

## NEET 2024 Zoology R1 Question Paper with Solutions

### 151. 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:**

- The Pons (A) connects different regions of the brain (III).
- The Hypothalamus (B) contains neurosecretory cells (IV) responsible for hormone regulation.
- The Medulla (C) controls respiration and gastric secretions (II).
- The Cerebellum (D) provides additional space for neurons and regulates posture and balance (I).

#### **Quick Tip**

The brainstem, which includes the Pons and Medulla, controls vital functions like breathing and heart rate.

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

- (1) Isthmus
- (2) Infundibulum
- (3) Ampulla
- (4) Uterine fundus

**Correct Answer:** (4) Uterine fundus

**Solution:**

- The Fallopian tube consists of the Isthmus, Infundibulum, and Ampulla.
- The Uterine fundus is part of the uterus, not the Fallopian tube.

**Quick Tip**

The Uterine fundus is the upper portion of the uterus, not the Fallopian tube.

**153. 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:**

- The Ti plasmid stands for Tumor Inducing Plasmid.
- It is responsible for the ability of *Agrobacterium tumefaciens* to cause crown gall disease in plants.

**Quick Tip**

Ti plasmids are used in genetic engineering to introduce foreign genes into plants.

**154. 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:**

- Expiratory capacity (A) is the sum of Expiratory reserve volume and Tidal volume (II).
- Functional residual capacity (B) is the sum of Expiratory reserve volume and Residual volume (IV).
- Vital capacity (C) is the sum of Tidal volume, Inspiratory reserve volume, and Expiratory reserve volume (I).
- Inspiratory capacity (D) is the sum of Tidal volume and Inspiratory reserve volume (III).

**Quick Tip**

Vital capacity refers to the total volume of air that can be exhaled after a maximum inhalation.

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**155. 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 females and Leydig cells in males.

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

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:**

- FSH (Follicle Stimulating Hormone) indeed acts upon ovarian follicles in females, but it does not directly act on Leydig cells. LH is the hormone that stimulates Leydig cells.
- Growing ovarian follicles secrete estrogen in females, and Leydig cells secrete androgens in males, making Reason R true.

### Quick Tip

FSH targets ovarian follicles in females, while LH stimulates Leydig cells in males.

156. 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:**

- Lipase (A) acts on the ester bond in lipids (II).
- Nuclease (B) cleaves the phosphodiester bond in nucleic acids (IV).
- Protease (C) breaks down peptide bonds in proteins (I).
- Amylase (D) acts on the glycosidic bond in carbohydrates (III).

### Quick Tip

Each enzyme targets a specific type of bond, depending on the molecule it acts upon.

157. 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:**

- The correct sequence of human evolution from past to present is: Homo habilis (A), Homo erectus (D), Homo neanderthalensis (C), and finally Homo sapiens (B).

#### Quick Tip

Homo habilis is one of the earliest members of the genus Homo, often referred to as the "handy man" for using tools.

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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:**

- Myasthenia gravis, Rheumatoid arthritis, and Systemic Lupus Erythematosus (SLE) are all

autoimmune disorders where the body's immune system attacks its own tissues.

- Gout and Muscular dystrophy are not autoimmune disorders.

### Quick Tip

Autoimmune diseases occur when the immune system mistakenly targets the body's own tissues as harmful.

### 159. Match List I with List II:

#### List I

- A. Common cold
- B. Haemozoin
- C. Widal test
- D. Allergy

#### List II

- I. *Plasmodium*
- II. Typhoid
- III. Rhinoviruses
- 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:

- Common cold is caused by Rhinoviruses (III).
- Haemozoin is a product of *Plasmodium* (I), the parasite responsible for malaria.
- Widal test is used for diagnosing Typhoid (II).
- Allergy is triggered by Dust mites (IV).

### Quick Tip

Widal test detects the presence of antibodies against *Salmonella typhi* in typhoid infection.

### 160. Match List I with List II:

**List I**

- A. Axoneme
- B. Cartwheel pattern
- C. Crista
- D. Satellite

**List II**

- I. Centriole
- II. Cilia and flagella
- III. Chromosome
- 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:**

- Axoneme is found in Cilia and flagella (II).
- Cartwheel pattern is a feature of the Centriole (I).
- Crista is found in the Mitochondria (IV).
- Satellite is associated with Chromosome (III).

**Quick Tip**

The axoneme is a structural component of cilia and flagella, responsible for their movement.

**161. Match List I with List II:**

	<b>List I</b>		<b>List II</b>
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

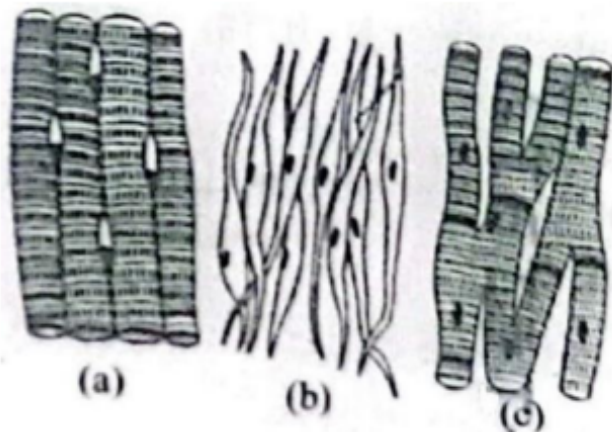
**Solution:**

- Pleurobrachia is a type of Ctenophora (II).
- Radula is found in Mollusca (I).
- Stomochord is present in Hemichordata (IV).
- Air bladder is characteristic of Osteichthyes (III).

**Quick Tip**

The radula is a feeding organ in mollusks used for scraping or cutting food.

**162. 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) Skeletal muscle – Triceps and Biceps

**Solution:**

- Figure (a) shows skeletal muscles attached to bones like triceps and biceps, enabling voluntary movements.
- Figure (b) shows smooth muscles, which are non-striated and found in internal organs like the stomach wall.
- Figure (c) shows cardiac muscles, which are striated and involuntary, located in the heart wall.

#### Quick Tip

Skeletal muscles are voluntary, smooth muscles are involuntary, and cardiac muscles are striated but involuntary.

### 163. 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:**

- Diakinesis involves the completion of terminalization of chiasmata (II).
- Pachytene is characterized by the appearance of recombination nodules (IV).

- Zygotene is marked by the formation of the synaptonemal complex (I).
- Leptotene is distinguished by chromosomes appearing as thin threads (III).

#### Quick Tip

Diakinesis is the final stage of prophase I, where crossing over is complete and chromosomes are prepared for metaphase.

164.

	List I		List II
A.	Down's syndrome	I.	11 <sup>th</sup> chromosome
B.	$\alpha$ -Thalassemia	II.	'X' chromosome
C.	$\beta$ -Thalassemia	III.	21 <sup>st</sup> chromosome
D.	Klinefelter's syndrome	IV.	16 <sup>th</sup> 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:**

- Down's syndrome is caused by trisomy of chromosome 21 (III).
- $\alpha$ -Thalassemia is linked with chromosome 16 (IV).
- $\beta$ -Thalassemia is associated with chromosome 11 (I).
- Klinefelter's syndrome results from an XXY chromosome pattern (II).

#### Quick Tip

Down's syndrome occurs due to an extra copy of chromosome 21, leading to developmental and intellectual delays.

165. Which of the following statements is incorrect?

- (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:**

- Bio-reactors are primarily used for large-scale cultivation of microorganisms or cells, not small-scale cultures.
- They are equipped with agitators, oxygen delivery systems, and foam control systems to maintain optimal growth conditions.

**Quick Tip**

Bio-reactors are essential in industrial biotechnology for mass production of products like vaccines, enzymes, and antibiotics.

**166. Match List I with List II:**

**List I**

- A. *Pterophyllum*
- B. *Myxine*
- C. *Pristis*
- D. *Exocoetus*

**List II**

- I. Hag fish
- II. Saw fish
- III. Angel fish
- 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:**

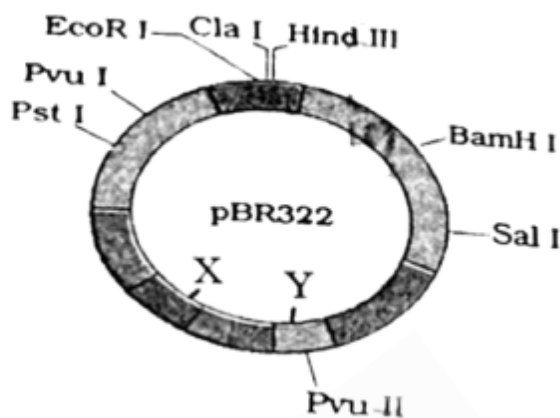
- *Pterophyllum* is commonly known as Angelfish (III).
- *Myxine* is also called Hagfish (I).
- *Pristis* is the Sawfish (II).
- *Exocoetus* is known as the Flying fish (IV).

### Quick Tip

Angelfish (*Pterophyllum*) is a popular aquarium fish, while *Exocoetus* (Flying fish) is known for its ability to glide above the water surface.

**167. 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 the protein involved in the replication of plasmid.

(2) The gene 'X' is for the protein involved in the 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 the 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 the protein involved in the replication of plasmid.

### Solution:

- 'X' represents *ori* (Origin of Replication), which controls the copy number of the linked DNA.

- 'Y' represents *rop*, a gene coding for a protein involved in plasmid replication.

- Together, *ori* and *rop* ensure proper replication and maintenance of plasmids in the host cell.

### Quick Tip

The *ori* region determines the number of plasmids within a cell, while the *rop* gene helps regulate plasmid replication.

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### 168. 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 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:

- Statement I is true. The presence or absence of the hymen is not a reliable indicator of virginity because it can be torn due to various activities like exercise, tampon use, or injury.
- Statement II is false. The hymen can remain intact even after coitus or may tear due to non-sexual activities.

### Quick Tip

The hymen is not a definitive marker of virginity; it can be stretched or torn for reasons unrelated to sexual activity.

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### 169. 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:**

- A. Annelids are true coelomates – True. They have a body cavity completely lined by mesoderm.
- B. Poriferans are pseudocoelomates – False. Poriferans are acoelomates.
- C. Aschelminthes are acoelomates – False. Aschelminthes are pseudocoelomates.
- D. Platyhelminthes are pseudocoelomates – False. Platyhelminthes are acoelomates.

**Quick Tip**

Among the listed groups, Annelids are the only true coelomates.

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**170. 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, which increases the surface area for reabsorption.

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:** (1) Both Statement I and Statement II are false

**Solution:**

- Statement I is false. The descending limb of the loop of Henle is permeable to water but impermeable to electrolytes.
- Statement II is false. The proximal convoluted tubule is lined by simple cuboidal

epithelium with a brush border, not columnar epithelium.

**Quick Tip**

The descending limb of the loop of Henle absorbs water, while the ascending limb absorbs electrolytes.

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**171. 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:**

The correct sequence of stages in cell division is:

- E. Gap 1 phase (first phase where the cell grows).
- C. Synthesis phase (DNA replication occurs).
- A. Gap 2 phase (preparation for cell division).
- D. Karyokinesis (division of the nucleus).
- B. Cytokinesis (division of the cytoplasm).

**Quick Tip**

Karyokinesis is the division of the nucleus, while cytokinesis refers to the division of the cytoplasm.

**172. 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)

**Solution:**

In cockroaches, a pair of anal cerci is present on the 10th abdominal segment. These cerci help in sensing changes in the environment, particularly detecting air currents.

**Quick Tip**

Anal cerci are sensory structures that help cockroaches detect changes in their surroundings.

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**173. 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-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:**

- Fibrous joints (A): These joints are immovable, as seen in the skull, so the correct match is A-III.
- Cartilaginous joints (B): These joints allow limited movement, like between adjacent vertebrae, so B-I is correct.
- Hinge joints (C): These allow movement like in the knee, so C-IV is correct.

- Ball and socket joints (D): These joints allow rotational movement, as seen between the humerus and the pectoral girdle, so D-II is correct.

#### Quick Tip

Ball and socket joints allow rotational movement, while hinge joints allow movement in one plane.

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**174. Which of the following is not a steroid hormone?**

- (1) Testosterone
- (2) Progesterone
- (3) Glucagon
- (4) Cortisol

**Correct Answer:** (3) Glucagon

**Solution:**

- Testosterone, Progesterone, and Cortisol are steroid hormones derived from cholesterol and are lipophilic, allowing them to cross cell membranes easily.
- Glucagon, however, is a peptide hormone, not a steroid hormone. It is synthesized from amino acids and works by binding to receptors on the cell surface.

#### Quick Tip

Steroid hormones are derived from cholesterol, while peptide hormones like glucagon are made from amino acids.

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**175. 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) 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:**

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

- E. SA node initiates the action potential.
- C. AV node delays the impulse to allow ventricles time to fill.
- A. AV bundle transmits the impulse down the septum.
- D. Bundle branches carry the impulse to the Purkinje fibers.
- B. Purkinje fibers distribute the impulse to the ventricles, causing contraction.

#### Quick Tip

The SA node is the pacemaker of the heart and starts the conduction of the action potential.

#### 176. 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 options 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:**

- A. Non-medicated IUD: The Lippes loop is a type of non-medicated intrauterine device. Thus, A-III.
- B. Copper releasing IUD: Multiload 375 is a copper-releasing IUD. Thus, B-I.
- C. Hormone releasing IUD: LNG-20 is a hormone-releasing IUD. Thus, C-IV.
- D. Implants: These release progestogens, a class of hormones. Thus, D-II.

#### Quick Tip

IUDs can be non-medicated (copper-based) or hormone-releasing, preventing pregnancy by altering the uterine environment.

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### 177. 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:

- Periodic abstinence: Avoiding sexual intercourse during the fertile phase of the menstrual cycle.
- Lactational amenorrhea: A natural infertility method during breastfeeding.
- Vaults: Artificial contraceptive methods involving physical barriers.
- Coitus interruptus: The withdrawal method, which is a natural contraceptive method.

#### Quick Tip

Vaults are artificial contraceptives, unlike natural methods like abstinence or lactational amenorrhea.

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### 178. Which one is the correct product of DNA-dependent RNA polymerase for the given template?

3'TACATGGCAAATATCCATTCA5'

- (1) 5' AUGUAAAGUUUAUAGGUAAGU3'
- (2) 5' AUGUACCGUUUAUAGGGAAGU3'
- (3) 5' ATGTACCGTTTATAGGTAAGT3'
- (4) 5' AUGUACCGUUUAUAGGUAAGU3'

**Correct Answer:** (4) 5' AUGUACCGUUUAUAGGUAAGU3'

**Solution:**

DNA-dependent RNA polymerase synthesizes RNA in the 5' to 3' direction, complementary to the DNA template.

For the given template strand: 3'TACATGGCAAATATCCATTCA5', the complementary RNA strand is: 5' AUGUACCGUUUAUAGGUAAGU3'.

**Quick Tip**

RNA synthesis replaces thymine (T) in DNA with uracil (U) in RNA.

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**179. 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:**

The Hardy-Weinberg equilibrium assumes that allele frequencies in a population remain constant unless disturbed by factors such as:

- Genetic drift: Random changes in allele frequencies.
- Gene migration: Movement of alleles between populations.
- Genetic recombination: Introducing new combinations of alleles.

A constant gene pool does not disturb the equilibrium, maintaining allele frequencies.

### Quick Tip

Hardy-Weinberg equilibrium assumes no allele frequency changes due to mutations, selection, or migration.

### 180. Match List I with List II:

List I	List II
A. Cocaine	I. Effective sedative in surgery
B. Heroin	II. <i>Cannabis sativa</i>
C. Morphine	III. <i>Erythroxylum</i>
D. Marijuana	IV. <i>Papaver somniferum</i>

Choose the correct answer from the options given below:

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

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

#### Solution:

- Cocaine is derived from the *Erythroxylum* plant. (III)
- Heroin is synthesized from morphine, which comes from the opium poppy (*Papaver somniferum*). (IV)
- Morphine is used as an effective sedative in surgery. (I)
- Marijuana comes from *Cannabis sativa*. (II)

### Quick Tip

Heroin and morphine are opiate derivatives, while cocaine and marijuana come from different plant families.

### 181. 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

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

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

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

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

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

**Solution:**

- A. Typhoid is caused by *Salmonella typhi*, a bacterium.
- B. Leishmaniasis is caused by *Leishmania*, a protozoan parasite.
- C. Ringworm is a fungal infection caused by various types of fungi.
- D. Filariasis is caused by *Wuchereria bancrofti*, a nematode (roundworm).

#### Quick Tip

Typhoid is bacterial, Leishmaniasis is protozoal, Ringworm is fungal, and Filariasis is caused by a nematode.

#### 182. Match List I with List II:

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

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

(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:**

- A.  $\alpha$ -I antitrypsin: Deficiency causes emphysema (III).
- B. Cry IAb: Used for ADA deficiency (IV).
- C. Cry IAc: Toxin effective against cotton bollworm (I).
- D. Enzyme replacement therapy: Toxin effective against corn borer (II).

**Quick Tip**

Enzyme replacement therapy is used to treat genetic disorders like ADA deficiency.

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**183. Assertion-Reason Question:**

Assertion (A): Breastfeeding during the initial period of infant growth is recommended by doctors for a healthy baby.

Reason (R): Colostrum contains several antibodies essential for developing resistance in the newborn baby.

- (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:**

- Breastfeeding is essential for infant growth as it provides vital nutrients and immune protection.
- Colostrum, the first milk, is rich in antibodies that protect the baby from infections.

**Quick Tip**

Colostrum is rich in immunoglobulins, especially IgA, which protects newborns from infections.

**184. The flippers of Penguins and Dolphins are examples of:**

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

**Correct Answer:** (2) Convergent evolution

**Solution:**

- Convergent evolution occurs when unrelated species evolve similar traits due to similar environmental pressures.
- Penguins (birds) and Dolphins (mammals) evolved flippers independently as adaptations for swimming.

**Quick Tip**

Convergent evolution results in similar traits in unrelated species due to similar ecological niches.

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**185. Which of the following factors favor the formation of oxyhemoglobin 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:**

- High  $pO_2$  in alveoli enhances oxygen binding to hemoglobin.
- Lesser  $H^+$  concentration (less acidity) increases hemoglobin's oxygen affinity by reducing the Bohr effect.

**Quick Tip**

In alveoli, high oxygen levels ( $pO_2$ ) and low acidity promote efficient oxygen binding to hemoglobin.

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**186. 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

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

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

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

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

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

**Solution:**

- A. Unicellular glandular epithelium: Found as goblet cells in the alimentary canal (III).
- B. Compound epithelium: Present on the moist surface of the buccal cavity (IV).
- C. Multicellular glandular epithelium: Found in glands like salivary glands (I).
- D. Endocrine glandular epithelium: Found in glands like the pancreas, which release hormones (II).

**Quick Tip**

Unicellular goblet cells secrete mucus, while multicellular glands like salivary glands secrete enzymes and other substances.

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**187. Choose the correct statement regarding juxtamedullary nephrons:**

- (1) Renal corpuscle of juxtamedullary nephron lies in the outer portion of the renal medulla.
- (2) Loop of Henle of juxtamedullary nephron runs deep into the medulla.
- (3) Juxtamedullary nephrons outnumber cortical nephrons.
- (4) Juxtamedullary nephrons are located in the columns of Bertini.

**Correct Answer:** (2) Loop of Henle of juxtamedullary nephron runs deep into the medulla.

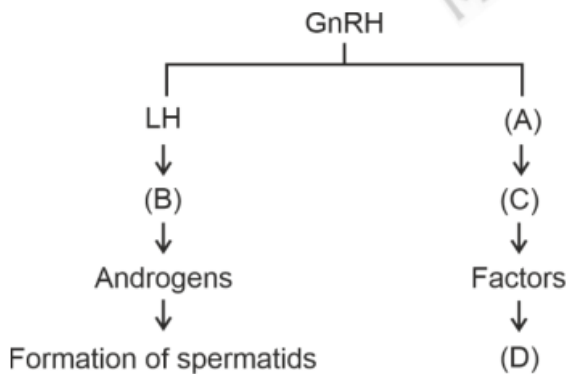
**Solution:**

- Juxtamedullary nephrons have their renal corpuscles near the cortex-medulla boundary.
- Their Loop of Henle extends deep into the medulla, which is critical for concentrating urine.
- Juxtamedullary nephrons are fewer in number compared to cortical nephrons.
- The columns of Bertini are part of the renal medulla and do not contain nephrons.

**Quick Tip**

Juxtamedullary nephrons play a vital role in the production of concentrated urine due to their long loops of Henle.

**188. Identify the correct roles of components (A), (B), (C), and (D) in 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:**

- A. FSH: Stimulates Sertoli cells to nourish developing sperm.
- B. Leydig cells: Produce testosterone, essential for spermatogenesis.
- C. Sertoli cells: Provide support and nutrients to developing sperm and form the blood-testis barrier.
- D. Spermiogenesis: Final stage of spermatogenesis, where spermatids mature into spermatozoa.

### Quick Tip

FSH acts on Sertoli cells, while Leydig cells secrete testosterone, crucial for spermatogenesis.

### 189. 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.

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

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

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

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

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

### Solution:

- A. P wave represents atrial depolarization (I).
- B. QRS complex represents ventricular depolarization (II).
- C. T wave represents ventricular repolarization (III).
- D. T-P gap represents the electrically silent phase of the heart (IV).

### Quick Tip

The P wave, QRS complex, and T wave represent the electrical activity in the heart as seen on an ECG.

### 190. 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 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:** (4) Both Statement I and Statement II are true

**Solution:**

- Statement I: True. Bone marrow is the primary lymphoid organ where blood cells, including lymphocytes, are produced.
- Statement II: True. Bone marrow is where T-lymphocytes originate, and the thymus is where they mature.

**Quick Tip**

Bone marrow is the site of blood cell production, while the thymus is essential for T-cell maturation.

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**191. 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 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)

**Solution:**

- Statement I is false because Gause's principle applies to species competing for the **same resources**, not different resources.
- Statement II is true because the inferior species is likely to be eliminated during competition if resources are limited.

Thus, Statement I is false, and Statement II is true, making the correct answer Option 3.

### Quick Tip

Gause's principle focuses on competition for identical resources and predicts exclusion of the inferior competitor under limiting conditions.

### 192. 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.

(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)

#### Solution:

- A. Exophthalmic goiter: Caused by hypersecretion of thyroid hormone, leading to protruding eyeballs (III).
- B. Acromegaly: Caused by excessive secretion of growth hormone (IV).
- C. Cushing's syndrome: Results from excess secretion of cortisol, characterized by moon face and hyperglycemia (I).
- D. Cretinism: Caused by hyposecretion of thyroid hormone, resulting in stunted growth (II).

Thus, the correct match is: A - III, B - IV, C - I, D - II.

### Quick Tip

Endocrine disorders like acromegaly and Cushing's syndrome involve hormonal imbalances, while cretinism results from thyroid hormone deficiency.

### 193. 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-IV, C-II, D-III

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

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

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

**Correct Answer:** (3)

**Solution:**

- A. The crop is the structure used for storing food (IV).
- B. The gastric caeca are blind tubules at the junction of the foregut and midgut (II).
- C. Malpighian tubules are involved in excretion and osmoregulation (III).
- D. The gizzard grinds food before it enters the midgut (I).

Thus, the correct match is: A - IV, B - II, C - III, D - I.

#### Quick Tip

The crop stores food temporarily, while the gizzard grinds it for digestion in cockroaches.

**194. 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 only

(2) C & B only

(3) D & E only

(4) A only

**Correct Answer:** (4)

**Solution:**

- The father's blood group is B+, which means his genotype can be  $I_B I_B$  (homozygous) or  $I_B i$  (heterozygous).

- The mother's blood group is A+, which means her genotype can be  $I_A I_A$  or  $I_A i$ .
  - The child's blood group is O+, which must have the genotype  $ii$  as O blood type is recessive.
  - For the child to inherit  $ii$ , both parents must contribute an  $i$  allele, meaning both parents must be heterozygous:  $I_B i$  (father) and  $I_A i$  (mother).
- Thus, the correct answer is Option (4):  $I_B i$ ,  $I_A i$ , and  $ii$ .

### Quick Tip

The O blood group (genotype  $ii$ ) requires both parents to carry the recessive  $i$  allele.

### 195. 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

- (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)

#### Solution:

- RNA polymerase III transcribes snRNAs and tRNA, so it matches with IV.
- Termination of transcription in prokaryotes is facilitated by the Rho factor, so it matches with III.
- Splicing of exons is carried out by snRNPs (small nuclear ribonucleoproteins), so it matches with I.
- The TATA box is a promoter sequence recognized during transcription initiation, so it matches with II.

Thus, the correct match is: A - IV, B - III, C - I, D - II.

### Quick Tip

The TATA box is an essential promoter sequence for initiating transcription by RNA polymerase II.

### 196. 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

- (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)

#### Solution:

- The Mesozoic Era is known for the dominance of birds and reptiles (III).
- The Proterozoic Era saw the rise of lower invertebrates (I).
- The Cenozoic Era is recognized as the age of mammals (IV).
- The Paleozoic Era is marked by the emergence of fish and amphibians (II).

Thus, the correct match is: A - III, B - I, C - IV, D - II.

### Quick Tip

The Cenozoic Era is also called the "Age of Mammals," while the Mesozoic Era is known as the "Age of Reptiles."

### 197. 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.

In the light of the above statements, choose the correct 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)

**Solution:**

- Statement I is correct: The corpus callosum is a nerve tract that connects the two cerebral hemispheres, allowing communication between them.

- Statement II is incorrect: The brain stem consists of the medulla oblongata, pons, and midbrain, not the cerebrum. The cerebrum is part of the forebrain.

Thus, the correct answer is: Statement I is correct, Statement II is incorrect.

#### Quick Tip

The brainstem includes the medulla oblongata, pons, and midbrain, while the cerebrum is part of the forebrain.

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**198. Regarding the 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) 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)

**Solution:**

The correct order of steps in the catalytic cycle of enzyme action is:

1. Substrate binding to active site (E).
2. Substrate-enzyme complex formation (A).
3. Chemical bonds of the substrate are broken (D).
4. Release of products (C).
5. Free enzyme ready to bind with another substrate (B).

Thus, the correct sequence is: *E, A, D, C, B*.

#### Quick Tip

In enzyme catalysis, the enzyme returns to its original form after releasing the products, ready for another reaction.

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#### 199. Given below are two statements:

Statement I: Mitochondria and chloroplasts are both double-membrane bound organelles.

Statement II: The inner membrane of mitochondria is relatively less permeable compared to chloroplasts.

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:** (2)

#### Solution:

- Statement I is correct: Both mitochondria and chloroplasts are double-membrane bound organelles.

- Statement II is incorrect: The inner membrane of mitochondria is relatively more permeable compared to the inner membrane of chloroplasts, which is more selectively permeable.

Thus, the correct answer is: Statement I is correct, Statement II is incorrect.

### Quick Tip

Mitochondria have a highly permeable outer membrane and a selectively permeable inner membrane involved in ATP synthesis.

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#### 200. 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)

#### **Solution:**

- Statement A is incorrect: Non-chordates generally do not have a pharynx perforated by gill slits, which is a feature of chordates.
- Statement B is correct: Non-chordates lack a notochord.
- Statement C is incorrect: Non-chordates typically have a ventral nervous system, not dorsal.
- Statement D is correct: If a heart is present in non-chordates, it is typically dorsal.
- Statement E is correct: A post-anal tail is generally absent in non-chordates.

Thus, the correct answer is: *B, D, & E* only.

### Quick Tip

Non-chordates are characterized by the absence of a notochord and a ventral nervous system, with few exceptions.