Correct Answer: (1) 10x (kcal m^{-2}) yr^{-1}

Solution: In an ecosystem, the Gross Primary Productivity (GPP) is always higher than the Net Primary Productivity (NPP) because GPP includes energy used by producers for respiration. The energy lost in each trophic level due to respiration and metabolism reduces the available energy for the next level.

Given:

$$\text{NPP of the first trophic level} = 100x \text{ (kcal } m^{-2}) \text{ } yr^{-1}$$

By the 10% energy transfer rule (on average, 10

$$\text{GPP of the third trophic level} = 10x \text{ (kcal } m^{-2}) \text{ } yr^{-1}$$

Thus, the correct answer is:

$$10x \text{ (kcal } m^{-2}) \text{ } yr^{-1}$$

Quick Tip

The 10% energy transfer rule helps explain the decrease in energy as you move up trophic levels in an ecosystem.

ZOOLOGY

SECTION-A

151. Match List I with List II

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

Choose the correct answer from the options given below:

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

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

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

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

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

Solution: - **Down's syndrome (A-III):** Caused by trisomy of chromosome 21.

Associated with mutations in chromosome 16:

α**-Thalassemia (B-IV):** Associated with mutations in chromosome 16.

Associated with mutations in chromosome 11:

β**-Thalassemia (C-I):** Associated with mutations in chromosome 11.

- **Klinefelter's syndrome (D-II):** Occurs due to the presence of an extra X chromosome (XXY).

Quick Tip

Genetic Disorders: - Down's syndrome: Trisomy 21

- Klinefelter's syndrome: XXY condition

Thalassemia: Mutation in hemoglobin genes (α: Chr 16, β: Chr 11).

---

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

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

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

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

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

Solution: Diakinesis (A-II): Terminalization of chiasmata is completed.

Pachytene (B-IV): Appearance of recombination nodules where crossing-over occurs.

Zygotene (C-I): Synaptonemal complex formation takes place.

Leptotene (D-III): Chromosomes appear as thin threads.

Quick Tip

Prophase I Subphases: - Leptotene: Chromosome condensation starts. - Zygotene: Synapsis begins. - Pachytene: Crossing-over occurs. - Diplotene: Chiasmata formation. - Diakinesis: Terminalization of chiasmata.

---

153. Which of the following factors are favorable for the formation of oxyhemoglobin in alveoli?

(1) Low pCO_2 and High H^+ concentration

(2) Low pCO_2 and High temperature

(3) High pO_2 and High pCO_2

(4) High pO_2 and Lesser H^+ concentration

Correct Answer: (4) High pO_2 and Lesser H^+ concentration

Solution: Oxyhemoglobin formation is favored by high oxygen partial pressure (pO_2) in the alveoli.

Low carbon dioxide (CO_2) and low H^+ concentration reduce acidity, promoting oxygen binding to hemoglobin.

Quick Tip

Oxyhemoglobin Formation Factors: - **Favors:** High pO_2, Low CO_2, Low H^+ (high pH). - **Inhibits:** High CO_2, High H^+ (low pH), High temperature (Bohr effect).

---

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

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

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

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

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

Solution: Typhoid (A-IV): Caused by *Salmonella typhi*, a bacterium.

Leishmaniasis (B-III): Caused by *Leishmania*, a protozoan parasite.

Ringworm (C-I): A fungal infection affecting skin, nails, and hair.

Filariasis (D-II): Caused by nematode worms such as *Wuchereria bancrofti*.

Quick Tip

Disease Causative Agents: Bacteria: Typhoid

Protozoa: Leishmaniasis

Fungi: Ringworm

Nematodes: Filariasis

---

155. 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-I, C-III, D-IV

Solution: To solve this matching, let's first understand the definitions of each term in List I and List II.

- **Expiratory capacity**: The volume of air that can be exhaled after a normal exhalation. It is the sum of *Expiratory reserve volume* and *Tidal volume*.
- **Functional residual capacity**: The amount of air left in the lungs after a normal exhalation. It is the sum of *Tidal volume* and *Expiratory reserve volume*.
- **Vital capacity**: The maximum amount of air that can be exhaled after a maximum inhalation. It is the sum of *Tidal volume* and *Inspiratory reserve volume*.
- **Inspiratory capacity**: The maximum amount of air that can be inhaled after a normal exhalation. It is the sum of *Expiratory reserve volume* and *Residual volume*.

Now, match the items from List I with the correct items from List II:

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

Thus, the correct matching is:

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

Quick Tip

Lung Capacities: - Expiratory capacity = TV + ERV - Functional residual capacity = ERV + RV - Vital capacity = TV + IRV + ERV - Inspiratory capacity = TV + IRV

---

156. 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) B, C & E only

(2) C, D & E only

(3) A, B & D only

(4) A, B & E only

Correct Answer: (4) A, B & E only

Solution: Myasthenia gravis (A): Autoimmune neuromuscular disorder leading to muscle weakness.

Rheumatoid arthritis (B): Chronic inflammatory autoimmune disorder affecting joints.

Systemic Lupus Erythematosus (E): Autoimmune disorder affecting multiple organs.

Gout (C) and Muscular dystrophy (D): Not autoimmune disorders. Gout is caused by uric acid deposition, and muscular dystrophy is a genetic disorder.

Quick Tip

Autoimmune Disorders: - Myasthenia gravis - Rheumatoid arthritis - Systemic Lupus Erythematosus (SLE) **Not Autoimmune:** - Gout (metabolic disorder) - Muscular dystrophy (genetic disorder)

---

157. Given below are two statements:

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

Statement II: The proximal convoluted tubule is lined by simple columnar brush border epithelium and increases the surface area for reabsorption.

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

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

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

(3) Both Statement I and Statement II are true

(4) Both Statement I and Statement II are false

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

Solution: - The descending limb of the loop of Henle is **permeable** to water and **impermeable** to electrolytes, making Statement I false.

- The proximal convoluted tubule is lined by **simple cuboidal** brush border epithelium, not columnar, making Statement II false.

Quick Tip

Nephron Functionality: - Descending limb: Permeable to water, impermeable to solutes. - Proximal convoluted tubule: Lined by simple cuboidal epithelium.

---

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

(1) Progesterone

(2) Glucagon

(3) Cortisol

(4) Testosterone

Correct Answer: (2) Glucagon

Solution: - **Steroid hormones:** Derived from cholesterol, examples include **Progesterone, Cortisol, and Testosterone**.

- **Peptide hormones:** Made of amino acids, an example is **Glucagon**, which regulates blood sugar levels.

Quick Tip

Steroid vs Peptide Hormones: - Steroid: Lipophilic, derived from cholesterol (e.g., Cortisol, Estrogen). - Peptide: Hydrophilic, made of amino acids (e.g., Insulin, Glucagon).

---

159. Given below are two statements:

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.

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

(1) A is true but R is false

(2) A is false but R is true

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

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

Correct Answer: (2) A is false but R is true

Solution: FSH (Follicle Stimulating Hormone) acts on ovarian follicles in females, but in males, it acts on **Sertoli cells**, not Leydig cells.

Leydig cells are stimulated by LH (Luteinizing Hormone), not FSH, making Assertion A false.

Reason R is true since ovarian follicles secrete estrogen and interstitial cells (Leydig cells) secrete androgens.

Quick Tip

FSH vs LH Action: - FSH: Stimulates ovarian follicle growth in females, Sertoli cells in males. - LH: Stimulates ovulation in females, Leydig cells in males.

---

160. 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) C-B-D-A

(2) A-D-C-B

(3) D-A-C-B

(4) B-A-D-C

Correct Answer: (2) A-D-C-B

Solution: ***Homo habilis*** **(A)**: Earliest known species, used tools.

Homo erectus **(D)**: First to use fire, bipedal movement.

Homo neanderthalensis **(C)**: Lived in colder regions, had larger brains.

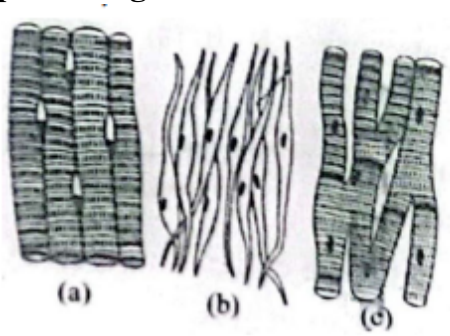
Homo sapiens **(B)**: Modern humans, evolved advanced cognitive skills.

Quick Tip

Human Evolution Sequence: 1. *Homo habilis* $\rightarrow$ 2. *Homo erectus* $\rightarrow$ 3. *Homo neanderthalensis* $\rightarrow$ 4. *Homo sapiens*

---

161. 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 – Biceps
(b) Involuntary – Intestine
(c) Smooth – Heart

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

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

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

Correct Answer: (4) Skeletal – Triceps, Smooth – Stomach, Cardiac – Heart

Solution: Step 1: Understanding Muscle Types The three main types of muscles are:

Skeletal Muscles: Voluntary muscles attached to bones (e.g., triceps, biceps, legs).

Smooth Muscles: Involuntary muscles found in organs like the stomach and intestines.

Cardiac Muscles: Involuntary muscles present in the heart.

Step 2: Matching Given Options

(a) Skeletal muscle – Triceps (voluntary)

(b) Smooth muscle – Stomach (involuntary)

(c) Cardiac muscle – Heart (involuntary)

Thus, option (4) is correct.

Quick Tip

- Skeletal muscles are voluntary and control movement. - Smooth muscles are involuntary and found in internal organs. - Cardiac muscles are involuntary and only in the heart.

---

162. 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.	Erythroxylum
D.	Marijuana	IV.	Papaver somniferum

Choose the correct answer from the options given below:

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

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

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

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

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

Solution: To solve this matching, let's first understand the drugs and their respective sources:

- **Cocaine** is derived from *Erythroxylum*, and it is an effective sedative in surgery, so:

A matches with III. Erythroxylum

- **Heroin** is derived from *Papaver somniferum*, so:

B matches with IV. Papaver somniferum

- **Morphine** is derived from *Papaver somniferum*, so:

C matches with I. Effective sedative in surgery

- **Marijuana** is derived from *Cannabis sativa*, so:

D matches with II. Cannabis sativa

Thus, the correct matching is:

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

Quick Tip

- Cocaine → *Erythroxylum* - Heroin → *Papaver somniferum* - Morphine → Sedative in surgery - Marijuana → *Cannabis sativa*

---

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

(1) Tumor inducing plasmid

(2) Temperature independent plasmid

(3) Tumor inhibiting plasmid

(4) Tumor independent plasmid

Correct Answer: (1) Tumor inducing plasmid

Solution: Step 1: Understanding Ti Plasmid The Ti plasmid (tumor-inducing plasmid) is a type of plasmid found in the bacterium *Agrobacterium tumefaciens*, which is responsible for transferring genes that cause tumor-like growth in plants.

Thus, option (1) is correct.

Quick Tip

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

---

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

$$3'\textbf{TCATCTGGAAATTACCTTACAS}5'$$

(1) 5' UAUGUCCUUUAAUGGAAUGU 3'

(2) 5' AUGUCCUUUUAAUGGAAGU 3'

(3) 5' UAGUCCUUUUAAUGGAAGU 3'

(4) 5' AUGUAGUCCUUUAUGGAAGU 3'

Correct Answer: (3) 5' UAGUCCUUUUAAUGGAAGU 3'

Solution: Step 1: Transcription Process DNA-dependent RNA polymerase synthesizes mRNA complementary to the template strand. The base-pairing rules are:

$$A \to U, \quad T \to A, \quad C \to G, \quad G \to C$$

Step 2: Finding the Correct mRNA Sequence The given DNA template is:

$$3'\text{TCATCTGGAAATTACCTTACAS}5'$$

The complementary mRNA strand is:

$$5'\text{UAGUCCUUUUAAUGGAAGU}3'$$

Thus, option (3) is correct.

Quick Tip

- RNA is synthesized in the 5' to 3' direction complementary to the 3' to 5' DNA strand.

---

165. 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-V, B-I, C-II, D-III

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

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

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

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

Solution: To solve this matching, let's first identify the fish species and their common names:

- **Pterophyllum** (A) is commonly known as the **Angel fish**, so A matches with III.
- **Myxine** (B) is commonly known as the **Hag fish**, so B matches with I.
- **Pristis** (C) is commonly known as the **Saw fish**, so C matches with II.
- **Exocoetus** (D) is commonly known as the **Flying fish**, so D matches with IV.

Thus, the correct matching is:

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

Quick Tip

- Hag fish (Myxine) → Primitive jawless fish - Saw fish (Pristis) → Characterized by a long, saw-like snout - Angel fish (Pterophyllum) → Freshwater aquarium fish - Flying fish (Exocoetus) → Capable of gliding above water

---

166. 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-II, B-I, C-I, D-IV
2. A-III, B-I, C-IV, D-II
3. A-IV, B-III, C-II, D-I

4. A-I, B-II, C-III, D-IV

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

Solution:

- **Fibrous joints** (A) are found between adjacent vertebrae, allowing limited movement. Hence, A matches with **I. Adjacent vertebrae, limited movement**.
- **Cartilaginous joints** (B) are found in places like the skull, and they don't allow any movement. Hence, B matches with **III. Skull, don't allow any movement**.
- **Hinge joints** (C) are found in places like the knee and help in locomotion. Hence, C matches with **IV. Knee, help in locomotion**.
- **Ball and socket joints** (D) are found in the humerus and pectoral girdle, allowing rotational movement. Hence, D matches with **II. Humerus and Pectoral girdle, rotational movement**.

Thus, the correct matching is:

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

Quick Tip

- Hinge joints allow movement in one direction (e.g., knee).
- Ball and socket joints allow rotational movement.

---

167. The flippers of Penguins and Dolphins are an example of:

(1) Convergent evolution

(2) Divergent evolution

(3) Adaptive radiation

(4) Natural selection

Correct Answer: (1) Convergent evolution

Solution:

Step 1: Understanding Convergent Evolution. Convergent evolution occurs when unrelated species develop similar traits due to adaptation to similar environments or

ecological niches.

Step 2: Applying to the Given Example. - Penguins (birds) and dolphins (mammals) belong to entirely different taxonomic groups. - However, both have developed streamlined bodies and flippers for efficient swimming in aquatic environments. - This similarity is due to environmental pressures rather than shared ancestry.

Conclusion: Since the structural similarity is due to adaptation to a similar habitat and not common ancestry, this is an example of convergent evolution.

Final Answer: Convergent evolution.

Quick Tip

- Convergent Evolution: Different ancestry, similar traits due to similar environments. - Divergent Evolution: Common ancestry, different traits due to different environments.

---

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

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

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

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

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

Solution:

Step 1: Understanding the pairs from List I and List II.

- α-1 antitrypsin deficiency is associated with **Emphysema** (III).

- Cry IAb gene is effective against **Corn borer** (IV). - Cry IAc gene is effective against **Cotton bollworm** (I).

- Enzyme replacement therapy is used for **ADA deficiency** (II).

Step 2: Matching the correct pairs.

$$A \rightarrow III \quad (\alpha\text{-1 antitrypsin} \rightarrow \text{Emphysema})$$

$$B \rightarrow IV \quad (\text{Cry IAb} \rightarrow \text{Corn borer})$$

$$C \rightarrow I \quad (\text{Cry IAc} \rightarrow \text{Cotton bollworm})$$

$$D \rightarrow II \quad (\text{Enzyme replacement therapy} \rightarrow \text{ADA deficiency})$$

Final Answer: $\boxed{A-III, B-IV, C-I, D-II}$.

Quick Tip

- Cry proteins (Bt toxins) target specific insect pests. - Enzyme replacement therapy is a treatment for genetic disorders like ADA deficiency. - α-1 antitrypsin deficiency leads to lung diseases such as emphysema.

---

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

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

Solution:

Step 1: Understanding the matches between List I and List II.

Axoneme is the central core of cilia and flagella $\Rightarrow II$.

Cartwheel pattern is a characteristic structural feature of the centriole $\Rightarrow I$.

Crista are folds in the inner membrane of mitochondria $\Rightarrow IV$.

Satellite DNA is a highly repetitive sequence associated with the chromosome $\Rightarrow III$.

Step 2: Matching the correct pairs.

$$A \rightarrow II \quad \text{(Axoneme} \rightarrow \text{Cilia and flagella)}$$

$$B \rightarrow I \quad \text{(Cartwheel pattern} \rightarrow \text{Centriole)}$$

$$C \rightarrow IV \quad \text{(Crista} \rightarrow \text{Mitochondria)}$$

$$D \rightarrow III \quad \text{(Satellite} \rightarrow \text{Chromosome)}$$

Final Answer: $\boxed{A-II, B-I, C-IV, D-III}$.

Quick Tip

- Axoneme is the structural framework of cilia and flagella.
- The cartwheel structure is a feature of centrioles.
- Cristae increase the surface area of mitochondria for ATP production.
- Satellite DNA is involved in chromosome structure and function.

170. Given below are two statements: One is labeled as Assertion (A) and the other as Reason (R).

Assertion (A): Breastfeeding during the 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 newborn baby.

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

(1) A is correct but R is not correct.

(2) A is not correct but R is correct.

(3) Both A and R are correct, and R is the correct explanation of A.

(4) Both A and R are correct, but R is NOT the correct explanation of A.

Correct Answer: (3) Both A and R are correct, and R is the correct explanation of A.

Solution:

Step 1: Analyzing Assertion (A). Breastfeeding is crucial in the early stages of life because it provides essential nutrients and immunity-boosting substances to the baby. Hence, Assertion (A) is correct.

Step 2: Analyzing Reason (R). Colostrum, the first milk secreted by the mother after childbirth, is rich in maternal antibodies (such as IgA) that help in developing passive immunity in the newborn. This justifies the medical recommendation for breastfeeding. Hence, Reason (R) is correct.

Step 3: Evaluating the Explanation. Since colostrum provides essential antibodies that help develop immunity, it directly supports the health benefits of breastfeeding. Therefore, Reason (R) correctly explains Assertion (A).

Final Answer: Both A and R are correct, and R is the correct explanation of A. .

Quick Tip

- Colostrum is rich in immunoglobulins, which protect newborns from infections.
- Breastfeeding not only provides nutrition but also strengthens the infant's immune system.
- Passive immunity from colostrum is crucial in the early stages of life.

---

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

(1) Infundibulum

(2) Ampulla

(3) Uterine fundus

(4) Isthmus

Correct Answer: (3) Uterine fundus

Solution: The Fallopian tube consists of four main parts: Infundibulum, Ampulla, Isthmus, and Interstitial part. The **Uterine fundus** is actually a part of the uterus, not the Fallopian tube.

Quick Tip

The Fallopian tube is responsible for transporting the egg from the ovary to the uterus and is the site of fertilization.

---

172. Which of the following statements is incorrect?

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

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

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

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

Correct Answer: (1) Bio-reactors are used to produce small-scale bacterial cultures

Solution: Bio-reactors are large-scale systems designed for the mass production of biological products such as antibiotics, vaccines, and enzymes. Small-scale bacterial cultures are typically grown in laboratory flasks or petri dishes, not bio-reactors.

Quick Tip

Bio-reactors provide a controlled environment for microbial or cell culture growth, ensuring optimal conditions for industrial-scale production.

---

173. 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-III, C-II, D-IV

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

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

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

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

Solution: The **Pons** (A) connects different parts of the brain.

The **Hypothalamus** (B) has neurosecretory cells responsible for hormone regulation.

The **Medulla** (C) controls vital functions like respiration and digestion.

The **Cerebellum** (D) regulates posture and balance.

Quick Tip

The brainstem consists of the midbrain, pons, and medulla, which are responsible for vital functions such as breathing, heartbeat, and neural connectivity.

---

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

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

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

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

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

Solution: - **Lipase** breaks down fats, which contain **ester bonds**.

- **Nuclease** breaks down nucleic acids, which contain **phosphodiester bonds**.

- **Protease** breaks down proteins, which contain **peptide bonds**.

- **Amylase** breaks down carbohydrates, which contain **glycosidic bonds**.

Quick Tip

Each enzyme is specific to a type of bond. Proteases target peptide bonds in proteins, lipases target ester bonds in fats, nucleases target phosphodiester bonds in nucleic acids, and amylases target glycosidic bonds in carbohydrates.

---

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

(1) Lactational amenorrhea

(2) Vaults

(3) Coitus interruptus

(4) Periodic abstinence

Correct Answer: (2) Vaults

Solution: Lactational amenorrhea, **coitus interruptus**, and **periodic abstinence** are natural contraceptive methods.

Vaults are barrier contraceptive methods, making them non-natural.

Quick Tip

Natural contraceptive methods involve behavioral and physiological approaches, such as tracking fertility cycles and breastfeeding-related amenorrhea.

---

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

A. AV bundle

B. Purkinje fibers

C. AV node D. Bundle branches

E. SA node

Choose the correct sequence of pathway from the options given below

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

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

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

4) A-E-C-B-D

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

Solution: The correct sequence of electrical conduction in the heart is:

1. **SA node** (E) initiates the heartbeat.
2. **AV node** (C) delays the impulse for proper ventricular filling.
3. **AV bundle** (A) transmits the impulse.
4. **Bundle branches** (D) conduct signals through the ventricles.
5. **Purkinje fibers** (B) distribute the impulse, causing ventricular contraction.

Quick Tip

The sinoatrial (SA) node is the pacemaker of the heart, generating rhythmic electrical impulses that regulate heartbeat.

---

177. Match List-I with List-II:

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

Choose the correct answer from the options given below:

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

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

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

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

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

Solution: **Pleurobrachia** belongs to **Ctenophora**.

Radula is a structure present in **Mollusca**.

Stomochord is found in **Hemichordata**.

Air bladder is a characteristic feature of **Osteichthyes** (bony fishes).

Quick Tip

Biological classification involves grouping organisms based on structural and functional similarities.

---

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

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

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

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

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

Solution: **Common cold** is caused by **rhinoviruses**.

Haemozoin is a byproduct of **Plasmodium**, the malaria-causing parasite.

Widal test is used for diagnosing **typhoid**.

Allergy can be triggered by **dust mites**.

Quick Tip

- **Common cold**: Viral infection affecting the respiratory tract.
- **Haemozoin**: Malarial pigment produced by Plasmodium.
- **Widal test**: Serological test for Salmonella (typhoid).
- **Allergy**: Hypersensitive immune response to allergens.

---

179. 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) C only

(2) D only

(3) B only

(4) A only

Correct Answer: (4) A only

Solution: - **Annelids** possess a **true coelom**, which is lined by mesoderm.

- **Poriferans** are **acoelomates**, not pseudocoelomates.

- **Aschelminthes** (Nematodes) are **pseudocoelomates**, not acoelomates.

- **Platyhelminthes** are **acoelomates**, not pseudocoelomates.

Quick Tip

Coelom classification:

- Acoelomates: No body cavity (e.g., Platyhelminthes).
- Pseudocoelomates: Body cavity not lined by mesoderm (e.g., Aschelminthes).
- Coelomates: True body cavity lined by mesoderm (e.g., Annelida, Mollusca).

---

180. In both sexes of cockroach, a pair of jointed filamentous structures called anal

cerci are present on:

(1) 8^{th} and 9^{th} segment

(2) 11^{th} segment

(3) 5^{th} segment

(4) 10^{th} segment

Correct Answer: (4) 10^{th} segment

Solution: Anal cerci are paired, sensitive appendages in cockroaches that help in detecting vibrations. These structures are located on the **10^{th} abdominal segment**. They are present in both males and females.

Quick Tip

In cockroaches: - **9^{th} segment**: Male genitalia. - **10^{th} segment**: Anal cerci. - **11^{th} segment**: Absent.

---

181. 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) Statement I is true but Statement II is false

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

(3) Both Statement I and Statement II are true

(4) Both Statement I and Statement II are false

Correct Answer: (1) Statement I is true but Statement II is false

Solution: The **hymen** is a thin membrane that can be ruptured due to several non-sexual activities such as exercise, cycling, or medical conditions.

Hence, its **presence or absence is not a reliable indicator of virginity**.

Statement II is incorrect because the hymen may tear due to various factors, not only during the first coitus.

Quick Tip

The hymen is an elastic structure and may remain intact even after sexual activity or may break due to physical activities unrelated to coitus.

---

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

(1) Gene migration

(2) Constant gene pool

(3) Genetic recombination

(4) Genetic drift

Correct Answer: (2) Constant gene pool

Solution: The **Hardy-Weinberg equilibrium** states that allele frequencies in a population remain constant if no evolutionary forces act upon them.

Factors that disturb this equilibrium include:

Gene migration (movement of alleles between populations).

Genetic drift (random changes in allele frequency).

Genetic recombination (shuffling of alleles during reproduction).

A **constant gene pool** ensures that allele frequencies remain unchanged, maintaining equilibrium.

Quick Tip

Hardy-Weinberg equilibrium holds when: 1. No mutation.

2. No gene flow.

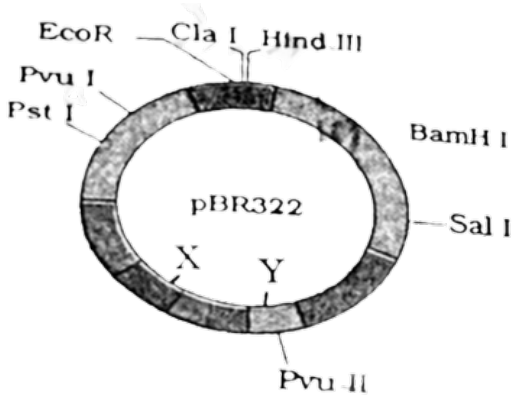
3. No genetic drift.

4. No natural selection.

5. Random mating occurs.

---

183. 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 for protein involved in replication of Plasmid and 'Y' for resistance to antibiotics.

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

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

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

Correct Answer: (4) 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: The **pBR322 plasmid** is a widely used cloning vector in genetic engineering.

Gene 'X' is located in the **origin of replication (ori)**, which controls the **copy number** of the plasmid.

Gene 'Y' is responsible for the production of a protein essential for the **replication of the plasmid**.

Antibiotic resistance genes (e.g., for ampicillin and tetracycline resistance) are separate and not associated with 'X' and 'Y'.

Quick Tip

pBR322 vector contains: - **Ori**: Origin of replication (controls copy number). - **Amp^R and Tet^R**: Genes for ampicillin and tetracycline resistance. - **Multiple cloning sites (MCS)**: Contain restriction enzyme recognition sequences.

---

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

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

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

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

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

Solution: **Non-medicated IUDs** include **Lippes loop** (A-III).

Copper releasing IUDs include **Multiload 375** (B-I).

Hormone releasing IUDs include **LNG-20** (C-IV).

Implants release **progestogens** (D-II).

Quick Tip

- **Non-medicated IUDs**: Inert devices, no hormones. - **Copper IUDs**: Release copper, toxic to sperm. - **Hormonal IUDs**: Release hormones like LNG (levonorgestrel). - **Implants**: Subdermal hormonal contraceptives.

---

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

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

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

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

Correct Answer: (2) E-C-A-D-B

Solution: - **Gap 1 (G1) phase** (E) – Cell grows and prepares for DNA synthesis.

- **Synthesis (S) phase** (C) – DNA replication occurs.

- **Gap 2 (G2) phase** (A) – Cell prepares for mitosis.

- **Karyokinesis** (D) – Division of the nucleus.

- **Cytokinesis** (B) – Division of the cytoplasm.

Quick Tip

- **Interphase** = G1 + S + G2 (preparatory phase). - **M phase** = Karyokinesis + Cytokinesis.

SECTION-B

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

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

(2) Juxta medullary nephrons outnumber the cortical nephrons.

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

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

Correct Answer: (1)

Solution: - Juxta medullary nephrons have a longer **Loop of Henle** that extends deep into the medulla, which helps in water conservation.

- Cortical nephrons are more numerous than juxta medullary nephrons.

- Juxta medullary nephrons are located near the **medulla**, not in the columns of Bertini.

- The renal corpuscle of these nephrons is present in the **cortex** of the kidney, not in the outer renal medulla.

Quick Tip

- Juxta medullary nephrons: Important for concentrated urine formation. - Cortical nephrons: More common and have shorter Loops of Henle.

---

187. 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) B, D & E only

(2) B, C & D only

(3) A & C only

(4) A, B & D only

Correct Answer: (1) B, D & E only

Solution: - Non-chordates **lack a notochord** (B).

- If a heart is present, it is **dorsally** located (D).

- A **post-anal tail is absent** in non-chordates (E).

- Chordates, not non-chordates, have a **dorsal** central nervous system.

- Pharyngeal gill slits are a characteristic feature of chordates, not non-chordates.

Quick Tip

- **Chordates**: Have a notochord, dorsal CNS, post-anal tail. - **Non-chordates**: Lack notochord, ventral CNS, no post-anal tail.

---

188. Given below are two statements:

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

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

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

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

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

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

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

Correct Answer: (1) Statement I is correct but Statement II is incorrect.

Solution: - **Mitochondria and chloroplasts** are indeed double-membrane bound organelles (Statement I is correct).

- The **inner membrane of mitochondria is highly selective** and contains specialized transport proteins, but the inner membrane of chloroplasts is also selectively permeable.

- Since Statement II implies that the chloroplast inner membrane is more permeable than the mitochondrial membrane, which is incorrect, Statement II is false.

Quick Tip

- **Mitochondria**: Site of ATP production, double-membrane with **cristae**. - **Chloroplast**: Site of photosynthesis, double-membrane with **thylakoid membranes**.

---

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

A. Substrate enzyme complex formation.

B. Free enzyme ready to bind with another substrate.

C. Release of products.

D. Chemical bonds of the substrate broken.

E. Substrate binding to active site.

Choose the correct answer from the options given below:

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

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

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

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

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

Solution: - **Step 1:** The substrate binds to the enzyme's active site (E).

- **Step 2:** This forms the enzyme-substrate complex (A).

- **Step 3:** The enzyme catalyzes the breaking of chemical bonds in the substrate (D).

- **Step 4:** The reaction results in the release of products (C).

- **Step 5:** The enzyme is now free to bind with another substrate (B).

Quick Tip

- Enzymes work via the **lock and key** or **induced fit** model.

- They lower activation energy and increase reaction speed.

---

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

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

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

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

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

Solution: - **P wave (A)** represents the **depolarisation of atria** (III).

- **QRS complex (B)** indicates the **depolarisation of ventricles** (II).

- **T wave (C)** represents the **repolarisation of ventricles** (IV).

- **T-P gap (D)** is the period where the **heart muscles are electrically silent** (I).

Quick Tip

- The **P wave** represents atrial contraction. - The **QRS complex** represents ventricular contraction. - The **T wave** represents ventricular relaxation.

---

191. Given below are two statements:

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

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

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

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

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

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

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

Correct Answer: (3) Both Statement I and Statement II are correct.

Solution: - Bone marrow is the **primary lymphoid organ**, responsible for the production of all blood cells, including lymphocytes.

- The thymus provides an essential environment for the **maturation of T-lymphocytes**.

- Since both bone marrow and thymus contribute to lymphocyte development, both statements are correct.

Quick Tip

- **Primary Lymphoid Organs:** Bone marrow and thymus (involved in lymphocyte development). - **Secondary Lymphoid Organs:** Lymph nodes, spleen, and tonsils (sites of immune response).

---

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

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

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

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

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

Solution: - **Unicellular glandular epithelium (A)** includes **goblet cells of the alimentary canal** (III).

- **Compound epithelium (B)** is found in the **moist surface of the buccal cavity** (IV).

- **Multicellular glandular epithelium (C)** includes **salivary glands** (I).

- **Endocrine glandular epithelium (D)** is present in the **pancreas** (II).

Quick Tip

- **Unicellular Glands:** Goblet cells secrete mucus.

- **Multicellular Glands:** Include both endocrine (ductless) and exocrine (ducted) glands.

- **Compound Epithelium:** Provides protection, found in the buccal cavity and skin.

---

193. 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 most appropriate answer from the options given below:

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

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

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

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

Correct Answer: (1) Statement I is correct but Statement II is incorrect.

Solution: - The **corpus callosum** is a large, C-shaped nerve fiber bundle that connects the left and right cerebral hemispheres, allowing communication between them. Thus, Statement I is correct.

- The **brainstem** consists of the **medulla oblongata, pons, and midbrain** but does not include the cerebrum. Therefore, Statement II is incorrect.

Quick Tip

- **Brain Stem:** Medulla oblongata, pons, and midbrain (not the cerebrum).
- **Corpus Callosum:** Connects the left and right cerebral hemispheres.

---

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

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

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

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

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

Solution: RNA polymerase III (A) is responsible for transcribing **SnRNAs and tRNA** (IV).

Termination of transcription (B) in prokaryotes is often facilitated by the **Rho factor** (III).

Splicing of exons (C) is mediated by **snRNPs** (I).

TATA box (D) is a promoter element, thus associated with **promoters** (II).

Quick Tip

- **RNA Polymerases:** - RNA Polymerase I: rRNA synthesis.
- RNA Polymerase II: mRNA synthesis.
- RNA Polymerase III: tRNA and snRNA synthesis.
- **Transcription Termination:** Rho-dependent and Rho-independent.

---

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

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

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

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

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

Solution: Mesozoic Era (A) is known as the age of **birds and reptiles** (III).

Proterozoic Era (B) marks the emergence of **lower invertebrates** (I).

Cenozoic Era (C) is the era of **mammals** (IV).

Paleozoic Era (D) saw the rise of **fish and amphibians** (II).

Quick Tip

Geological Eras:

- Proterozoic Era: Early life forms, lower invertebrates.
- Paleozoic Era: Age of fishes and amphibians.
- Mesozoic Era: Age of reptiles and birds.
- Cenozoic Era: Age of mammals.

196. 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) Statement I is true but Statement II is false.

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

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

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

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

Solution: - **Statement I is incorrect** because Gause's competitive exclusion principle states that **two closely related species competing for the same resources cannot coexist indefinitely**. The given statement incorrectly mentions "different resources."

- **Statement II is correct** because in a competitive scenario, when resources are limiting, **the inferior species is likely to be eliminated**.

Quick Tip

- **Gause's Competitive Exclusion Principle:** Two species competing for the same resource cannot coexist indefinitely; one will be excluded.

- **Resource Partitioning:** Species coexist by utilizing different niches.

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

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

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

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

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

Solution: - **Exophthalmic goiter (A)** is due to the **hypersecretion of thyroid hormone**, causing protruding eyeballs (III).

- **Acromegaly (B)** is caused by the **excessive secretion of growth hormone** (IV).

- **Cushing's syndrome (C)** is due to the **excess secretion of cortisol**, leading to moon face and hyperglycemia (I).

- **Cretinism (D)** results from the **hypo-secretion of thyroid hormone**, causing stunted growth (II).

Quick Tip

- **Endocrine Disorders:**

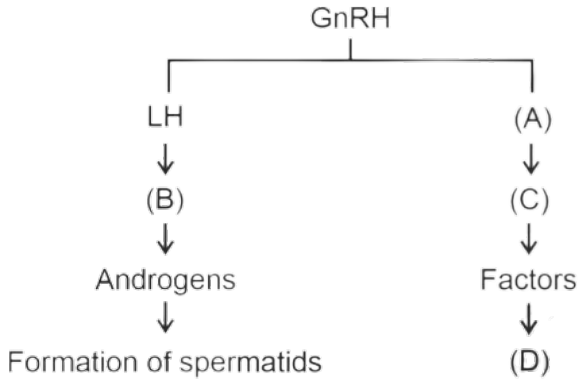
- Exophthalmic Goiter: Hyperthyroidism.

- Acromegaly: Excess GH in adulthood.

- Cushing's Syndrome: Excess cortisol.

- Cretinism: Congenital hypothyroidism.

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



Choose the correct answer from the options given below:

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

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

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

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

Correct Answer: (3) FSH, Leydig cells, Sertoli cells, spermiogenesis.

Solution: **(A) FSH** stimulates the Sertoli cells to regulate spermatogenesis. **(B) Leydig cells** produce androgens (testosterone). **(C) Sertoli cells** regulate spermatogenesis. **(D) Spermiogenesis** is the final stage of sperm maturation.

Quick Tip

- **Hormonal Control of Spermatogenesis:** - **FSH**: Stimulates Sertoli cells. - **LH**: Stimulates Leydig cells for testosterone production. - **Spermiogenesis**: Final transformation of spermatids into spermatozoa.

---

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

A. $I^Bi/I^Ai/ii$

B. $I^BI^B/I^AI^A/ii$

C. $I^AI^B/iI^A/I^Bi$

D. $I^Ai/I^Bi/I^Ai$

E. $ii/I^Ai/I^AI^B$

Choose the most appropriate answer from the options given below :

(1) C & B only

(2) D & E only

(3) A only

(4) B only

Correct Answer: (3) A only

Solution: To determine the correct genotype combinations for each family member based on their blood types: - The father with blood type B+ must have at least one B allele. Since the child is type O+, the father cannot be I^BI^B (he must carry an i to pass to the child).

- The mother with blood type A+ must have at least one A allele. Similarly, she cannot be I^AI^A as she needs to pass an i to the child.

- The child with blood type O+ must have the genotype ii, inheriting one i from each parent.

From the options provided, only Option A correctly reflects these requirements: - Father: I^Bi - Mother: I^Ai - Child: ii

This combination allows the father to contribute the I^B or i, the mother I^A or i, and ensures the child receives i from both, resulting in the O+ phenotype.

Quick Tip

When analyzing genetic possibilities for the ABO blood group system, focus on ensuring the child's genotype is supported by the alleles present in both parents.

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

List I	Description	List II	Structure
A	The structures used for storing food	I	Gizzard
B	Ring of 6-8 blind tubules at the junction of foregut and midgut	II	Gastric Caeca
C	Ring of 100-150 yellow-colored thin filaments at the 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-III, C-II, D-I

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

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

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

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

Solution: - **(A) Crop** (IV) is responsible for storing food.

- **(B) Gastric Caeca** (II) are 6-8 blind tubules at the junction of the foregut and midgut.

- **(C) Malpighian tubules** (III) are thin yellow-colored filaments at the junction of midgut and hindgut, playing a role in excretion.

- **(D) Gizzard** (I) is used for grinding food.

Quick Tip

- **Cockroach Digestive System:** - Crop: Food storage.
- Gizzard: Grinding food.
- Gastric Caeca: Secretes digestive enzymes.
- Malpighian Tubules: Excretion.