllum
D.	Marijuana	IV.	Papaver somniferum

Choose the correct answer from the options given below:

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

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

Solution: Matching the substances with their sources or uses.

Cocaine is derived from Erythroxyllum, so A-III.

Heroin is derived from Papaver somniferum, so B-IV.

Morphine, used as a sedative in surgery, also comes from Papaver somniferum, so C-I.

Marijuana is associated with Cannabis sativa, so D-II.

Quick Tip

Knowing the scientific sources of drugs can aid in understanding their pharmacological effects and potential uses or abuses.

185. 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 correct answer from the options given below:

- (1) A, B & D only
- (2) A, B & E only

(3) B, C & E only

(4) C, D & E only

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

Solution: Identifying autoimmune disorders.

Myasthenia gravis, Rheumatoid arthritis, and Systemic Lupus Erythematosus are all autoimmune diseases where the body's immune system mistakenly attacks its own tissues. Gout is related to uric acid metabolism, and Muscular dystrophy is a genetic disorder, not autoimmune.

Quick Tip

Autoimmune diseases often involve the body's immune system attacking normal components as if they were foreign.

SECTION-B

186. Match List I with List II:

List I		List II	
A.	Exophthalmic goiter	I.	Excess secretion of cortisol, moon face & hyperglycemia.
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-I, B-III, C-II, D-IV

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

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

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

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

Solution: Matching the medical conditions with their hormonal imbalances.

Exophthalmic goiter involves hypersecretion of thyroid hormones causing symptoms like protruding eyeballs, so A-III.

Acromegaly results from excessive secretion of growth hormone, so B-IV.

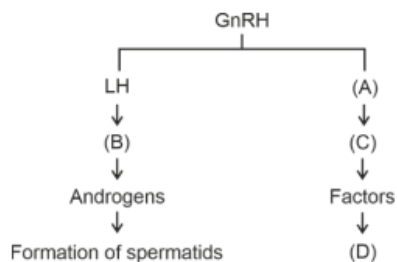
Cushing's syndrome is characterized by an excess of cortisol, leading to symptoms like moon face and hyperglycemia, so C-I.

Cretinism results from hypo-secretion of thyroid hormone, affecting growth, so D-II.

Quick Tip

Connecting endocrine disorders with their specific hormonal imbalances can clarify their physiological effects and guide appropriate treatments.

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



- (1) FSH, Leydig cells, Sertoli cells, spermiogenesis.
- (2) ICSH, Interstitial cells, Leydig cells, spermiogenesis.
- (3) FSH, Sertoli cells, Leydig cells, spermatogenesis.
- (4) ICSH, Leydig cells, Sertoli cells, spermatogenesis.

Correct Answer: (1) FSH, Leydig cells, Sertoli cells, spermiogenesis.

Solution: Step 1: GnRH induces the secretion of FSH and LH from the pituitary gland.

Step 2: FSH stimulates Sertoli cells which support spermatogenesis. Leydig cells, stimulated by LH, produce testosterone that further aids this process.

Step 3: Spermiogenesis is the final stage of spermatogenesis, where spermatids mature into spermatozoa.

Quick Tip

Remember, FSH and LH play distinct yet collaborative roles in the regulation of spermatogenesis, with FSH directly influencing Sertoli cells and LH targeting Leydig cells.

188. Given below are two statements:

Statement I: Mitochondria and chloroplasts both have double membranes bound organelles.

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

- (1) Both Statement I and Statement II are correct.
- (2) Both Statement I and Statement II are incorrect.
- (3) Statement I is correct but Statement II is incorrect.
- (4) Statement I is incorrect but Statement II is correct.

Correct Answer: (3) Statement I is correct but Statement II is incorrect.

Solution: Step 1: Confirm that both mitochondria and chloroplasts are indeed double-membraned organelles—Statement I is correct.

Step 2: The inner membrane of mitochondria is highly impermeable to maintain the proton gradient essential for ATP synthesis, more so than chloroplast membranes—Statement II is incorrect.

Quick Tip

Understanding the structural and functional differences between organelles is crucial for grasping their roles in cellular metabolism.

189. Given below are two statements:

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

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

- (1) Both Statement I and Statement II are correct.
- (2) Both Statement I and Statement II are incorrect.
- (3) Statement I is correct but Statement II is incorrect.
- (4) Statement I is incorrect but Statement II is correct.

Correct Answer: (3) Statement I is correct but Statement II is incorrect.

Solution: Step 1: The corpus callosum does connect the cerebral hemispheres—Statement I is correct.

Step 2: The brain stem includes the medulla oblongata, pons, and midbrain, not the cerebrum, making Statement II incorrect.

Quick Tip

Always double-check anatomical terms in neurobiology, as they are crucial for understanding brain function and connectivity.

190. Match List I with List II:

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

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

Solution: Step 1: RNA polymerase III is responsible for transcribing genes encoding tRNAs and some snRNAs, hence matches with IV.

Step 2: Termination of transcription in prokaryotes often involves the rho factor, an essential termination protein, thus matches with III.

Step 3: Splicing of exons in mRNA is facilitated by snRNPs (small nuclear Ribonucleoproteins), perfectly matches with I.

Step 4: The TATA box is a promotor element found in many genes, essential for forming the transcription initiation complex, correctly matches with II.

Quick Tip

The TATA box, typically found about 25-35 bases upstream of the transcription start site, plays a critical role in positioning RNA polymerase II for accurate transcription initiation.

191. 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-II, B-I, C-III, D-IV
- (2) A-III, B-I, C-II, D-IV
- (3) A-I, B-II, C-IV, D-III
- (4) A-III, B-I, C-IV, D-II

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

Solution: Step 1: The Mesozoic Era, famously known as the "Age of Reptiles", also saw the dominance of birds, hence matches with III.

Step 2: The Proterozoic Era witnessed the emergence of the first complex life, including lower invertebrates, accurately matching with I.

Step 3: The Cenozoic Era, termed the "Age of Mammals", reflects the dominance of mammals after the dinosaurs' extinction, correctly aligns with IV.

Step 4: The Paleozoic Era is well known for its diverse marine life and the early development of fish and amphibians, thus matches with II.

Quick Tip

Understanding the major geological and biological milestones of each era helps in painting a comprehensive picture of Earth's evolutionary history.

192. 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:

1. $|B^i|/|A^i|/ii$
2. $|B|B|/|A|A|/ii$
3. $|A|B|/|iA|/|B^i|$

4. $|A^i|/|B^i|/|A^i|$

5. $i|B^i|/|A|/|A|B$

Choose the most appropriate answer from the options given below :

- (1) A only
- (2) B only
- (3) C & B only
- (4) D & E only

Correct Answer: (1) A only

Solution: Step 1: Considering blood group genetics, for a child to have O blood type, each parent must contribute an i allele.

Step 2: Father with B⁺ can be either IBIB or IBi. Mother with A⁺ can be either IAIA or IAi.

Step 3: Since the child is O⁺, the only possible combination for parents is IBi (father) and IAi (mother), thus making option (A) IBi/IAi correct.

Quick Tip

In blood group inheritance, the i allele is recessive and must be inherited from both parents for a child to have blood type O.

193. Match List I with List II related to the digestive system of a 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

Choose the correct answer from the options given below:

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

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

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

Solution: Step 1: Crop is used for storing food in cockroaches, so A matches with IV.

Step 2: Gastric caeca are found at the junction of the foregut and midgut, serving as digestive glands, so B matches with II.

Step 3: Malpighian tubules, which are excretory structures, are located at the junction of the midgut and hindgut, so C matches with III.

Step 4: Gizzard, part of the digestive tract, is involved in the grinding of food, so D matches with I.

Quick Tip

Understanding the functional anatomy of cockroach digestion can clarify how nutrients are processed and waste is managed.

194. 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

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

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

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

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

Correct Answer: (1) E, A, D, C, B

Solution: Step 1: Substrate binds to the enzyme's active site, E.

Step 2: This binding forms the substrate-enzyme complex, A.

Step 3: Chemical bonds within the substrate are then broken, D.

Step 4: Leading to the release of the products from the enzyme, C.

Step 5: The enzyme is then free again to bind with another substrate, B.

Quick Tip

Memorizing the sequence of enzyme action can significantly help in understanding various biochemical reactions.

195. 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.

- (1) A & C only
- (2) A, B & D only
- (3) B, D & E only
- (4) B, C & D only

Correct Answer: (3) B, D & E only

Solution: Step 1: Analyzing each statement based on non-chordate characteristics:

A is incorrect as non-chordates do not have pharynx perforated by gill slits, typical of chordates.

B is correct, as non-chordates lack a notochord.

C is incorrect, non-chordates generally have a ventral nervous system, not dorsal.

D is correct, non-chordates that possess a heart, generally have it positioned dorsally.

E is correct, as non-chordates do not possess a post-anal tail.

Quick Tip

Understanding fundamental differences between chordates and non-chordates is crucial in zoology, especially regarding structural anatomy.

196. 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.

- (1) Both Statement I and Statement II are correct.
- (2) Both Statement I and Statement II are incorrect.
- (3) Statement I is correct but Statement II is incorrect.
- (4) Statement I is incorrect but Statement II is correct.

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

Solution: Step 1: Statement I is correct as bone marrow is indeed the primary lymphoid organ responsible for the production of all types of blood cells, including lymphocytes.

Step 2: Statement II is also correct. The bone marrow is involved in the early stages of T-lymphocyte development, while the thymus is responsible for the subsequent maturation and differentiation of these cells.

Quick Tip

Bone marrow and thymus play complementary roles in the development of T-lymphocytes, a key component of the adaptive immune system.

197. 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-I, B-III, C-IV, D-II
- (2) A-III, B-II, C-IV, D-I
- (3) A-II, B-III, C-I, D-IV
- (4) A-IV, B-II, C-I, D-III

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

Solution: Step 1: The P wave corresponds to the depolarization of the atria, so A matches with III. **Step 2:** The QRS complex represents the depolarization of the ventricles, matching B with II. **Step 3:** The T wave indicates the repolarization of the ventricles, so C matches

with IV. **Step 4:** The T-P gap, a period where the heart muscles are relatively silent electrically, aligns D with I.

Quick Tip

Memorizing the electrocardiogram (ECG) components can significantly aid in understanding cardiac physiology and diagnosing related disorders.

198. 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 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 true.
- (2) Both Statement I and Statement II are false.
- (3) Statement I is true but Statement II is false.
- (4) Statement I is false but Statement II is true.

Correct Answer: (4) Statement I is false but Statement II is true.

Solution: Step 1: Statement I is false because the competitive exclusion principle states that two species competing for the *same* limiting resources cannot coexist at constant population values.

Step 2: Statement II is true as it correctly summarizes that during such competition, the species that is less efficient at using the resources will likely be outcompeted.

Quick Tip

The competitive exclusion principle is fundamental in understanding how species interactions shape community structure.

199. Choose the correct statement given below regarding juxta medullary nephron.

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

- (2) Renal corpuscle of juxta medullary nephron lies in the outer portion of the renal medulla.
- (3) Loop of Henle of juxta medullary nephron runs deep into medulla.
- (4) Juxta medullary nephrons outnumber the cortical nephrons.

Correct Answer: (3) Loop of Henle of juxta medullary nephron runs deep into medulla.

Solution: Juxta medullary nephrons have their renal corpuscles near the cortex-medulla junction and are characterized by their long loops of Henle, which extend deep into the renal medulla. This aids in the concentration of urine, a key feature distinguishing them from cortical nephrons.

Quick Tip

The deep penetration of the loop of Henle into the medulla allows juxta medullary nephrons to effectively concentrate urine and play a crucial role in maintaining water balance in the body.

200. 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-I, B-III, C-IV, D-II
- (2) A-III, B-II, C-I, D-IV
- (3) A-III, B-IV, C-I, D-II
- (4) A-IV, B-II, C-I, D-III

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

Solution: Step 1: Unicellular glandular epithelium refers to individual cells capable of secretion, such as goblet cells, so A matches with III.

Step 2: Compound epithelium is found covering body surfaces or lining cavities, not typically associated with glandular function, making B match with IV.

Step 3: Multicellular glandular epithelium includes structures such as the salivary glands, so

C matches with I.

Step 4: Endocrine glandular epithelium, like that found in the pancreas, secretes hormones directly into the bloodstream, so D matches with II.

Quick Tip

Knowing the structure and function of different epithelial tissues helps in understanding their roles in secretion and absorption in various organs.
