NEET UG 2023 G4 Zoology Question Paper with Solutions

Time Allowed :3 Hour 20 Minutes	**Maximum Marks :**720	**Total Questions :**200

General Instructions

Read the following instructions very carefully and strictly follow them:

1. The Answer Sheet is this Test Booklet. When you are directed to open the Test Booklet, take the Answer Sheet and fill in the particulars in ORIGINAL Copy carefully with blue/black ball pen only.
2. The test is of 3 hours 20 minutes duration and the Test Booklet contains 200 multiple-choice questions (four options with a single correct answer) from Physics, Chemistry, and Biology (Botany and Zoology). 50 questions in each subject are divided into two Sections (A and B) as per details given below:
3. (a) Section A shall consist of 35 (Thirty-five) questions in each subject (Question Nos. 1 to 35, 51 to 85, 101 to 135 and 151 to 185).
4. (b) Section B shall consist of 15 (Fifteen) questions in each subject (Question Nos. 36 to 50, 86 to 100, 136 to 150 and 186 to 200). In Section B, a candidate needs to attempt any 10 (Ten) questions out of 15 (Fifteen) in each subject.
5. Candidates are advised to read all 15 questions in each subject of Section B before they start attempting the question paper. In the event of a candidate attempting more than ten questions, the first ten questions answered by the candidate shall be evaluated.
6. Each question carries 4 marks. For each correct response, the candidate will get 4 marks. For each incorrect response, one mark will be deducted from the total scores. The maximum marks are 720.
7. Rough work is to be done in the space provided for this purpose in the Test Booklet only.
8. On completion of the test, the candidate must hand over the Answer Sheet (ORIGINAL and OFFICE Copy) to the Invigilator before leaving the Room/Hall. The candidates are allowed to take away this Test Booklet with them.
9. Use of Electronic/Manual Calculator is prohibited.

Section A

151. Broad palm with single palm crease is visible in a person suffering from-

(A) Thalassemia
(B) Down's syndrome

(C) Turner's syndrome
(D) Klinefelter's syndrome

Correct Answer: (B) Down's syndrome

Solution:

Step 1: Understanding the Question:
The question asks to identify the genetic disorder associated with the physical characteristic of a broad palm with a single transverse palmar crease.

Step 3: Detailed Explanation:

- **Down's syndrome**, also known as Trisomy 21, is a chromosomal disorder caused by the presence of all or part of a third copy of chromosome 21.
- It is characterized by a set of distinct physical features. One of the well-known features is a single transverse palmar crease (also called a simian crease) across the palm of the hand, along with broad palms and short fingers.
- Other features include a small round head, a flattened facial profile, a furrowed tongue, and congenital heart defects.
- **Thalassemia** is a blood disorder. **Turner's syndrome** (XO) and **Klinefelter's syndrome** (XXY) are chromosomal disorders with different sets of symptoms, but the single palmar crease is not a defining characteristic for them.

Step 4: Final Answer:
A broad palm with a single palmar crease is a characteristic feature of Down's syndrome.

Quick Tip

Associate the term "single palmar crease"or "simian crease"directly with Down's syndrome. It is a classic and frequently tested physical marker for this condition.

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152. Given below are two statements:
Statement I: Low temperature preserves the enzyme in a temporarily inactive state whereas high temperature destroys enzymatic activity because proteins are denatured by heat.
Statement II: When the inhibitor closely resembles the substrate in its molecular structure and inhibits the activity of the enzyme, it is known as competitive inhibitor.

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

(A) Statement I is false but Statement II is true.
(B) Both Statement I and Statement II are true.
(C) Both Statement I and Statement II are false.
(D) Statement I is true but Statement II is false.

Correct Answer: (B) Both Statement I and Statement II are true.

Solution:

Step 1: Understanding the Question:
The question asks to evaluate two statements. The first statement is about the effect of temperature on enzyme activity. The second statement defines competitive inhibition.

Step 3: Detailed Explanation:
Statement I Analysis:
Enzymes have an optimal temperature range for activity.

- **Low temperatures** reduce the kinetic energy of both the enzyme and substrate molecules, causing a decrease in the reaction rate. The enzyme is preserved in a temporarily inactive state. If the temperature is raised back to the optimum, its activity is restored.
- **High temperatures** increase kinetic energy, but beyond the optimum, the heat disrupts the weak hydrogen bonds that maintain the enzyme's specific three-dimensional structure. This change in shape, called denaturation, is irreversible and leads to a permanent loss of enzymatic activity.

Therefore, Statement I is correct.

Statement II Analysis:
This statement describes competitive inhibition. A competitive inhibitor is a molecule that is structurally similar to the substrate. It competes with the substrate for binding to the active site of the enzyme. When the inhibitor is bound, the substrate cannot bind, and the enzyme's activity is inhibited. This is the precise definition of a competitive inhibitor. Therefore, Statement II is correct.

Step 4: Final Answer:
Both Statement I and Statement II are true statements.

Quick Tip

Remember that low temperature is like putting an enzyme into 'hibernation' (inactive but recoverable), while high temperature 'cooks' it (denatured and destroyed). Competitive inhibitors 'compete' for the active site because they 'look like' the real substrate.

153. Which one of the following common sexually transmitted diseases is completely curable when detected early and treated properly?

(A) HIV Infection
(B) Genital herpes
(C) Gonorrhoea
(D) Hepatitis-B

Correct Answer: (C) Gonorrhoea

Solution:

Step 1: Understanding the Question:
The question asks to identify which of the listed sexually transmitted diseases (STDs) can be completely cured.

Step 3: Detailed Explanation:
The key to answering this question is to distinguish between bacterial and viral infections.

- **Gonorrhoea** is a bacterial infection caused by *Neisseria gonorrhoeae*. Bacterial infections can generally be treated and completely cured with a course of antibiotics, especially if diagnosed early.
- **HIV Infection**, **Genital herpes** (caused by Herpes Simplex Virus), and **Hepatitis-B** are all caused by viruses. As of now, there are no cures for these viral infections. Antiviral medications can manage the symptoms, reduce the viral load, and prevent transmission, but they cannot eliminate the virus from the body completely.

Step 4: Final Answer:
Among the given options, only Gonorrhoea, being a bacterial STD, is completely curable with proper antibiotic treatment.

Quick Tip

A general rule for STDs in exams: bacterial infections (like Gonorrhoea, Syphilis, Chlamydia) are considered curable, while viral infections (like HIV, Herpes, Hepatitis B, HPV) are generally not curable, only manageable.

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154. Given below are two statements:
Statement I: Electrostatic precipitator is most widely used in thermal power plant.
Statement II: Electrostatic precipitator in thermal power plant removes ionising radiations
In the light of the above statements, choose the most appropriate answer from the

options given below:

(A) Statement I incorrect but Statement II is correct.
(B) Both Statement I and Statement II are correct.
(C) Both Statement I and Statement II are incorrect.
(D) Statement I is correct but Statement II is incorrect.

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

Solution:

Step 1: Understanding the Question:
The question asks to evaluate two statements regarding the use and function of an electrostatic precipitator in a thermal power plant.

Step 3: Detailed Explanation:
Statement I Analysis:
Thermal power plants, which burn fossil fuels like coal, produce large amounts of fly ash and other particulate matter in their exhaust gases. The electrostatic precipitator is a highly efficient (up to 99% efficiency) and widely used device to remove these particulate pollutants from the exhaust before it is released into the atmosphere. Therefore, Statement I is correct.

Statement II Analysis:
An electrostatic precipitator works by using high-voltage electrodes to create an electric field. This field charges the dust particles in the exhaust gas, which are then attracted to and collected on oppositely charged plates. Its function is to remove **particulate matter**, not ionising radiations. Ionising radiation is a concern associated with nuclear power plants, not thermal power plants. Therefore, Statement II is incorrect.

Step 4: Final Answer:
Statement I is a correct fact, but Statement II incorrectly describes the function of an electrostatic precipitator.

Quick Tip

Associate "electrostatic precipitator"with "particulate matter"(like dust and ash). It uses static electricity to clean smoke. It has nothing to do with radiation.

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155. Given below are two statements:
Statement I: Vas deferens receives a duct from seminal vesicle and opens into urethra as the ejaculatory duct.
Statement II: The cavity of the cervix is called cervical canal which along with vagina forms birth canal.
In the light of the above statements, choose the correct answer from the options

given below:

(A) Statement I incorrect but Statement II is true.
(B) Both Statement I and Statement II are true.
(C) Both Statement I and Statement II are false.
(D) Statement I is correct but Statement II is false.

Correct Answer: (B) Both Statement I and Statement II are true.

Solution:

Step 1: Understanding the Question:
The question asks to evaluate the correctness of two statements describing parts of the male and female reproductive systems.

Step 3: Detailed Explanation:
Statement I Analysis:
This statement describes the formation of the ejaculatory duct in the male reproductive system. The vas deferens, which carries sperm from the epididymis, ascends and loops over the urinary bladder. It then receives the duct from the seminal vesicle. The union of the vas deferens and the seminal vesicle duct forms the ejaculatory duct. This duct then passes through the prostate gland and opens into the urethra. This description is anatomically correct.

Statement II Analysis:
This statement describes the formation of the birth canal in the female reproductive system. The cervix is the lower, narrow part of the uterus that opens into the vagina. The cavity within the cervix is called the cervical canal. During childbirth (parturition), the baby passes from the uterus, through the cervical canal, and then through the vagina to the outside. Therefore, the cervical canal and the vagina together constitute the birth canal. This description is also anatomically correct.

Step 4: Final Answer:
Both statements are accurate descriptions of human reproductive anatomy.

Quick Tip

To remember the male duct system, trace the path of sperm: Epididymis $\rightarrow$ Vas deferens + Seminal vesicle duct $\rightarrow$ Ejaculatory duct $\rightarrow$ Urethra. For the female system, remember the birth canal is the exit path: Uterus $\rightarrow$ Cervical Canal + Vagina.

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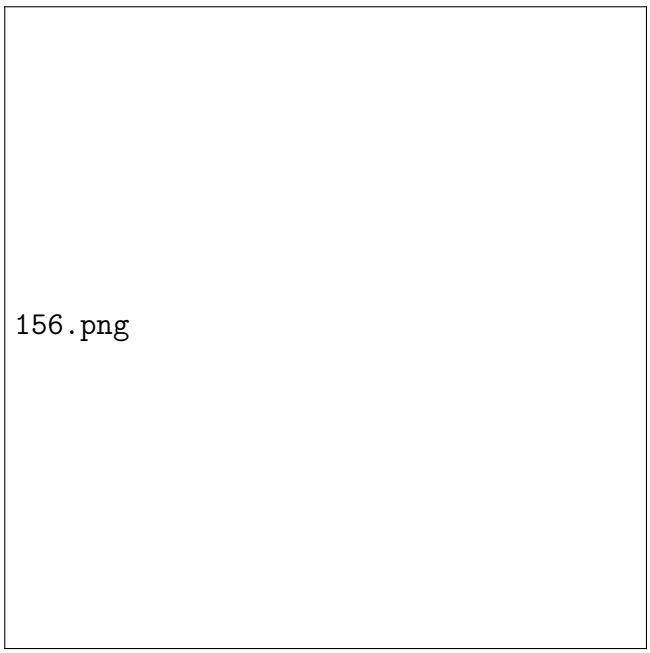
156. Which one of the following symbols represents mating between relatives in human pedigree analysis?



Correct Answer: (C)

Solution:

Step 1: Understanding the Question:
The question asks to identify the standard symbol used in a human pedigree chart to represent a consanguineous mating, i.e., mating between close relatives.

Step 3: Detailed Explanation:
In standard pedigree nomenclature:

- A square represents a male.
- A circle represents a female.
- A horizontal line connecting a square and a circle represents mating between them.
- A **double horizontal line** connecting a square and a circle specifically indicates a **consanguineous mating** (mating between relatives).

Let's analyze the options (assuming standard symbols):

- (A) Shows an affected female (filled circle) and an unaffected male (unfilled square) mating.
- (B) Shows a normal mating between an unaffected male and an unaffected female.
- (C) Shows a mating between an unaffected male and an unaffected female connected by a **double line**, which is the correct symbol for mating between relatives.
- (D) Shows a mating between two affected individuals.

Step 4: Final Answer:
The symbol with the double line between the male and female represents mating between relatives.

Quick Tip

In pedigree charts, remember: Single line = normal mating; Double line = consanguineous (relative) mating. This is a crucial symbol for tracking recessive genetic disorders, which are more likely to appear in the offspring of such matings.

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157. Match List I with List II.

List I	List II
A. Taenia	**I. Nephridia**
B. Paramoecium	**II. Contractile vacuole**
C. Periplaneta	**III. Flame cells**
D. Pheretima	**IV. Urecose gland**

Choose the correct answer from the options give below:

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

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

Solution:

Step 1: Understanding the Question:
The question requires matching organisms from List I with their corresponding excretory or osmoregulatory structures from List II.

Step 3: Detailed Explanation:

- **A. Taenia (Tapeworm):** It belongs to the phylum Platyhelminthes. The excretory structures in platyhelminths are specialized cells called **flame cells** (protonephridia). So, **A matches III**.
- **B. Paramoecium:** It is a single-celled protozoan. For osmoregulation (excretion of excess water), it uses a specialized organelle called the **contractile vacuole**. So, **B matches II**.
- **C. Periplaneta (Cockroach):** It belongs to the phylum Arthropoda, class Insecta. The primary excretory organs are Malpighian tubules. However, insects also use fat bodies and **urecose glands** to store uric acid. So, **C matches IV**.

- **D. Pheretima (Earthworm):** It belongs to the phylum Annelida. The excretory organs in annelids are coiled tubular structures called **nephridia**. So, **D matches I**.

The correct combination is A-III, B-II, C-IV, D-I.

Step 4: Final Answer:
The option that corresponds to the correct matching is (D).

Quick Tip

Memorizing excretory structures of major phyla is essential. Create a list:

- Protozoa → Contractile vacuole
- Platyhelminthes → Flame cells
- Annelida → Nephridia
- Arthropoda (Insects) → Malpighian tubules

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158. Given below are two statements:
Statement I: In prokaryotes, the positively charged DNA is held with some negatively charged proteins in a region called nucleoid.
Statement II: In eukaryotes, the negatively charged DNA is wrapped around the positively charged histone octamer to form nucleosome.
In the light of the above statements, choose the correct answer from the options given below:

(A) Statement I incorrect but Statement II is true.
(B) Both Statement I and Statement II are true.
(C) Both Statement I and Statement II are false.
(D) Statement I is correct but Statement II is false.

Correct Answer: (A) Statement I incorrect but Statement II is true.

Solution:

Step 1: Understanding the Question:
The question asks to evaluate two statements describing DNA packaging in prokaryotes and eukaryotes, focusing on the charges of DNA and associated proteins.

Step 3: Detailed Explanation:
Statement I Analysis:
This statement has a fundamental error in the charges. DNA, due to its phosphate backbone (PO_4^{3-}), is **negatively charged**. In prokaryotes, this negatively charged DNA is organized in a region called the nucleoid, associated with some **positively charged** proteins (often called

histone-like proteins). The statement says "positively charged DNA"and "negatively charged proteins,"which is the reverse of the actual situation. Therefore, Statement I is incorrect.

Statement II Analysis:
This statement correctly describes the basic unit of DNA packaging in eukaryotes. The **negatively charged DNA** molecule wraps around a core of eight histone proteins (a histone octamer). Histones are rich in positively charged amino acids (lysine and arginine), making the histone octamer **positively charged**. This entire complex is called a nucleosome. Therefore, Statement II is correct.

Step 4: Final Answer:
Statement I is incorrect because it reverses the charges of DNA and its associated proteins, while Statement II is correct.

Quick Tip

Always remember: DNA is an acid (Deoxyribonucleic Acid) and is **negatively charged** due to its phosphate groups. For packaging, it must be associated with **positively charged** proteins. In eukaryotes, these are histones.

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159. Which of the following functions is carried out by cytoskeleton in a cell?

(A) Transportation
(B) Nuclear division
(C) Protein synthesis
(D) Motility

Correct Answer: (D) Motility

Solution:

Step 1: Understanding the Question:
The question asks to identify a key function performed by the cytoskeleton.

Step 3: Detailed Explanation:
The cytoskeleton is a network of protein filaments (microfilaments, intermediate filaments, and microtubules) within the cytoplasm. Its major functions include:

- **Mechanical Support:** Maintaining the shape of the cell.
- **Anchorage of Organelles:** Holding organelles in place.
- **Intracellular Transport:** Acting as tracks for motor proteins to move vesicles and organelles.

- **Motility:** This is a crucial function. It includes the movement of the entire cell (e.g., amoeboid movement via microfilaments) and the movement of cilia and flagella (powered by microtubules).

Let's analyze the options:

- (A) Transportation: While the cytoskeleton is involved in intracellular transport, "transportation"is a very broad term.
- (B) Nuclear division: The cytoskeleton (specifically microtubules forming the spindle) is essential for chromosome separation during nuclear division, but "motility"is a more general and direct function.
- (C) Protein synthesis: This is the function of ribosomes.
- (D) Motility: This is a direct and defining function of the cytoskeleton, encompassing various forms of cellular movement.

Given the choices, motility is one of the most prominent and direct functions of the cytoskeleton.

Step 4: Final Answer:
Motility is a primary function carried out by the cytoskeleton.

Quick Tip

Think of the cytoskeleton as the cell's "skeleton and muscles."It provides structure and is responsible for all kinds of movement, both inside the cell and of the cell itself.

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160. Given below are two statements:
Statement I: Ligaments are dense irregular tissue.
Statement II: Cartilage is dense regular tissue.
In the light of the above statements, choose the correct answer from the options given below:

(A) Statement I is false but Statement II is true.
(B) Both Statement I and Statement II are true.
(C) Both Statement I and Statement II are false.
(D) Statement I is true but Statement II is false.

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

Solution:

Step 1: Understanding the Question:
The question asks to evaluate the correctness of two statements that classify specific types of

connective tissue.

Step 3: Detailed Explanation:
Statement I Analysis:
Ligaments are connective tissues that attach bone to bone. They are composed of collagen fibres oriented in a parallel fashion to withstand tensile stress in one direction. This parallel arrangement is characteristic of **dense regular** connective tissue, not dense irregular. Therefore, Statement I is false.

Statement II Analysis:
Cartilage is a type of **specialized connective tissue**, characterized by a firm, pliable matrix and chondrocyte cells. It is not classified under the categories of dense regular or dense irregular connective tissue, which are types of connective tissue proper. Therefore, Statement II is false.

Step 4: Final Answer:
Both statements incorrectly classify the tissues. Ligaments are dense regular, and cartilage is a specialized connective tissue.

Quick Tip

Remember the key examples for connective tissue proper:

- **Dense Regular:** Tendons (muscle to bone) and Ligaments (bone to bone). Think "regular"arrangement for strength in one direction.
- **Dense Irregular:** Dermis of the skin. Think "irregular"arrangement for strength in many directions.
- **Specialized:** Cartilage, Bone, and Blood are in their own categories.

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161. Which of the following are NOT considered as the part of endomembrane system?
A. Mitochondria **B. Endoplasmic Reticulum**
C. Chloroplasts **D. Golgi complex**
E. Peroxisomes
Choose the most appropriate answer from the options given below:

(A) A, D and E only
(B) B and D only
(C) A, C and E only
(D) A and D only

Correct Answer: (C) A, C and E only

Solution:

Step 1: Understanding the Question:
The question asks to identify which of the listed organelles are not part of the endomembrane system.

Step 3: Detailed Explanation:
The endomembrane system is a group of membranes and organelles in eukaryotic cells that work together to modify, package, and transport lipids and proteins. The components are either directly connected or exchange material through vesicle transport.
The core components of the endomembrane system are:

- Endoplasmic Reticulum (B)
- Golgi complex (apparatus) (D)
- Lysosomes
- Vacuoles
- The plasma membrane

The following organelles are **not** part of the endomembrane system because their functions are distinct and they do not originate from the ER-Golgi pathway:

- **Mitochondria (A):** They are involved in cellular respiration and have their own DNA.
- **Chloroplasts (C):** They are involved in photosynthesis and have their own DNA.
- **Peroxisomes (E):** They are involved in metabolic processes, including breaking down fatty acids and detoxifying harmful substances.

Therefore, mitochondria, chloroplasts, and peroxisomes are not part of the endomembrane system.

Step 4: Final Answer:
The organelles not part of the endomembrane system are A, C, and E.

Quick Tip

Think of the endomembrane system as a cell's internal "postal service"for proteins and lipids: ER $\rightarrow$ Golgi $\rightarrow$ Vesicles. Mitochondria and chloroplasts are the cell's "power plants"and are functionally separate. Peroxisomes are the "detox centers."

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162. Given below are two statements: one is labelled as Assertion A and the other is labelled as Reason R.
Assertion A: Amniocentesis for sex determination is one of the strategies of Reproductive and Child Health Care Programme.

Reason R: Ban on amniocentesis checks increasing menace of female foeticide.
In the light of the above statements, choose the correct answer from the options given below:

(A) A is false but R is true.
(B) Both A and R are true and R is the correct explanation of A.
(C) Both A and R are true and R is NOT the correct explanation of A.
(D) A is true but R is false.

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

Solution:

Step 1: Understanding the Question:
The question presents an Assertion and a Reason regarding amniocentesis, its use for sex determination, and its relation to government health programs and social issues.

Step 3: Detailed Explanation:
Assertion A Analysis:
Amniocentesis is a prenatal diagnostic technique used to detect genetic abnormalities in the fetus. Its use for determining the sex of the fetus is a misuse of the technology and is legally banned in India under the Pre-Conception and Pre-Natal Diagnostic Techniques (PCPNDT) Act, 1994. The Reproductive and Child Health Care (RCH) Programme is a government initiative to improve maternal and child health. Promoting a banned practice like sex determination is completely against the objectives of the RCH Programme. Therefore, Assertion A is false.

Reason R Analysis:
The primary reason for imposing a statutory ban on amniocentesis for sex determination was to curb the widespread practice of female foeticide, which has led to a skewed sex ratio in many parts of the country. By making it illegal to determine and disclose the sex of the fetus, the government aims to prevent the selective abortion of female fetuses. Therefore, Reason R is true.

Step 4: Final Answer:
The Assertion (A) is false, while the Reason (R) is true.

Quick Tip

Amniocentesis for checking genetic disorders = a valid medical procedure. Amniocentesis for sex determination = a banned, illegal act. Government health programs (like RCH) promote health and would never include a banned activity in their strategies.

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163. Given below are statements: one is labelled as Assertion A and the other is labelled as Reason R.
Assertion A: Nephrons are of two types: Cortical & Juxta medullary, based on

their relative position in cortex and medulla.
Reason R: Juxta medullary nephrons have short loop of Henle whereas, cortical nephrons have longer loop of Henle.
In the light of the above statements, choose the correct answer from the options given below:

(A) A is false but R is true.
(B) Both A and R are true and R is the correct explanation of A.
(C) Both A and R are true but R is NOT the correct explanation of A.
(D) A is true but R is false.

Correct Answer: (D) A is true but R is false.

Solution:

Step 1: Understanding the Question:
The question presents an Assertion and a Reason about the types of nephrons and the length of their loops of Henle.

Step 3: Detailed Explanation:
Assertion A Analysis:
Nephrons are the functional units of the kidney. Based on their location within the kidney, they are classified into two main types:

- **Cortical nephrons:** The majority of nephrons (about 85%), with their glomeruli located in the outer cortex.
- **Juxtamedullary nephrons:** Their glomeruli are located deep in the cortex, close to the medulla (juxta = near).

This classification based on position is correct. Therefore, Assertion A is true.

Reason R Analysis:
This statement describes the loop of Henle length for the two types of nephrons. However, it states the facts incorrectly.

- **Cortical nephrons** have a **short** loop of Henle that only extends slightly into the medulla.
- **Juxtamedullary nephrons** have a very **long** loop of Henle that extends deep into the medulla. This long loop is crucial for creating the concentration gradient required to produce concentrated urine.

The Reason statement claims the opposite, so Reason R is false.

Step 4: Final Answer:
The Assertion (A) is true, but the Reason (R) is false.

Quick Tip

Remember: **Juxtamedullary** means "near the medulla."These nephrons dive deep into the medulla, so they need a **long** loop of Henle. Cortical nephrons stay mainly in the cortex and have **short** loops.

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164. Match List I with List II.

List I (Type of Joint)	List II (Found between)
A. Cartilaginous Joint	**I. Between flat skull bones**
B. Ball and Socket Joint	**II. Between adjacent vertebrae in vertebral column**
C. Fibrous Joint	**III. Between carpal and metacarpal of thumb**
D. Saddle Joint	**IV. Between Humerus and Pectoral girdle**

Choose the correct answer from the options given below:

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

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

Solution:

Step 1: Understanding the Question:
The question asks to match the type of joint in List I with its correct location in the human body from List II.

Step 3: Detailed Explanation:

- **A. Cartilaginous Joint:** These joints have bones connected by cartilage and allow for limited movement. An example is the joint **between adjacent vertebrae in the vertebral column**. Thus, **A matches with II**.
- **B. Ball and Socket Joint:** This is a type of synovial joint where the ball-shaped head of one bone fits into the cup-like socket of another, allowing for movement in many directions. An example is the joint **between the humerus and the pectoral girdle** (the shoulder joint). Thus, **B matches with IV**.
- **C. Fibrous Joint:** These joints have bones connected by dense fibrous connective tissue and allow for no movement. The sutures **between the flat skull bones** are examples of fibrous joints. Thus, **C matches with I**.

- **D. Saddle Joint:** This is another type of synovial joint that allows for back and forth and side-to-side movement, but limited rotation. The classic example is the joint **between the carpal and metacarpal of the thumb**. Thus, **D matches with III**.

The correct matching is A-II, B-IV, C-I, D-III.

Step 4: Final Answer:
The correct option is (C), which reflects the matching A-II, B-IV, C-I, D-III.

Quick Tip

Associate specific, unique examples with each joint type: Saddle Joint → Thumb; Fibrous Joint → Skull Sutures; Cartilaginous Joint → Vertebrae. This makes matching questions easier.

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165. Vital capacity of lung is

(A) IRV + ERV + TV
(B) IRV + ERV
(C) IRV + ERV + TV + RV
(D) IRV + ERV + TV – RV

Correct Answer: (A) IRV + ERV + TV

Solution:

Step 1: Understanding the Question:
The question asks for the correct formula to calculate the Vital Capacity (VC) of the lungs.

Step 3: Detailed Explanation:
Let's define the terms related to lung volumes:

- **Tidal Volume (TV):** The volume of air inspired or expired during a normal, quiet breath.
- **Inspiratory Reserve Volume (IRV):** The additional volume of air that can be forcibly inhaled after a normal inspiration.
- **Expiratory Reserve Volume (ERV):** The additional volume of air that can be forcibly exhaled after a normal expiration.
- **Residual Volume (RV):** The volume of air remaining in the lungs even after a forceful expiration.

Vital Capacity (VC) is defined as the maximum amount of air a person can exhale after filling the lungs to the maximum extent (a maximal inspiration). It represents the total usable volume of the lungs for breathing.

The formula for Vital Capacity is the sum of the three volumes that can be exchanged:

$$VC = TV + IRV + ERV$$

The total lung capacity (TLC) is the vital capacity plus the residual volume (TLC = VC + RV = TV + IRV + ERV + RV).

Step 4: Final Answer:
The correct formula for vital capacity is IRV + ERV + TV.

Quick Tip

Remember that "Vital Capacity"is the 'vital' or usable part of the lung volume. It includes everything you can possibly move in and out. The "Residual Volume"is what's left over and cannot be exhaled, so it's not part of the vital capacity.

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166. Match List I with List II.

List I	List II
A. Ringworm	**I. Haemophilus influenzae**
B. Filariasis	**II. Trichophyton**
C. Malaria	**III. Wuchereria bancrofti**
D. Pneumonia	**IV. Plasmodium vivax**

Choose the correct answer from the options given below:

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

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

Solution:

Step 1: Understanding the Question:
The question requires matching the diseases in List I with their respective causative organisms in List II.

Step 3: Detailed Explanation:

- **A. Ringworm:** Despite its name, ringworm is not caused by a worm. It is a common fungal infection of the skin, caused by fungi belonging to genera like **Trichophyton**, Microsporum, and Epidermophyton. Thus, **A matches with II**.
- **B. Filariasis** (Elephantiasis): This is a parasitic disease caused by infection with filarial worms, specifically **Wuchereria bancrofti**. Thus, **B matches with III**.

- **C. Malaria:** This is a protozoan disease caused by parasites of the genus **Plasmodium**. *Plasmodium vivax* is one of the species that cause malaria. Thus, **C matches with IV**.
- **D. Pneumonia:** This is an infection of the lungs that can be caused by bacteria, viruses, or fungi. One of the common bacterial causes is **Haemophilus influenzae** (another is *Streptococcus pneumoniae*). Thus, **D matches with I**.

The correct set of matches is A-II, B-III, C-IV, D-I.

Step 4: Final Answer:
The option that corresponds to the correct matching is (B).

Quick Tip

It is crucial to know the type of pathogen for common diseases: Ringworm = Fungal; Filariasis = Helminth (worm); Malaria = Protozoan; Pneumonia = Bacterial/Viral. This helps narrow down the options quickly.

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167. In which blood corpuscles, the HIV undergoes replication and produces progeny viruses?

(A) Eosinophils
(B) T_H cells
(C) B-lymphocytes
(D) Basophils

Correct Answer: (B) T_H cells

Solution:

Step 1: Understanding the Question:
The question asks to identify the specific type of blood cell in which the Human Immunodeficiency Virus (HIV) replicates.

Step 3: Detailed Explanation:
HIV is a retrovirus that attacks the human immune system. Its primary target is a specific type of lymphocyte called the **Helper T-cell**, also known as a T_H cell or a CD4+ T-cell.
The virus uses the CD4 protein on the surface of these helper T-cells as a receptor to gain entry. Once inside the T_H cell, HIV uses its own enzyme, reverse transcriptase, to convert its RNA genome into DNA. This viral DNA is then integrated into the host cell's DNA.
The infected T_H cell is then hijacked to become a "virus factory,"producing new HIV particles (progeny viruses). These new viruses bud off from the cell, ready to infect other T_H cells. The process eventually leads to the death of the host T_H cell.
The progressive destruction of T_H cells is what severely weakens the immune system, leading

to Acquired Immunodeficiency Syndrome (AIDS).

Step 4: Final Answer:
HIV replicates within Helper T-cells (T_H cells).

Quick Tip

Remember that HIV attacks the "commander"of the immune system. The Helper T-cells (T_H) play a central role in coordinating the immune response, so their destruction cripples the entire system.

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168. Match List I with List II.

List I		List II	
A.	**Gene 'a'**	**I.**	**β-galactosidase**
B.	**Gene 'y'**	**II.**	**Transacetylase**
C.	**Gene 'i'**	**III.**	**Permease**
D.	**Gene 'z'**	**IV.**	**Repressor protein**

Choose the correct answer from the options given below:

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

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

Solution:

Step 1: Understanding the Question:
The question requires matching the genes of the lac operon (List I) with the proteins they encode (List II).

Step 3: Detailed Explanation:
The lac operon in E. coli consists of a regulator gene and three structural genes.

- **C. Gene 'i' (lacI):** This is the regulator gene. It codes for the **repressor protein**, which binds to the operator region and prevents transcription in the absence of lactose. Thus, **C matches with IV**.
- **D. Gene 'z' (lacZ):** This is the first structural gene. It codes for the enzyme **β-galactosidase**, which hydrolyzes lactose into glucose and galactose. Thus, **D matches with I**.
- **B. Gene 'y' (lacY):** This is the second structural gene. It codes for the protein **permease**, which increases the permeability of the cell to lactose, allowing it to enter the cell. Thus, **B matches with III**.

- **A. Gene 'a' (lacA):** This is the third structural gene. It codes for the enzyme **transacetylase**. Thus, **A matches with II**.

The correct matching is A-II, B-III, C-IV, D-I.

Step 4: Final Answer:
The option that corresponds to the correct matching is (C).

Quick Tip

Remember the order of the structural genes in the lac operon: z, y, a. And their functions: 'z' for β-galactosidase (breaks down lactose), 'y' for permease (lets lactose in), and 'a' for transacetylase. The 'i' gene stands for "inhibitor"(repressor).

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169. Match List I with List II with respect to human eye.

List I	List II
A. Fovea	**I. Visible coloured portion of eye that regulates diameter of pupil.**
B. Iris	**II. External layer of eye formed of dense connective tissue.**
C. Blind spot	**III. Point of greatest visual acuity or resolution.**
D. Sclera	**IV. Point where optic nerve leaves the eyeball and photoreceptor cells are absent.**

Choose the correct answer from the options given below:

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

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

Solution:

Step 1: Understanding the Question:
The question asks to match parts of the human eye (List I) with their correct description or function (List II).

Step 3: Detailed Explanation:

- **A. Fovea:** The fovea is a small depression in the retina (at the center of the macula lutea) where cone cells are most concentrated. This is the region of the most acute vision, or the **point of greatest visual acuity or resolution**. Thus, **A matches with III**.

- **B. Iris:** The iris is the thin, circular structure in the eye responsible for controlling the diameter and size of the pupil. It is the **visible coloured portion of the eye**. Thus, **B matches with I**.
- **C. Blind spot:** This is the point on the retina where the axons of the ganglion cells exit the eye to form the optic nerve. Because there are no photoreceptor cells (rods or cones) at this location, it is insensitive to light. Thus, it is the **point where the optic nerve leaves the eyeball and photoreceptor cells are absent**. Thus, **C matches with IV**.
- **D. Sclera:** The sclera is the tough, fibrous, white outer layer of the eyeball. It is the **external layer of the eye formed of dense connective tissue**. Thus, **D matches with II**.

The correct set of matches is A-III, B-I, C-IV, D-II.

Step 4: Final Answer:
The option that corresponds to the correct matching is (B).

Quick Tip

Create simple associations for eye parts: Fovea = Focus (sharpest vision); Iris = Colour (controls pupil); Sclera = White part (tough outer layer); Blind Spot = No vision (optic nerve exit).

---

170. Select the correct group/set of Australian Marsupials exhibiting adaptive radiation.

(A) Lemur, Anteater, Wolf
(B) Tasmanian wolf, Bobcat, Marsupial mole
(C) Numbat, Spotted cuscus, Flying phalanger
(D) Mole, Flying squirrel, Tasmanian tiger cat

Correct Answer: (C) Numbat, Spotted cuscus, Flying phalanger

Solution:

Step 1: Understanding the Question:
The question asks to identify the group that consists exclusively of Australian marsupials, which are a classic example of adaptive radiation.

Step 3: Detailed Explanation:
Adaptive radiation is the evolutionary process where organisms diversify rapidly from an ancestral species into a multitude of new forms, particularly when a change in the environment makes new resources available, creates new challenges, or opens new environmental niches. Australian marsupials are a prime example, having evolved from a common ancestor to fill

diverse ecological roles.
We need to find the option where all listed animals are Australian marsupials.

- (A) Lemur (primate), Anteater (placental mammal), Wolf (placental mammal). This group is incorrect.
- (B) Tasmanian wolf (marsupial), **Bobcat** (placental mammal), Marsupial mole (marsupial). The presence of a placental mammal makes this group incorrect.
- (C) **Numbat** (marsupial anteater), **Spotted cuscus** (marsupial), and **Flying phalanger** (marsupial sugar glider) are all Australian marsupials. This group is correct.
- (D) **Mole** (placental mammal), **Flying squirrel** (placental mammal), Tasmanian tiger cat (marsupial). The presence of placental mammals makes this group incorrect.

The animals in options A, B, and D that are not marsupials (e.g., Anteater, Wolf, Bobcat, Mole, Flying squirrel) are placental mammals that show convergent evolution with their marsupial counterparts.

Step 4: Final Answer:
The only group consisting entirely of Australian marsupials is Numbat, Spotted cuscus, and Flying phalanger.

Quick Tip

To answer questions about adaptive radiation in Australian marsupials, you must be able to distinguish them from their placental counterparts. For example: Marsupial Mole vs. Placental Mole; Tasmanian Wolf vs. Placental Wolf; Flying Phalanger vs. Flying Squirrel. The question is testing this distinction.

---

171. Which of the following statements are correct regarding female reproductive cycle?
A. In non-primate mammals cyclical changes during reproduction are called oestrus cycle.
B. First menstrual cycle begins at puberty and is called menopause.
C. Lack of menstruation may be indicative of pregnancy.
D. Cyclic menstruation extends between menarche and menopause.
Choose the most appropriate answer from the options given below:

(A) A, C and D only
(B) A and D only
(C) A and B only
(D) A, B and C only

Correct Answer: (A) A, C and D only

Solution:

Step 1: Understanding the Question:
The question asks to identify the correct statements about the female reproductive cycle from a given list.

Step 3: Detailed Explanation:
Let's evaluate each statement:

- **A. In non-primate mammals cyclical changes during reproduction are called oestrus cycle.** This is correct. Primates (monkeys, apes, humans) have a menstrual cycle, while non-primate mammals (like cows, dogs, cats) have an oestrus cycle (or "heat"cycle).
- **B. First menstrual cycle begins at puberty and is called menopause.** This is incorrect. The first menstrual cycle is called **menarche**. **Menopause** is the permanent cessation of the menstrual cycle.
- **C. Lack of menstruation may be indicative of pregnancy.** This is correct. While missed periods can be due to stress, poor health, etc., it is a primary indicator of pregnancy.
- **D. Cyclic menstruation extends between menarche and menopause.** This is correct. The reproductive life of a female, characterized by cyclic menstruation, starts at menarche and ends at menopause.

Therefore, statements A, C, and D are correct.

Step 4: Final Answer:
The correct option is (A), which includes statements A, C, and D.

Quick Tip

Remember the key terms for the start and end of the menstrual cycle: Menarche = Start (at puberty); Menopause = Pause/End (in later life). Don't confuse the two.

---

172. Given below are two statements: one is labelled as Assertion A and the other is labelled as Reason R.
Assertion A: Endometrium is necessary for implantation of blastocyst.
Reason R: In the absence of fertilization, the corpus luteum degenerates that causes disintegration of endometrium.
In the light of the above statements, choose the correct answer from the options given below:

(A) A is false but R is true.
(B) Both A and R are true and R is the correct explanation of A.
(C) Both A and R are true but R is NOT the correct explanation of A.

(D) A is true but R is false.

Correct Answer: (C) Both A and R are true but R is NOT the correct explanation of A.

Solution:

Step 1: Understanding the Question:
The question presents an Assertion about the role of the endometrium in implantation and a Reason that describes the fate of the endometrium in the absence of fertilization. We need to evaluate their truth and relationship.

Step 3: Detailed Explanation:
Assertion A Analysis:
The endometrium is the inner lining of the uterus. It becomes thick, vascular, and rich in glands under the influence of progesterone to prepare for the implantation of the blastocyst. Implantation involves the embedding of the blastocyst into this receptive uterine wall. Therefore, the endometrium is absolutely necessary for implantation. Assertion A is true.

Reason R Analysis:
After ovulation, the remnant of the Graafian follicle develops into the corpus luteum, which secretes progesterone. Progesterone maintains the endometrium. If fertilization does not occur, the corpus luteum degenerates, leading to a fall in progesterone levels. This progesterone withdrawal causes the disintegration of the endometrium, resulting in menstruation. This statement accurately describes the events of the late luteal phase of the menstrual cycle. Reason R is true.

Explanation Analysis:
While both statements are true and related to the endometrium, Reason R explains why menstruation occurs in the absence of fertilization. It does not explain *why* the endometrium is necessary for implantation (i.e., its role in providing nourishment, anchorage, and forming the maternal part of the placenta). The reason for the necessity of the endometrium is its structural and physiological preparedness to receive the embryo. Therefore, R is a true statement but not the direct correct explanation for A.

Step 4: Final Answer:
Both Assertion A and Reason R are true, but R is not the correct explanation of A.

Quick Tip

When evaluating Assertion-Reason questions, always ask "Does R explain A?"In this case, R explains the menstrual cycle, while A states the function of the endometrium in pregnancy. They are two different aspects of the same structure.

173. Match List I with List II.

List I	List II
A. Heroin	**I. Effect on cardiovascular system**
B. Marijuana	**II. Slow down body function**
C. Cocaine	**III. Painkiller**
D. Morphine	**IV. Interfere with transport of dopamine**

Choose the correct answer from the options given below:

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

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

Solution:

Step 1: Understanding the Question:
The question requires matching different psychoactive drugs (List I) with their primary effects or mechanisms of action (List II).

Step 3: Detailed Explanation:

- **A. Heroin (Smack):** Heroin (diacetylmorphine) is an opioid and a powerful central nervous system depressant. It binds to opioid receptors and is known to **slow down body functions**. Thus, **A matches with II**.
- **B. Marijuana (Cannabinoids):** Cannabinoids interact with cannabinoid receptors in the brain. They are known to have a significant **effect on the cardiovascular system**, such as increasing heart rate. Thus, **B matches with I**.
- **C. Cocaine (Coke):** Cocaine is a potent central nervous system stimulant. It **interferes with the transport of the neurotransmitter dopamine** by blocking its reuptake, leading to a buildup of dopamine in the synapse and feelings of euphoria. Thus, **C matches with IV**.
- **D. Morphine:** Morphine is a very effective sedative and **painkiller** (analgesic). It is extracted from the poppy plant and is a primary opioid. Thus, **D matches with III**.

The correct matching is A-II, B-I, C-IV, D-III.

Step 4: Final Answer:
The option that corresponds to the correct matching is (B).

Quick Tip

Categorize drugs by their main effect: Depressants (Heroin, Morphine), Stimulants (Cocaine), and Hallucinogens (Marijuana has hallucinogenic properties). Knowing the category helps deduce the general effect.

---

174. Which of the following is not a cloning vector?

(A) Probe
(B) BAC
(C) YAC
(D) pBR322

Correct Answer: (A) Probe

Solution:

Step 1: Understanding the Question:
The question asks to identify which of the given options is not a cloning vector.

Step 3: Detailed Explanation:
A **cloning vector** is a small piece of DNA that can be stably maintained in an organism, and into which a foreign DNA fragment can be inserted for cloning purposes. It acts as a vehicle to carry foreign DNA into a host cell.
Let's analyze the options:

- **pBR322:** This is a well-known, artificially constructed plasmid vector used for cloning in *E. coli*. It is a cloning vector.
- **BAC (Bacterial Artificial Chromosome):** This is a cloning vector based on the F-plasmid of *E. coli*, used to clone large DNA fragments (100-300 kb). It is a cloning vector.
- **YAC (Yeast Artificial Chromosome):** This is a cloning vector that can accommodate very large DNA fragments (up to a million base pairs) and is replicated in yeast cells. It is a cloning vector.
- **Probe:** A DNA probe is a short, single-stranded fragment of DNA (or RNA) that is labeled with a radioactive or fluorescent marker. It is used to detect the presence of a specific complementary nucleotide sequence in a DNA sample through hybridization. It is a **detection tool**, not a vehicle for carrying and replicating DNA.

Step 4: Final Answer:
A probe is a tool for detection, not a cloning vector.

Quick Tip

Remember the key difference: a **vector** is like a truck that carries cargo (DNA) into a factory (host cell) to be copied. A **probe** is like a scanner used to find a specific item (a DNA sequence) in a warehouse.

---

175. Which of the following statements is correct?

(A) Algal Bloom decreases fish mortality
(B) Eutrophication refers to increase in domestic sewage and waste water in lakes.
(C) Biomagnification refers to increase in concentration of the toxicant at successive trophic levels.
(D) Presence of large amount of nutrients in water restricts 'Algal Bloom'

Correct Answer: (C) Biomagnification refers to increase in concentration of the toxicant at successive trophic levels.

Solution:

Step 1: Understanding the Question:
The question asks to identify the one correct statement among the four options related to ecological concepts of water pollution.

Step 3: Detailed Explanation:

- **(A) Algal Bloom decreases fish mortality:** This is incorrect. Algal blooms cause a severe depletion of dissolved oxygen in the water when the algae die and are decomposed by bacteria. This leads to hypoxia or anoxia, which **increases** fish mortality.
- **(B) Eutrophication refers to increase in domestic sewage and waste water in lakes.:** This is an imprecise definition. Eutrophication is the **natural aging of a lake by nutrient enrichment** of its water. Cultural or accelerated eutrophication is caused by pollutants like domestic sewage and agricultural fertilizers, which add excess nutrients (like nitrates and phosphates). The statement confuses the cause with the process itself. **(C) Biomagnification refers to increase in concentration of the toxicant at successive trophic levels.:** This is the correct definition of biomagnification. Toxic substances that are not metabolized or excreted (like DDT or mercury) accumulate in an organism's tissues and become more concentrated in organisms at higher trophic levels.
- **(D) Presence of large amount of nutrients in water restricts 'Algal Bloom':** This is incorrect. The presence of large amounts of nutrients (eutrophication) is the primary cause that **promotes or causes** massive algal blooms.

Step 4: Final Answer:
The only correct statement is (C), which accurately defines biomagnification.

Quick Tip

Memorize the definitions of key environmental terms:

- **Eutrophication:** Nutrient enrichment.
- **Algal Bloom:** Consequence of eutrophication.
- **Biomagnification:** Toxicant concentration increases up the food chain.
- **BOD (Biological Oxygen Demand):** Measure of organic pollution.

---

176. Which one of the following techniques does not serve the purpose of early diagnosis of a disease for its early treatment?

(A) Enzyme Linked Immuno-Sorbent Assay (ELISA) technique
(B) Recombinant DNA Technology
(C) Serum and Urine analysis
(D) Polymerase Chain Reaction (PCR) technique

Correct Answer: (C) Serum and Urine analysis

Solution:

Step 1: Understanding the Question:
The question asks to identify which of the listed techniques is generally not suitable for the *early* diagnosis of a disease, where the pathogen or marker concentration is very low.

Step 3: Detailed Explanation:
Early diagnosis is crucial for effective treatment. It relies on techniques that are highly sensitive and can detect pathogens or biomarkers even at very low concentrations.

- **(A) ELISA:** This is a highly sensitive immunological assay that can detect the presence of specific antigens (from the pathogen) or antibodies (produced by the host in response to infection). It is widely used for early diagnosis (e.g., for HIV).
- **(B) Recombinant DNA Technology:** This technology allows for the creation of DNA probes that can hybridize with the nucleic acid of a pathogen, enabling its detection even in minute quantities. It is a basis for many early diagnostic tools.
- **(D) PCR:** The polymerase chain reaction is a technique used to amplify a specific DNA sequence. It can detect a pathogen's DNA or RNA from a very small sample by making millions of copies, making it an extremely sensitive tool for early diagnosis.
- **(C) Serum and Urine analysis:** Conventional analysis of serum and urine typically relies on detecting the physiological symptoms of a disease, such as the presence of certain metabolites or a high concentration of pathogens. These signs are often only apparent

after the infection has progressed significantly. Therefore, while useful, it is generally not considered a technique for *early* diagnosis compared to the molecular methods listed.

Step 4: Final Answer:
Conventional serum and urine analysis is not typically used for the very early diagnosis of diseases before symptoms are well-established.

Quick Tip

For questions on "early diagnosis,"think about molecular techniques that can amplify or detect very small amounts of a substance. PCR, ELISA, and DNA probes are classic examples of such sensitive methods. Conventional methods are usually less sensitive.

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177. Given below are two statements:
Statement I: RNA mutates at a faster rate.
Statement II: Viruses having RNA genome and shorter life span mutate and evolve faster.
In the light of the above statements, choose the correct answer from the options given below:

(A) Statement I false but Statement II is true.
(B) Both Statement I and Statement II are true.
(C) Both Statement I and Statement II are false.
(D) Statement I is true but Statement II is false.

Correct Answer: (B) Both Statement I and Statement II are true.

Solution:

Step 1: Understanding the Question:
The question asks to evaluate two statements concerning the mutation rate of RNA and the evolutionary rate of RNA viruses.

Step 3: Detailed Explanation:
Statement I Analysis:
Compared to DNA, RNA is inherently less stable. RNA molecules are typically single-stranded and the sugar (ribose) has a hydroxyl group at the 2' position, making it more susceptible to hydrolysis. Furthermore, the enzymes that replicate RNA genomes (RNA-dependent RNA polymerases) lack the proofreading mechanisms that DNA polymerases have. This lack of proofreading means that errors made during replication are not corrected, leading to a much higher mutation rate. Thus, Statement I is true.

Statement II Analysis:
This statement is a direct consequence of the principle described in Statement I. Viruses with

RNA genomes (like influenza virus, HIV, and coronaviruses) benefit from the high mutation rate of RNA. This, combined with their short generation time (short life span), allows them to generate a vast amount of genetic variation in a short period. This rapid generation of variants enables them to evolve quickly, for example, to evade the host immune system or develop drug resistance. Thus, Statement II is also true.

Step 4: Final Answer:
Both statements are correct facts in molecular biology and virology.

Quick Tip

Remember the key reasons for RNA's high mutation rate: it is chemically less stable than DNA, and its replication machinery lacks a "spell-checker"(proofreading ability). This is why we need a new flu vaccine every year - the RNA virus mutates and evolves rapidly.

---

178. Match List I with List II.

List I	List II
A. CCK	**I. Kidney**
B. GIP	**II. Heart**
C. ANF	**III. Gastric gland**
D. ADH	**IV. Pancreas**

Choose the correct answer from the options given below:

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

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

Solution:

Step 1: Understanding the Question:
The question requires matching hormones/factors in List I with their target organ or source in List II.

Step 3: Detailed Explanation:

- **A. CCK (Cholecystokinin):** This is a gastrointestinal hormone secreted by the duodenum. It acts on the **pancreas** to stimulate the secretion of pancreatic enzymes and on the gall bladder to cause its contraction. Thus, **A matches with IV**.
- **B. GIP (Gastric Inhibitory Peptide):** This is another gastrointestinal hormone. As its name suggests, it inhibits gastric secretion and motility, meaning it acts on the **gastric gland**. Thus, **B matches with III**.

- **C. ANF (Atrial Natriuretic Factor):** This peptide hormone is secreted by the atrial walls of the **heart** in response to high blood pressure. It acts on the kidneys to promote the excretion of sodium and water, thereby lowering blood pressure. Thus, **C matches with II**.
- **D. ADH (Antidiuretic Hormone or Vasopressin):** This hormone is released from the posterior pituitary but acts on the collecting ducts and distal convoluted tubules of the **kidney** to increase water reabsorption. Thus, **D matches with I**.

The correct set of matches is A-IV, B-III, C-II, D-I.

Step 4: Final Answer:
The option that corresponds to the correct matching is (B).

Quick Tip

Break down the hormone names for clues:

- **C**hole**C**ysto**K**inin: Cholecysto- refers to the gall bladder, and -kinin refers to movement.
- **G**astric **I**nhibitory **P**eptide: It inhibits gastric functions.
- **A**trial **N**atriuretic **F**actor: Atrial refers to the heart atria.
- **A**nti**D**iuretic **H**ormone: Anti-diuresis means preventing water loss, a function of the kidney.

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179. Match List I with List II.

List I (Cells)	List II (Secretion)
A. Peptic cells	**I. Mucus**
B. Goblet cells	**II. Bile juice**
C. Oxyntic cells	**III. Proenzyme pepsinogen**
D. Hepatic cells	**IV. HCl and intrinsic factor for absorption of vitamin B_{12}**

Choose the correct answer from the options given below:

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

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

Solution:

Step 1: Understanding the Question:
The question requires matching different types of cells (List I) with their respective secretions

(List II).

Step 3: Detailed Explanation:

- **A. Peptic cells (or Chief cells):** These cells are found in the gastric glands of the stomach and are responsible for secreting the inactive proenzyme **pepsinogen**. Thus, **A matches with III**.
- **B. Goblet cells:** These are specialized mucus-secreting cells found in the epithelial lining of various organs, including the stomach, intestines, and respiratory tract. Their primary secretion is **mucus**, which serves a protective function. Thus, **B matches with I**.
- **C. Oxyntic cells (or Parietal cells):** These cells are also found in the gastric glands. They secrete **hydrochloric acid (HCl)** and **intrinsic factor**, which is essential for the absorption of vitamin B_{12}. Thus, **C matches with IV**.
- **D. Hepatic cells (Hepatocytes):** These are the main cells of the liver. They have numerous functions, including the production and secretion of **bile juice**. Thus, **D matches with II**.

The correct set of matches is A-III, B-I, C-IV, D-II.

Step 4: Final Answer:
The option that corresponds to the correct matching is (D).

Quick Tip

Memorize the cells of the gastric gland:

- Mucous neck cells / Goblet cells $\rightarrow$ Mucus
- Peptic/Chief cells $\rightarrow$ Pepsinogen (Proenzyme)
- Oxyntic/Parietal cells $\rightarrow$ HCl + Intrinsic factor

This covers three of the four items in this question.

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180. Given below are two statements:
Statement I: A protein is imagined as a line, the left end represented by first amino acid (C-terminal) and the right end represented by last amino acid (N-terminal)
Statement II: Adult human haemoglobin, consists of 4 subunits (two subunits of α type and two subunits of β type.)
In the light of the above statements, choose the correct answer from the options given below:

(A) Statement I is false but Statement II is true.
(B) Both Statement I and Statement II are true.

(C) Both Statement I and Statement II are false.
(D) Statement I is true but Statement II is false.

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

Solution:

Step 1: Understanding the Question:
The question asks to evaluate two statements. Statement I describes the convention for representing the terminals of a polypeptide chain. Statement II describes the subunit structure of adult human hemoglobin.

Step 3: Detailed Explanation:
Statement I Analysis:
A protein or polypeptide chain is a polymer of amino acids linked by peptide bonds. By convention, the sequence is written starting from the amino acid with the free amino group (-NH_2) and ending with the amino acid with the free carboxyl group (-COOH).

- The beginning of the chain (the first amino acid) is called the **N-terminal** (amino-terminal).
- The end of the chain (the last amino acid) is called the **C-terminal** (carboxyl-terminal).

The statement incorrectly describes the left end as C-terminal and the right end as N-terminal. It's the other way around. Therefore, Statement I is false.

Statement II Analysis:
Adult human hemoglobin (HbA) is a classic example of a protein with a quaternary structure. It is a tetramer, meaning it is composed of four polypeptide subunits. It consists of two identical α**-chains** and two identical β**-chains** ($\alpha_2\beta_2$). Each subunit contains a heme group that binds oxygen. This statement is correct. Therefore, Statement II is true.

Step 4: Final Answer:
Statement I is false, and Statement II is true.

Quick Tip

Remember the alphabetical order for protein terminals: the chain starts with the **A**mino (N) terminal and ends with the **C**arboxyl (C) terminal. N comes before C in the alphabet.

---

181. Match List I with List II.

List I (Interacting species)	List II (Name of Interaction)
A. A Leopard and a Lion in a forest/grassland	**I. Competition**
B. A Cuckoo laying egg in a Crow's nest	**II. Brood parasitism**
C. Fungi and root of a higher plant in Mycorrhizae	**III. Mutualism**
D. A cattle egret and a Cattle in a field	**IV. Commensalism**

Choose the correct answer from the options given below:

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

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

Solution:

Step 1: Understanding the Question:
The question requires matching specific examples of species interactions (List I) with the correct ecological term for that interaction (List II).

Step 3: Detailed Explanation:

- **A. A Leopard and a Lion in a forest/grassland:** Leopards and lions are large predators that often share the same habitat and prey on similar animals. Since they both require the same limited resources (food, territory), they are in **competition** with each other. Thus, **A matches with I**.
- **B. A Cuckoo laying egg in a Crow's nest:** The cuckoo lays its eggs in the nest of another bird species (the host, like a crow), which then unknowingly raises the cuckoo chick, often at the expense of its own offspring. This is a classic example of **brood parasitism**. Thus, **B matches with II**.
- **C. Fungi and root of a higher plant in Mycorrhizae:** Mycorrhiza is a symbiotic association between a fungus and the roots of a plant. The fungus helps the plant absorb nutrients and water from the soil, and the plant provides the fungus with carbohydrates. Since both partners benefit, this is an example of **mutualism**. Thus, **C matches with III**.
- **D. A cattle egret and a Cattle in a field:** Cattle egrets are birds that follow grazing cattle. As the cattle move and graze, they stir up insects from the vegetation, which the egrets then easily catch and eat. The egret benefits, while the cattle are largely unaffected. This is a textbook example of **commensalism** (+/0). Thus, **D matches with IV**.

The correct set of matches is A-I, B-II, C-III, D-IV.

Step 4: Final Answer:
The option that corresponds to the correct matching is (B).

Quick Tip

These four are the most frequently cited examples of their respective interactions. Committing them to memory is a high-yield strategy for ecology questions.

- Competition → Lion/Leopard
- Brood Parasitism → Cuckoo/Crow
- Mutualism → Mycorrhizae
- Commensalism → Cattle Egret/Cattle

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182. Once the undigested and unabsorbed substances enter the caecum, their backflow is prevented by-

(A) Pyloric sphincter
(B) Sphincter of Oddi
(C) Ileo - caecal valve
(D) Gastro - oesophageal sphincter

Correct Answer: (C) Ileo - caecal valve

Solution:

Step 1: Understanding the Question:
The question asks to identify the anatomical structure that prevents the backflow of contents from the caecum (part of the large intestine) into the ileum (part of the small intestine).

Step 3: Detailed Explanation:
Let's analyze the locations and functions of the given sphincters/valves:

- **Gastro-oesophageal sphincter:** Located between the esophagus and the stomach. It prevents the backflow of acidic stomach contents into the esophagus.
- **Pyloric sphincter:** Located between the stomach and the duodenum (the first part of the small intestine). It controls the passage of chyme from the stomach into the small intestine.
- **Sphincter of Oddi:** Located where the common bile duct and pancreatic duct enter the duodenum. It controls the flow of bile and pancreatic juice into the small intestine.
- **Ileo-caecal valve:** Located at the junction of the ileum (the last part of the small intestine) and the caecum (the first part of the large intestine). Its primary function is to allow the passage of digested food from the small intestine to the large intestine and to **prevent the backflow** of the contents of the large intestine (which has a high bacterial load) into the small intestine.

Step 4: Final Answer:
The backflow of substances from the caecum is prevented by the ileo-caecal valve.

Quick Tip

The names of the valves and sphincters often give away their location. "Ileo-caecal"is at the junction of the **ileum** and the **caecum**. "Gastro-oesophageal"is at the junction of the stomach (**gastro**) and the **esophagus**.

---

183. Match List I with List II.

List I	List II
A. P-wave	**I. Beginning of systole**
B. Q-wave	**II. Repolarisation of ventricles**
C. QRS complex	**III. Depolarisation of atria**
D. T-wave	**IV. Depolarisation of ventricles**

Choose the correct answer from the options given below:

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

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

Solution:

Step 1: Understanding the Question:
The question requires matching the different waves and complexes of a standard electrocardiogram (ECG) in List I with the cardiac event they represent in List II.

Step 3: Detailed Explanation:

- **A. P-wave:** This represents the electrical excitation, or **depolarisation of the atria**, which leads to the contraction of both atria. Thus, **A matches with III**.
- **C. QRS complex:** This complex represents the **depolarisation of the ventricles**, which initiates ventricular contraction (systole). Thus, **C matches with IV**.
- **B. Q-wave:** The QRS complex marks the onset of ventricular systole. The Q wave is the first downward deflection and marks the **beginning of ventricular systole**. Thus, **B matches with I**.
- **D. T-wave:** This wave represents the return of the ventricles from an excited to a normal state, which is called **repolarisation of the ventricles**. The end of the T-wave marks the end of systole. Thus, **D matches with II**.

The correct set of matches is A-III, B-I, C-IV, D-II.

Step 4: Final Answer:
The option that corresponds to the correct matching is (B).

Quick Tip

Remember the ECG sequence:

- **P** wave → **A**trial depolarization (**P**recedes **A**trial contraction).
- **QRS** complex → **V**entricular depolarization (**R**eally **S**trong contraction of ventricles).
- **T** wave → Ven**t**ricular **r**epolarization (**T**ime to **R**elax).

---

184. Radial symmetry is NOT found in adults of phylum _____.

(A) Echinodermata
(B) Ctenophora
(C) Hemichordata
(D) Coelenterata

Correct Answer: (C) Hemichordata

Solution:

Step 1: Understanding the Question:
The question asks to identify the phylum among the given options whose adult members do not exhibit radial symmetry.

Step 3: Detailed Explanation:
Let's analyze the symmetry of the adult forms in each phylum:

- **(A) Echinodermata:** A unique feature of echinoderms (like starfish and sea urchins) is that their larvae are bilaterally symmetrical, but the adults exhibit **penta-radial symmetry**. So they have radial symmetry.
- **(B) Ctenophora (Comb jellies):** These animals exhibit **biradial symmetry**, which is a type of radial symmetry.
- **(C) Hemichordata (e.g., Balanoglossus):** These are worm-like marine animals. They are exclusively **bilaterally symmetrical** throughout their lives. They do not have radial symmetry.
- **(D) Coelenterata (Cnidaria):** This phylum, which includes jellyfish and sea anemones, is characterized by **radial symmetry**.

Step 4: Final Answer:
Adults of the phylum Hemichordata are bilaterally symmetrical, not radially symmetrical.

Quick Tip

Remember the "big three"phyla with radial symmetry: Coelenterata (Cnidaria), Ctenophora, and adult Echinodermata. All other major animal phyla are primarily bilaterally symmetrical.

---

185. Match List I with List II.

List I	List II
A. Vasectomy	**I. Oral method**
B. Coitus interruptus	**II. Barrier method**
C. Cervical caps	**III. Surgical method**
D. Saheli	**IV. Natural method**

Choose the correct answer from the options given below:

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

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

Solution:

Step 1: Understanding the Question:
The question requires matching different contraceptive methods (List I) with their correct category (List II).

Step 3: Detailed Explanation:

- **A. Vasectomy:** This is a permanent method of contraception for males where the vas deferens is cut and tied to prevent the transport of sperm. This is a **surgical method** (sterilization). Thus, **A matches with III**.
- **B. Coitus interruptus (withdrawal method):** This involves withdrawing the penis from the vagina just before ejaculation. It is a traditional method that relies on timing and is considered a **natural method**. Thus, **B matches with IV**.
- **C. Cervical caps:** These are devices made of rubber that are inserted into the vagina to cover the cervix, physically preventing sperm from entering the uterus. This is a type of **barrier method**. Thus, **C matches with II**.

- **D. Saheli:** This is a non-steroidal contraceptive pill taken once a week. As it is a pill, it is an **oral method**. Thus, **D matches with I**.

The correct set of matches is A-III, B-IV, C-II, D-I.

Step 4: Final Answer:
The option that corresponds to the correct matching is (C).

Quick Tip

Categorize contraceptive methods into broad groups:

- **Natural:** Rhythm method, Coitus interruptus.
- **Barrier:** Condoms, Diaphragms, Cervical caps.
- **Chemical/Oral:** Pills (like Saheli), IUDs (hormonal).
- **Surgical/Terminal:** Vasectomy, Tubectomy.

This framework helps in quickly classifying any given method.

---

186. Which of the following statements are correct?
A. Basophils are most abundant cells of the total WBCs
B. Basophils secrete histamine, serotonin and heparin
C. Basophils are involved in inflammatory response
D. Basophils have kidney shaped nucleus
E. Basophils are agranulocytes
Choose the correct answer from the options given below:

(A) A and B only
(B) D and E only
(C) C and E only
(D) B and C only

Correct Answer: (D) B and C only

Solution:

Step 1: Understanding the Question:
The question asks to identify the correct statements about basophils from the given list.

Step 3: Detailed Explanation:
Let's evaluate each statement:

- **A. Basophils are most abundant cells of the total WBCs:** This is incorrect. The most abundant WBCs are neutrophils (60-65%). Basophils are the least abundant (0.5-1%).
- **B. Basophils secrete histamine, serotonin and heparin:** This is correct. The granules of basophils contain these substances, which are mediators of inflammation.
- **C. Basophils are involved in inflammatory response:** This is correct. By releasing histamine, serotonin, and heparin, basophils play a key role in initiating inflammatory reactions.
- **D. Basophils have kidney shaped nucleus:** This is incorrect. The nucleus of a basophil is typically S-shaped or bilobed, and it is often obscured by the large, dark granules. Monocytes have a kidney-shaped nucleus.
- **E. Basophils are agranulocytes:** This is incorrect. Basophils are classified as granulocytes, along with neutrophils and eosinophils, because of the prominent granules in their cytoplasm.

Therefore, the only correct statements are B and C.

Step 4: Final Answer:
The correct option is (D), which includes statements B and C.

Quick Tip

Remember the abundance of WBCs with the mnemonic: "**N**ever **L**et **M**onkeys **E**at **B**ananas"(Neutrophils > Lymphocytes > Monocytes > Eosinophils > Basophils). This tells you basophils are the least abundant. Also, associate basophils with histamine and inflammation.

---

187. Select the correct statements.
A. Tetrad formation is seen during Leptotene.
B. During Anaphase, the centromeres split and chromatids separate.
C. Terminalization takes place during Pachytene.
D. Nucleolus, Golgi complex and ER are reformed during Telophase.
E. Crossing over takes place between sister chromatids of homologous chromosome.
Choose the correct answer from the options given below:

(A) B and E only
(B) A and C only
(C) B and D only
(D) A, C and E only

Correct Answer: (C) B and D only

Solution:

Step 1: Understanding the Question:
The question asks to identify the correct statements about the events of cell division (mitosis/meiosis).

Step 3: Detailed Explanation:
Let's evaluate each statement:

- **A. Tetrad formation is seen during Leptotene.** Incorrect. Tetrads (bivalents with four chromatids) are formed during Zygotene when homologous chromosomes pair up (synapsis) and become clearly visible in Pachytene.
- **B. During Anaphase, the centromeres split and chromatids separate.** Correct. This statement accurately describes the key event of mitotic Anaphase and meiotic Anaphase II.
- **C. Terminalization takes place during Pachytene.** Incorrect. Terminalization of chiasmata (movement of chiasmata towards the ends of the chromatids) begins in late Diplotene and is completed in Diakinesis.
- **D. Nucleolus, Golgi complex and ER are reformed during Telophase.** Correct. During Telophase, the cell reverses the events of Prophase. The nuclear envelope, nucleolus, Golgi complex, and ER, which had disassembled, reform around the two sets of chromosomes.
- **E. Crossing over takes place between sister chromatids of homologous chromosome.** Incorrect. Crossing over is the exchange of genetic material between **non-sister chromatids** of homologous chromosomes.

Therefore, the only correct statements are B and D.

Step 4: Final Answer:
The correct option is (C), which includes statements B and D.

Quick Tip

Pay close attention to the specific stages of Prophase I: Synapsis (Zygotene), Crossing Over (Pachytene), Chiasmata visible (Diplotene), Terminalization (Diakinesis). Also, a critical distinction is crossing over between **non-sister** chromatids.

---

188. Select the correct statements with reference to chordates.
A. Presence of a mid-dorsal, solid and double nerve cord.
B. Presence of closed circulatory system.
C. Presence of paired pharyngeal gillslits.
D. Presence of dorsal heart
E. Triploblastic pseudocoelomate animals.
Choose the correct answer from the options given below:

(A) C, D and E only
(B) A, C and D only
(C) B and C only
(D) B, D and E only

Correct Answer: (C) B and C only

Solution:

Step 1: Understanding the Question:
The question asks to identify the correct statements that describe the characteristics of the phylum Chordata.

Step 3: Detailed Explanation:
Let's evaluate each statement based on the defining features of chordates:

- **A. Presence of a mid-dorsal, solid and double nerve cord.** Incorrect. Chordates have a **dorsal, hollow, and single** nerve cord. A ventral, solid, and double nerve cord is characteristic of non-chordates like annelids and arthropods.
- **B. Presence of closed circulatory system.** Correct. Chordates, especially vertebrates, have a closed circulatory system where blood is confined within vessels.
- **C. Presence of paired pharyngeal gill slits.** Correct. All chordates possess paired pharyngeal gill slits at some stage of their life cycle. In terrestrial vertebrates, these are embryonic and not functional in adults.
- **D. Presence of dorsal heart.** Incorrect. Chordates have a **ventral** heart. A dorsal heart is found in non-chordates.
- **E. Triploblastic pseudocoelomate animals.** Incorrect. Chordates are triploblastic, but they are **coelomates** (possessing a true coelom), not pseudocoelomates.

The fundamental features of chordates are: (1) a notochord, (2) a dorsal hollow nerve cord, and (3) paired pharyngeal gill slits. Of the given options, B and C are correct characteristics.

Step 4: Final Answer:
The correct statements are B and C. Therefore, option (C) is the right choice.

Quick Tip

Remember the key differences between chordates and non-chordates:

Chordates	**Non-Chordates**
Dorsal, hollow, single nerve cord	Ventral, solid, double nerve cord
Ventral heart	Dorsal heart
Pharyngeal gill slits present	Pharyngeal gill slits absent

189. Which of the following statements are correct regarding skeletal muscle?
A. Muscle bundles are held together by collagenous connective tissue layer called fascicle.
B. Sarcoplasmic reticulum of muscle fibre is a store house of calcium ions.
C. Striated appearance of skeletal muscle fibre is due to distribution pattern of actin and myosin proteins.
D. M line is considered as functional unit of contraction called sarcomere.
Choose the most appropriate answer from the options given below:

(A) C and D only
(B) A, B and C only
(C) B and C only
(D) A, C and D only

Correct Answer: (C) B and C only

Solution:

Step 1: Understanding the Question:
The question asks to identify the correct statements about the structure and function of skeletal muscle.

Step 3: Detailed Explanation:
Let's evaluate each statement:

- **A. Muscle bundles are held together by collagenous connective tissue layer called fascicle.** Incorrect. A muscle bundle itself is called a fascicle. The connective tissue layer that surrounds a fascicle is called the perimysium.
- **B. Sarcoplasmic reticulum of muscle fibre is a store house of calcium ions.** Correct. The sarcoplasmic reticulum is a specialized endoplasmic reticulum that sequesters and releases calcium ions (Ca^{2+}), which are essential for initiating muscle contraction.
- **C. Striated appearance of skeletal muscle fibre is due to distribution pattern of actin and myosin proteins.** Correct. The alternating light (I-bands, containing primarily actin) and dark (A-bands, containing myosin and overlapping actin) bands, which result from the regular arrangement of myofilaments, give skeletal muscle its characteristic striated or striped appearance.
- **D. M line is considered as functional unit of contraction called sarcomere.** Incorrect. The functional unit of contraction is the **sarcomere**, which is the region of a myofibril between two successive Z-lines. The M-line is a line in the center of the A-band.

Thus, the correct statements are B and C.

Step 4: Final Answer:
The correct option is (C), which includes statements B and C only.

Quick Tip

Remember the hierarchy of muscle structure: Muscle → Fascicle (bundle) → Muscle Fibre (cell) → Myofibril → Sarcomere. Also, remember that the Sarcomere (Z-line to Z-line) is the fundamental contractile unit.

---

190. Given below are two statements:
Statement I: During G_0 phase of cell cycle, the cell is metabolically inactive.
Statement II: The centrosome undergoes duplication during S phase of interphase.
In the light of the above statements, choose the most appropriate answer from the options given below:

(A) Statement I is incorrect but Statement II is correct.
(B) Both Statement I and Statement II are correct.
(C) Both Statement I and Statement II are incorrect.
(D) Statement I is correct but Statement II is incorrect.

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

Solution:

Step 1: Understanding the Question:
The question asks to evaluate two statements related to events in the cell cycle.

Step 3: Detailed Explanation:
Statement I Analysis:
The G_0 phase, or quiescent stage, is a non-dividing state that cells can enter from the G_1 phase. Cells in G_0 exit the cell cycle and do not proliferate. However, they are not metabolically inactive. They are metabolically **active** and carry out their specialized functions (e.g., a neuron in G_0 is actively conducting nerve impulses). They just do not divide. Therefore, Statement I is incorrect.

Statement II Analysis:
The centrosome is the primary microtubule-organizing center in animal cells and is crucial for forming the mitotic spindle. For a cell to divide correctly, the centrosome must duplicate. This duplication process begins in the late G_1 phase and is completed during the **S phase**, concurrent with DNA replication. Therefore, Statement II is correct.

Step 4: Final Answer:
Statement I is incorrect, while Statement II is correct.

Quick Tip

Do not confuse "quiescent"(not dividing) with "inactive". Cells in the G_0 phase are very much alive and active, they just aren't on the path to division. Remember that S phase is the "synthesis"phase, where both DNA and the centrosome are synthesized/duplicated.

---

191. Which one of the following is NOT an advantage of inbreeding?

(A) It decreases the productivity of inbred population, after continuous inbreeding.
(B) It decreases homozygosity.
(C) It exposes harmful recessive genes that are eliminated by selection.
(D) Elimination of less desirable genes and accumulation of superior genes takes place due to it.

Correct Answer: (B) It decreases homozygosity.

Solution:

Step 1: Understanding the Question:
The question asks to identify which statement does not describe an advantage of inbreeding. This could be a disadvantage, or it could be a statement that is factually incorrect about the effects of inbreeding.

Step 3: Detailed Explanation:
Let's analyze the effects of inbreeding:

- **Inbreeding's primary effect is to increase homozygosity.** This means the frequency of individuals with two identical alleles for a gene increases.
- **(A) It decreases the productivity...** This phenomenon is known as inbreeding depression. It is a major **disadvantage** of continuous inbreeding, and therefore, not an advantage.
- **(B) It decreases homozygosity.** This statement is **factually incorrect**. Inbreeding is defined by its effect of **increasing** homozygosity. Since it's a false statement about the effects of inbreeding, it cannot be an advantage.
- **(C) It exposes harmful recessive genes...** By increasing homozygosity, inbreeding brings recessive alleles together, allowing harmful traits to be expressed. This is an **advantage** in selective breeding programs because these individuals can be identified and removed, thus purging the population of harmful alleles.
- **(D) Elimination of less desirable genes and accumulation of superior genes...** This is a direct consequence of statement (C). By selecting for superior homozygous individuals, breeders can create pure lines. This is an **advantage**.

The question asks what is NOT an advantage. Statement (A) describes a disadvantage. Statement (B) is a fundamentally incorrect statement about what inbreeding does. In multiple-choice questions of this type, the factually incorrect statement is often the intended answer over a

statement describing a disadvantage. Decreasing homozygosity is not an outcome of inbreeding at all, so it can't be an advantage.

Step 4: Final Answer:
The statement "It decreases homozygosity"is false and therefore cannot be an advantage of inbreeding.

Quick Tip

Remember the core principle of inbreeding: it **increases homozygosity**. Any statement that contradicts this is fundamentally incorrect. The main advantage is creating pure lines and purging bad alleles; the main disadvantage is inbreeding depression.

---

192. Which of the following statements are correct?
A. An excessive loss of body fluid from the body switches off osmoreceptors.
B. ADH facilitates water reabsorption to prevent diuresis.
C. ANF causes vasodilation.
D. ADH causes increase in blood pressure.
E. ADH is responsible for decrease in GFR.
Choose the correct answer from the options given below:

(A) C, D and E only
(B) A and B only
(C) B, C and D only
(D) A, B and E only

Correct Answer: (C) B, C and D only

Solution:

Step 1: Understanding the Question:
The question asks to identify the correct statements regarding the regulation of kidney function and blood pressure.

Step 3: Detailed Explanation:

- **A. An excessive loss of body fluid...switches off osmoreceptors.** Incorrect. Excessive fluid loss increases blood osmolarity, which **activates** osmoreceptors in the hypothalamus, triggering thirst and ADH release.
- **B. ADH facilitates water reabsorption to prevent diuresis.** Correct. This is the primary function of Anti-Diuretic Hormone (ADH). It increases the permeability of the DCT and collecting ducts to water.

- **C. ANF causes vasodilation.** Correct. Atrial Natriuretic Factor (ANF) is released by the heart atria in response to high blood pressure. It acts as a vasodilator, widening blood vessels to help lower blood pressure.
- **D. ADH causes increase in blood pressure.** Correct. Besides its antidiuretic effect, ADH (also called vasopressin) causes constriction of blood vessels (vasoconstriction) at higher concentrations, which leads to an increase in blood pressure.
- **E. ADH is responsible for decrease in GFR.** Incorrect. ADH's primary role is on water permeability. The vasoconstrictive effect of ADH could potentially affect GFR, but its main and consistent role is not to decrease GFR. In contrast, ANF can increase GFR.

The correct statements are B, C, and D.

Step 4: Final Answer:
The correct option is (C), which includes statements B, C, and D.

Quick Tip

Remember the opposing roles of ADH/RAAS and ANF. ADH and RAAS work to *increase* blood pressure and conserve water. ANF works to *decrease* blood pressure by promoting water and salt loss.

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193. Which of the following are NOT under the control of thyroid hormone?
A. Maintenance of water and electrolyte balance
B. Regulation of basal metabolic rate
C. Normal rhythm of sleep-wake cycle
D. Development of immune system
E. Support the process of R.B.Cs formation
Choose the correct answer from the options given below:

(A) D and E only
(B) A and D only
(C) B and C only
(D) C and D only

Correct Answer: (D) C and D only

Solution:

Step 1: Understanding the Question:
The question asks to identify which functions are not primarily controlled by thyroid hormones (thyroxine).

Step 3: Detailed Explanation:
Let's analyze the functions of thyroid hormone:

- **A. Maintenance of water and electrolyte balance:** Thyroid hormones can influence this, but it is primarily under the control of hormones like aldosterone and ADH. However, thyroid hormones do have some influence.
- **B. Regulation of basal metabolic rate (BMR):** This is the main and most well-known function of thyroid hormone. It regulates the metabolism of carbohydrates, proteins, and fats.
- **C. Normal rhythm of sleep-wake cycle:** This circadian rhythm is primarily regulated by the pineal gland, which secretes melatonin, and the hypothalamus. While thyroid disorders can disrupt sleep, it is not the primary controller.
- **D. Development of immune system:** The primary organs for the development and maturation of the immune system are the bone marrow and the thymus gland (especially for T-cells). Thyroid hormone is not a primary regulator of this process.
- **E. Support the process of R.B.Cs formation:** Thyroid hormones are essential for erythropoiesis (RBC formation).

Based on this, the functions most directly under thyroid control are B and E. Thyroid hormones also influence A. The functions that are LEAST under the direct control of thyroid hormone are C (sleep-wake cycle) and D (immune system development).

Step 4: Final Answer:
The normal rhythm of the sleep-wake cycle and the development of the immune system are not primary functions of the thyroid hormone. Therefore, the correct option is (D).

Quick Tip

The three cardinal functions of thyroid hormone to remember are: regulation of **B**asal **M**etabolic **R**ate (BMR), supporting physical and mental **D**evelopment, and promoting **E**rythropoiesis (RBC formation).

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194. The parts of human brain that helps in regulation of sexual behaviour, expression of excitement, pleasure, rage, fear etc. are :

(A) Corpus callosum and thalamus
(B) Limbic system & hypothalamus
(C) Corpora quadrigemina & hippocampus
(D) Brain stem & epithalamus

Correct Answer: (B) Limbic system & hypothalamus

Solution:

Step 1: Understanding the Question:
The question asks to identify the parts of the human brain responsible for regulating emotions, motivations, and basic drives like fear and sexual behavior.

Step 3: Detailed Explanation:
These functions are primarily controlled by the **limbic system** and the **hypothalamus**.

- The **limbic system**, often called the "emotional brain,"is a group of interconnected structures including the amygdala, hippocampus, and others. It is deeply involved in motivation, emotion, learning, and memory. The amygdala is particularly associated with fear and rage, while other areas are linked to pleasure.
- The **hypothalamus** lies just below the thalamus and is a major control center for the autonomic nervous system and the endocrine system. It regulates body temperature, thirst, hunger, and is also involved in aspects of sexual behavior and rage.

Together, the limbic system and hypothalamus form a functional unit that governs these complex behaviors. The other options are incorrect as they list structures with different primary functions.

Step 4: Final Answer:
The limbic system and hypothalamus are the parts of the brain that regulate sexual behavior and emotional expressions.

Quick Tip

For questions about emotion, motivation, memory, and basic drives (fear, rage, pleasure, sex), the answer is almost always related to the limbic system and/or the hypothalamus.

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195. Match List I with List II.

List I	List II
A. Logistic growth	**I. Unlimited resource availability condition**
B. Exponential growth	**II. Limited resource availability condition**
C. Expanding age pyramid	**III. The percent individuals of pre-reproductive age is largest followed by reproductive and post reproductive age groups**
D. Stable age pyramid	**IV. The percent individuals of pre-reproductives and reproductive age group are same**

Choose the correct answer from the options given below:

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

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

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

Solution:

Step 1: Understanding the Question:
The question requires matching concepts from population ecology (List I) with their correct descriptions (List II).

Step 3: Detailed Explanation:

- **A. Logistic growth:** This describes population growth in an environment with a carrying capacity (K), where resources are **limited**. The growth curve is S-shaped. Thus, **A matches with II**.
- **B. Exponential growth:** This describes population growth under ideal conditions with **unlimited resources**. The growth curve is J-shaped. Thus, **B matches with I**.
- **C. Expanding age pyramid:** This is a pyramid with a broad base, indicating that the percentage of young, **pre-reproductive individuals is the largest**. This signifies a growing population. Thus, **C matches with III**.
- **D. Stable age pyramid:** This is a bell-shaped pyramid where the number of **pre-reproductive and reproductive individuals are roughly the same**. This indicates a stable or zero-growth population. Thus, **D matches with IV**.

The correct set of matches is A-II, B-I, C-III, D-IV.

Step 4: Final Answer:
The option that corresponds to the correct matching is (B).

Quick Tip

Associate keywords: **E**xponential → **U**nlimited resources (**J**-shape); **L**ogistic → **L**imited resources (**S**-shape). For age pyramids, the shape tells the story: broad base = expanding; straight sides = stable; narrow base = declining.

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196. Which one of the following is the sequence on corresponding coding strand, if the sequence on mRNA formed is as follows
5' AUCGAUCGAUCGAUCGAUCGAUCG AUCG 3'?

(A) 3' ATCGATCGATCGATCGATCGATCGATCG 5'
(B) 5' UAGCUAGCUAGCUAGCUAGCUAGC UAGC 3'
(C) 3' UAGCUAGCUAGCUAGCUAGCUAGC UAGC 5'

(D) 5’ ATCGATCGATCGATCGATCGATCGATCG 3’

Correct Answer: (D) 5’ ATCGATCGATCGATCGATCGATCGATCG 3’

Solution:

Step 1: Understanding the Question:
The question provides an mRNA sequence and asks for the sequence of the corresponding **coding strand** of the DNA.

Step 3: Detailed Explanation:
During transcription, the enzyme RNA polymerase reads the template strand (also called the non-coding or antisense strand) of the DNA to synthesize a complementary mRNA molecule. The other strand of the DNA is the **coding strand** (or sense strand). The sequence of the coding strand is identical to the sequence of the mRNA, with two key differences:

1. It has the same 5’ to 3’ polarity.
2. The base Thymine (T) is present in DNA instead of Uracil (U) in RNA.

Given mRNA sequence:
5’ AUCG AUCG AUCG AUCG AUCG AUCG AUCG 3’
To find the coding strand sequence, we simply replace every Uracil (U) with a Thymine (T), keeping the polarity the same:
5’ ATCG ATCG ATCG ATCG ATCG ATCG ATCG 3’

Step 4: Final Answer:
The correct sequence for the coding strand is 5’ ATCGATCGATCGATCGATCGATCGATCG 3’, which corresponds to option (D).

Quick Tip

Remember the relationship:

- **Coding Strand (DNA)**: Same sequence and polarity as mRNA (just T instead of U).
- **Template Strand (DNA)**: Complementary and antiparallel to mRNA.

For this question, just swap U for T in the given mRNA sequence.

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197. Which of the following is characteristic feature of cockroach regarding sexual dimorphism ?

(A) Presence of anal cerci
(B) Dark brown body colour and anal cerci
(C) Presence of anal styles

(D) Presence of sclerites

Correct Answer: (C) Presence of anal styles

Solution:

Step 1: Understanding the Question:
The question asks to identify a feature that is present in one sex of the cockroach but not the other, thus serving as a basis for sexual dimorphism.

Step 3: Detailed Explanation:
Sexual dimorphism refers to the distinct differences in size or appearance between the sexes of an animal. In cockroaches:

- **Anal cerci:** A pair of jointed filamentous structures that arise from the 10th abdominal segment. They are present in **both males and females**. They are sensory in function.
- **Anal styles:** A pair of short, unjointed, thread-like structures that are present **only in males**. They arise from the 9th abdominal sternite.

Therefore, the presence of anal styles is a distinguishing feature of male cockroaches.
The other options are incorrect because both sexes have a dark brown body, anal cerci, and sclerites (the hardened plates of the exoskeleton).

Step 4: Final Answer:
The presence of anal styles is the characteristic feature of sexual dimorphism in cockroaches, as they are found only in males.

Quick Tip

Remember: **C**erci = **C**ommon (in both sexes). **S**tyles = **S**pecific to males. This simple mnemonic can help you recall the key difference.

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198. Match List I with List II.

List I	List II
A. Mast cells	**I. Ciliated epithelium**
B. Inner surface of bronchiole	**II. Areolar connective tissue**
C. Blood	**III. Cuboidal epithelium**
D. Tubular parts of nephron	**IV. Specialised connective tissue**

Choose the correct answer from the options give below:

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

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

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

Solution:

Step 1: Understanding the Question:
The question requires matching the cell types or structures in List I with their correct tissue classification or location in List II.

Step 3: Detailed Explanation:

- **A. Mast cells:** These are immune cells that release histamine and other mediators. They are found in connective tissue, particularly abundant in **areolar connective tissue**. Thus, **A matches with II**.
- **B. Inner surface of bronchiole:** The bronchioles are part of the respiratory tract, and their inner surfaces are lined with **ciliated epithelium** to help move mucus and trapped particles out of the lungs. Thus, **B matches with I**.
- **C. Blood:** Blood is considered a fluid **specialised connective tissue** because it consists of cells (RBCs, WBCs, platelets) suspended in an extracellular matrix (plasma) and has a common embryonic origin with other connective tissues. Thus, **C matches with IV**.
- **D. Tubular parts of nephron:** The different segments of the kidney tubule, such as the Proximal Convoluted Tubule (PCT), are composed of **cuboidal epithelium**, which is specialized for secretion and absorption. Thus, **D matches with III**.

The correct set of matches is A-II, B-I, C-IV, D-III.

Step 4: Final Answer:
The option that corresponds to the correct matching is (D).

Quick Tip

When matching tissues, think about function. Respiration/movement of mucus → Cilia. Secretion/absorption in tubes → Cuboidal/Columnar. Blood is the unique fluid connective tissue. Mast cells are key components of loose/areolar tissue.

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199. The unique mammalian characteristics are:

(A) pinna, monocondylic skull and mammary glands
(B) hairs, tympanic membrane and mammary glands
(C) hairs, pinna and mammary glands

(D) hairs, pinna and indirect development

Correct Answer: (C) hairs, pinna and mammary glands

Solution:

Step 1: Understanding the Question:
The question asks to identify the set of characteristics that are unique to the class Mammalia.

Step 3: Detailed Explanation:
Let's analyze the characteristics given in each option:

- **(A) pinna, monocondylic skull and mammary glands:** This is incorrect. Mammals have a **dicondylic skull** (two occipital condyles), while reptiles and birds have a monocondylic skull.
- **(B) hairs, tympanic membrane and mammary glands:** This is incorrect. The tympanic membrane (eardrum) is also found in other tetrapods like frogs, reptiles, and birds.
- **(C) hairs, pinna and mammary glands:** This is correct. All three features are characteristic of mammals:
  - **Hairs (or fur):** The presence of hair is a defining feature of mammals.
  - **Pinna (external ear):** Most mammals possess external ears for sound collection.
  - **Mammary glands:** The presence of milk-producing glands to nourish the young is the most unique mammalian trait.
- **(D) hairs, pinna and indirect development:** This is incorrect. Most mammals exhibit direct development, where the young are born as miniature versions of the adult, without a larval stage.

Step 4: Final Answer:
The set of unique mammalian characteristics is hairs, pinna, and mammary glands.

Quick Tip

Remember the "big three"defining traits of mammals: Hairs, Mammary Glands, and a Dicondylic Skull. While the pinna is also a very common feature, the three just mentioned are the most fundamental.

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200. In cockroach, excretion is brought about by-
A. Phallic gland **B. Urecose gland**
C. Nephrocytes **D. Fat body**
E. Collaterial glands

Choose the correct answer from the options given below:

(A) B and D only
(B) A and E only
(C) A, B and E only
(D) B, C and D only

Correct Answer: (D) B, C and D only

Solution:

Step 1: Understanding the Question:
The question asks to identify which of the listed structures in a cockroach are involved in the process of excretion.

Step 3: Detailed Explanation:
The excretory system of the cockroach is adapted for water conservation, primarily excreting uric acid (uricotelism). Several structures contribute to this process:

- **Malpighian tubules (not listed):** These are the primary excretory organs.
- **B. Urecose glands:** These are accessory reproductive glands in some male cockroaches that also function in storing and excreting uric acid.
- **C. Nephrocytes:** These are specialized cells in the body cavity that absorb nitrogenous wastes from the hemolymph.
- **D. Fat body:** The cells of the fat body also play a role in storing and metabolizing nitrogenous waste products.

The other listed structures are not excretory:

- **A. Phallic gland:** This is an accessory reproductive gland in the male cockroach.
- **E. Collaterial glands:** These are accessory reproductive glands in the female cockroach that secrete the protective egg case (ootheca).

Therefore, the structures involved in excretion from the given list are the urecose gland, nephrocytes, and the fat body.

Step 4: Final Answer:
The correct combination of excretory structures is B, C, and D.

Quick Tip

In cockroaches, remember that excretion is not just done by one organ. It's a team effort involving Malpighian tubules (the main players), and supported by the Fat Body, Nephrocytes, and Urecose glands. Phallic and Collaterial glands are strictly for reproduction.
