NEET UG 2023 G2 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. 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 used for the *early* diagnosis of a disease. Early diagnosis often means detecting a pathogen or a marker when its concentration is very low, often before symptoms appear.

Step 2: Analyzing the Techniques:
- **(A) ELISA:** This is a highly sensitive immunological assay used to detect specific antigens (from a pathogen) or antibodies (produced by the host in response to infection). Its sensitivity allows for detection of infection at early stages.
- **(B) Recombinant DNA Technology:** This technology is used to create molecular probes (radioactively or fluorescently labeled single-stranded DNA or RNA) that can detect the presence of specific complementary nucleic acid sequences in a sample. This is used for identifying gene mutations or pathogen DNA/RNA for early diagnosis of genetic disorders and infections.
- **(D) PCR:** This technique can amplify a minute amount of DNA, making it possible to detect the presence of a pathogen's nucleic acid even when the infection is very recent and the number of pathogens is extremely low. It is a cornerstone of early diagnosis.
- **(C) Serum and Urine analysis:** This refers to conventional or traditional methods of diagnosis. These methods often rely on observing symptoms or measuring levels of certain substances in body fluids that change significantly only after the disease has progressed to a certain stage. For example, a high bacterial count in urine or the presence of certain proteins in serum may only be detectable when the infection is well-established. Therefore, these methods are generally less suited for very early diagnosis compared to the highly sensitive molecular techniques.

Step 3: Final Answer:
Conventional serum and urine analysis does not serve the purpose of early diagnosis as effectively as the more sensitive molecular techniques like PCR, ELISA, and methods based on recombinant DNA technology.

Quick Tip

Think about sensitivity. "Early diagnosis"requires high sensitivity. PCR, ELISA, and DNA probes are modern, highly sensitive techniques that can find a "needle in a haystack"(a tiny amount of pathogen/marker). Conventional lab tests often need a larger "needle"to find it, which usually means the disease is more advanced.

152. 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:
This Assertion-Reason question evaluates statements about amniocentesis, its misuse, and its relation to government health programs.

Step 2: Analyzing Assertion A:
"Amniocentesis for sex determination is one of the strategies of Reproductive and Child Health Care Programme."
This statement is **false**. Amniocentesis is a medical procedure used to detect genetic abnormalities in a fetus. However, its use for the purpose of sex determination is a misuse and is legally banned in many countries, including India. The Reproductive and Child Health Care (RCH) Programme aims to improve maternal and child health; it does not promote sex determination, which often leads to female foeticide.

Step 3: Analyzing Reason R:
"Ban on amniocentesis checks increasing menace of female foeticide."
This statement is **true**. The primary reason for imposing a statutory ban on using amniocentesis for sex determination was to prevent the selective abortion of female fetuses. This practice had led to a skewed sex ratio in many parts of the country. The ban is a legal measure to curb this social evil.

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

Quick Tip

Distinguish between the medical use and misuse of a technique. Amniocentesis for diagnosing genetic disorders is a valid medical tool. Amniocentesis for sex determination is a banned misuse. Government health programs promote valid medical practices, not their misuse.

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153. 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 Mycorrtizae	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 with the correct ecological term for that interaction.

Step 2: Matching Each Interaction:
- **A. A Leopard and a Lion in a forest/grassland:** Both are large carnivores that prey on similar animals (e.g., deer, zebra). Since they share and compete for the same limited food resource, their interaction is **Competition** (-, -). So, **A matches I**.
- **B. A Cuckoo laying egg in a Crow's nest:** This is a classic example of **Brood parasitism** (+, -). The Cuckoo benefits by having the Crow raise its young, while the Crow is harmed because its own offspring may be outcompeted or killed by the cuckoo chick. So, **B matches II**.
- **C. Fungi and root of a higher plant in Mycorrhizae:** This is a symbiotic relationship where both partners benefit. The fungus helps the plant absorb water and mineral nutrients from the soil, and the plant provides carbohydrates to the fungus. This is **Mutualism** (+, +). So, **C matches III**.

- **D. A cattle egret and a Cattle in a field:** The egret follows the cattle and feeds on insects that are stirred up from the vegetation as the cattle move. The egret benefits (+), while the cattle is largely unaffected (0). This interaction is **Commensalism** (+, 0). So, **D matches IV**.

Step 3: Compiling the Correct Match:
The correct matches are: A → I, B → II, C → III, D → IV. This combination corresponds to option (B).

Quick Tip

Remember the key examples for each type of population interaction, as they are frequently asked in exams. - Competition: Lions and Leopards. - Brood Parasitism: Cuckoo and Crow. - Mutualism: Mycorrhizae, Lichens, Pollinators. - Commensalism: Cattle Egret and Cattle, Orchid on a Mango tree.

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154. 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 a group consisting entirely of Australian marsupials. This group serves as an example of adaptive radiation, where a common ancestral marsupial evolved into a wide variety of forms adapted to different ecological niches.

Step 2: Analyzing the Options:
We need to distinguish between marsupial mammals (pouched mammals, mostly found in Australia) and placental mammals. Many marsupials have evolved to resemble placental mammals elsewhere in the world through convergent evolution.
- **(A) Lemur, Anteater, Wolf:** All of these are placental mammals. Lemurs are primates, the common anteater is a xenarthran, and the wolf is a canid. This is incorrect.
- **(B) Tasmanian wolf, Bobcat, Marsupial mole:** The Tasmanian wolf (thylacine) and Marsupial mole are marsupials. However, the Bobcat is a placental mammal (a feline). This is incorrect.
- **(C) Numbat, Spotted cuscus, Flying phalanger:** The Numbat (marsupial anteater), Spotted cuscus, and Flying phalanger (sugar glider) are all Australian marsupials. This group correctly represents members of the Australian marsupial radiation. This is correct.

- **(D) Mole, Flying squirrel, Tasmanian tiger cat:** The Mole and the Flying squirrel are placental mammals. The Tasmanian tiger cat (or quoll) is a marsupial. This is incorrect.

Step 3: Final Answer:
The only group that consists exclusively of Australian marsupials is Numbat, Spotted cuscus, and Flying phalanger.

Quick Tip

Be familiar with the classic examples of convergent evolution between placentals and Australian marsupials: - Placental Wolf ↔ Marsupial Wolf (Tasmanian wolf) - Placental Mole ↔ Marsupial Mole - Placental Flying Squirrel ↔ Marsupial Flying Phalanger The question often mixes these pairs to test your knowledge.

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155. 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 with its correct location in the human body.

Step 2: Matching Each Joint Type with its Location:
- **A. Cartilaginous Joint:** These joints allow limited movement and are characterized by cartilage connecting the bones. A prime example is the joints **between adjacent vertebrae** in the vertebral column (intervertebral discs). So, **A matches II**.
- **B. Ball and Socket Joint:** This is a type of synovial joint that allows for the widest range of motion. The shoulder joint, **between the humerus and the pectoral girdle** (scapula), is a classic example. So, **B matches IV**.
- **C. Fibrous Joint:** These joints are immovable (synarthroses) and are found where bones are connected by dense fibrous tissue. The sutures **between the flat skull bones** are fibrous

joints. So, **C matches I**.
- **D. Saddle Joint:** This is another type of synovial joint that allows movement in two planes. The best example in the human body is the carpometacarpal joint of the thumb, located **between the carpal (trapezium) and the metacarpal of the thumb**. So, **D matches III**.

Step 3: Compiling the Correct Match:
The correct matches are: A → II, B → IV, C → I, D → III. This combination is found in option (C).

Quick Tip

For joint questions, memorize the key examples: - Fibrous → Skull sutures (immovable) - Cartilaginous → Vertebrae (slightly movable) - Synovial → Most limb joints (freely movable) - Ball Socket → Shoulder, Hip - Hinge → Elbow, Knee - Saddle → Thumb

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156. 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) found in the digestive system with their respective secretions (List II).

Step 2: Matching Each Cell with its Secretion:
- **A. Peptic cells (or Chief cells):** These cells are located in the gastric glands of the stomach and are responsible for secreting the inactive proenzyme **pepsinogen**. So, **A matches III**.
- **B. Goblet cells:** These are specialized epithelial cells found throughout the gastrointestinal tract and respiratory tract. They secrete **Mucus**, which serves to protect and lubricate the

linings. So, **B matches 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}. So, **C matches IV**.
- **D. Hepatic cells (Hepatocytes):** These are the main cells of the liver. They produce and secrete **Bile juice**, which is stored in the gallbladder and aids in the digestion of fats. So, **D matches II**.

Step 3: Compiling the Correct Match:
The correct matches are: A → III, B → I, C → IV, D → II. This combination corresponds to option (D).

Quick Tip

Associate the cell names with their products: - **P**eptic → **P**epsinogen - **O**xyntic/**P**arietal → HCl and Intrinsic Factor - **G**oblet → Mucus (**G**ooey substance) - **H**epatic → **H**epa (liver) → Bile

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157. 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 having a broad palm with a single transverse palmar crease (also known as a simian crease).

Step 2: Detailed Explanation of the Disorders:
- **(A) Thalassemia:** This is a genetic blood disorder characterized by less hemoglobin and fewer red blood cells than normal. It does not cause the described palm characteristics.
- **(B) Down's syndrome:** This is a chromosomal disorder caused by the presence of a full or partial extra copy of chromosome 21 (Trisomy 21). It is characterized by a set of distinct physical features, including a small round head, a flattened facial profile, partially open mouth with a protruding furrowed tongue, and characteristically, **broad palms with a single palmar crease**.
- **(C) Turner's syndrome:** This is a chromosomal disorder in females caused by the absence of one of the X chromosomes (XO karyotype). It is characterized by short stature, a webbed neck, and underdeveloped ovaries, but not a single palm crease.

- **(D) Klinefelter's syndrome:** This is a chromosomal disorder in males caused by an extra X chromosome (XXY karyotype). It is characterized by tall stature, small testes, and some female characteristics (gynaecomastia), but not a single palm crease.

Step 3: Final Answer:
A broad palm with a single palmar crease is a classic physical symptom of Down's syndrome.

Quick Tip

For genetic disorders, associate each with its most distinctive features: - **Down's syndrome (Trisomy 21):** Single palm crease, flattened face, intellectual disability. - **Turner's syndrome (XO):** Short female, webbed neck, sterile. - **Klinefelter's syndrome (XXY):** Tall male, gynaecomastia, sterile.

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158. 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 a disease (List I) with its causative agent (List II).

Step 2: Matching Each Disease with its Pathogen:
- **A. Ringworm:** Despite its name, ringworm is not caused by a worm. It is a common fungal infection of the skin. The fungi responsible belong to genera such as *Trichophyton*, *Microsporum*, and *Epidermophyton*. So, **A matches II**.
- **B. Filariasis (Elephantiasis):** This is a parasitic disease caused by a filarial worm (a nematode). The most common causative agent is *Wuchereria bancrofti*. So, **B matches III**.
- **C. Malaria:** This is a protozoan disease transmitted by the bite of an infected female *Anopheles* mosquito. The causative agent is a species of *Plasmodium*, such as *Plasmodium vivax* or *Plasmodium falciparum*. So, **C matches IV**.
- **D. Pneumonia:** This is an infection that inflames the air sacs in one or both lungs. It can

be caused by bacteria, viruses, or fungi. A common bacterial cause is *Haemophilus influenzae* (another is *Streptococcus pneumoniae*). So, **D matches I**.

Step 3: Compiling the Correct Match:
The correct matches are: A → II, B → III, C → IV, D → I. This combination corresponds to option (B).

Quick Tip

Create a quick mental table for common diseases and their pathogen types: - Ringworm → Fungus (*Trichophyton*) - Malaria → Protozoa (*Plasmodium*) - Filariasis → Helminth/Worm (*Wuchereria*) - Pneumonia/Typhoid → Bacteria (*H. influenzae*/*S. typhi*)

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159. 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 code for (List II). The *lac* operon is a classic example of gene regulation in prokaryotes (*E. coli*).

Step 2: Matching Each Gene with its Product:
- **Gene 'z' (lacZ):** This is a structural gene that codes for the enzyme **β-galactosidase**. This enzyme hydrolyzes lactose into glucose and galactose. So, **D matches I**.
- **Gene 'y' (lacY):** This is a structural gene that codes for the protein **Permease**. This protein is embedded in the bacterial cell membrane and increases the cell's permeability to lactose. So, **B matches III**.
- **Gene 'a' (lacA):** This is a structural gene that codes for the enzyme **Transacetylase**. Its role in lactose metabolism is not fully clear but it's part of the operon. So, **A matches II**.
- **Gene 'i' (lacI):** This is the regulator gene. It is located upstream of the operon and codes

for the **Repressor protein**. This protein binds to the operator region to switch the operon 'off' in the absence of lactose. So, **C matches IV**.

Step 3: Compiling the Correct Match:
The correct matches are: A $\rightarrow$ II, B $\rightarrow$ III, C $\rightarrow$ IV, D $\rightarrow$ I. This combination is found in option (C).

Quick Tip

To remember the *lac* operon genes and their products, think in order: i (inhibitor/repressor), then the structural genes z, y, a. - $z \rightarrow$ β-galactosidase (breaks down lactose) - $y \rightarrow$ Permease (lets lactose in) - $a \rightarrow$ Transacetylase (the last one)

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160. 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, one about the convention of representing protein structure and the other about the composition of adult human hemoglobin.

Step 2: Analyzing 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)"
This statement describes the convention for writing a polypeptide chain, but it has the terminals reversed. By standard biochemical convention, a protein sequence is written starting from the **N-terminal (amino-terminal)** end on the left, which represents the first amino acid, to the **C-terminal (carboxyl-terminal)** end on the right, which represents the last amino acid. Therefore, Statement I is **false**.

Step 3: Analyzing Statement II:
"Adult human haemoglobin, consists of 4 subunits (two subunits of α type and two subunits of β type.)"
This statement accurately describes the quaternary structure of adult hemoglobin (HbA). It is a tetrameric protein composed of four polypeptide chains: two identical alpha (α) chains and two identical beta (β) chains. The structure is represented as $\alpha_2\beta_2$. 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 sequence starts with the **A**mino (N) terminal and ends with the **C**arboxyl (C) terminal. N comes before C in the alphabet, and the N-terminal comes first in the protein sequence.

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161. 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 various psychoactive drugs with their primary effect or mechanism of action.

Step 2: Matching Each Drug with its Effect:
- **A. Heroin:** Also known as smack or diacetylmorphine, it is a powerful opioid depressant. Its primary effect is to **slow down body function**. So, **A matches II**.
- **B. Marijuana:** The active ingredients are cannabinoids, which interact with cannabinoid receptors in the brain. They are known to have a significant **effect on the cardiovascular system** (e.g., increasing heart rate). So, **B matches I**.

- **C. Cocaine:** Also known as coke or crack, it is a potent stimulant. It works by blocking the reuptake of neurotransmitters, particularly dopamine, in the brain's pleasure circuits. Thus, it does **interfere with the transport of dopamine**. So, **C matches IV**.
- **D. Morphine:** This is a very effective sedative and **painkiller** (analgesic), widely used in medicine. It is an opioid extracted from the poppy plant. So, **D matches III**.

Step 3: Compiling the Correct Match:
The correct matches are: A → II, B → I, C → IV, D → III. This combination corresponds to option (B).

Quick Tip

Categorize drugs by their general effect:
- **Depressants** (slow down): Opioids (Morphine, Heroin), Barbiturates.
- **Stimulants** (speed up): Cocaine, Amphetamines.
- **Hallucinogens**: LSD, Marijuana (has properties of all categories). Remember the specific mechanism for Cocaine (dopamine transport) and the primary medical use for Morphine (painkiller).

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162. 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 set of correct statements regarding the female reproductive cycle in mammals.

Step 2: Detailed Explanation of Each Statement:
- **A. In non-primate mammals cyclical changes during reproduction are called oestrus cycle.** This is **correct**. Mammals like cows, sheep, dogs, and tigers have an oestrus

cycle, while primates (monkeys, apes, humans) have a menstrual cycle.
- **B. First menstrual cycle begins at puberty and is called menopause.** This is **incorrect**. The first menstrual cycle at puberty is called **menarche**. **Menopause** is the permanent cessation of the menstrual cycle, which occurs later in life.
- **C. Lack of menstruation may be indicative of pregnancy.** This is **correct**. Amenorrhea (the absence of menstruation) is one of the earliest and most reliable signs of pregnancy, although it can also be caused by other factors like stress, poor health, etc.
- **D. Cyclic menstruation extends between menarche and menopause.** This is **correct**. The reproductive phase of a human female is marked by the menstrual cycle, which starts at menarche and ends at menopause.

Step 3: Final Answer:
The correct statements are A, C, and D.

Quick Tip

Remember the key terms for the human female reproductive cycle: - **Menarche:** The **arch**rival's beginning - the first cycle. - **Menopause:** The cycle takes a **pause** - the end of cycles. - **Oestrus Cycle:** For other animals (non-primates).

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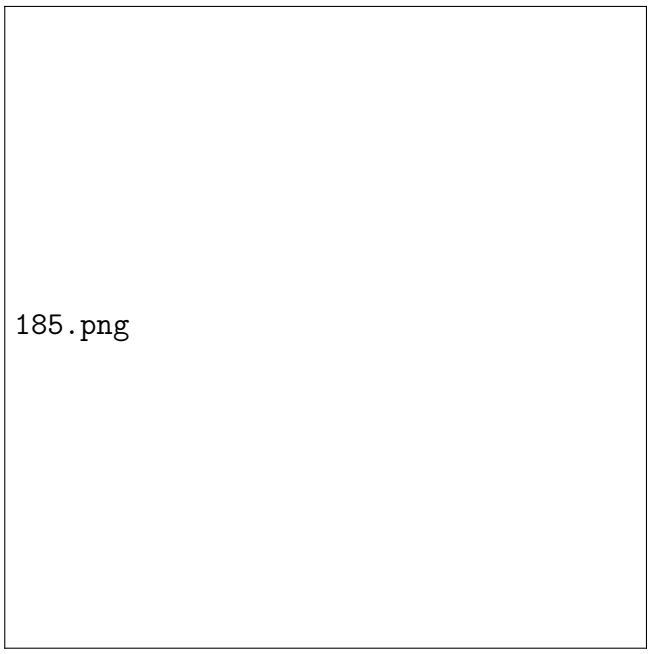
163. Which one of the following symbols represents mating between relatives in human pedigree analysis?



(A) (1)
(B) (2)
(C) (3)
(D) (4)

Correct Answer: (B) (2)

Solution:

Step 1: Understanding the Question:
The question asks to identify the standard symbol used in a pedigree chart to represent a consanguineous mating, which is a mating between closely related individuals.

Step 2: Analyzing the Symbols:
In standard pedigree nomenclature:
- A square represents a male.
- A circle represents a female.
- A horizontal line connecting a square and a circle represents a mating.
- **(1) Single horizontal line:** This represents mating between unrelated individuals. This is the standard symbol for a partnership.
- **(2) Double horizontal line:** This is the specific symbol used to indicate a consanguineous mating (mating between relatives).
- **(3) Unconnected square and circle:** This simply depicts a male and a female in the same generation, not a mating pair.
- **(4) Shaded diamond:** A diamond represents an individual of unspecified sex, and shading indicates that the individual is affected by the genetic trait being studied. This does not represent mating.

Step 3: Final Answer:
The symbol for mating between relatives is a double horizontal line connecting the male (square) and female (circle).

Quick Tip

Think of the lines as marriage lines. One line is a standard marriage. A **double line** signifies a "doubly close"or related marriage (consanguinity).

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164. 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 different animals (List I) with their corresponding excretory or osmoregulatory structures (List II).

Step 2: Matching Each Animal with its Structure:
- **A. *Taenia* (Tapeworm):** This is a platyhelminth (flatworm). The excretory structures in flatworms are specialized cells called **Flame cells** (protonephridia). So, **A matches III**.
- **B. *Paramoecium*:** This is a single-celled protozoan. It lives in freshwater and uses a **Contractile vacuole** for osmoregulation, to pump excess water out of the cell. So, **B matches II**.
- **C. *Periplaneta* (Cockroach):** This is an insect (arthropod). The primary excretory organs are Malpighian tubules. Additionally, fat bodies and **Uricose glands** are also involved in the storage and excretion of uric acid. So, **C matches IV**.
- **D. *Pheretima* (Earthworm):** This is an annelid. The excretory organs are coiled tubular structures called **Nephridia**. So, **D matches I**.

Step 3: Compiling the Correct Match:
The correct matches are: A → III, B → II, C → IV, D → I. This combination corresponds to option (D).

Quick Tip

Excretory structures are a key feature for classifying animal phyla. Memorize these pairs: - Platyhelminthes (Flatworms) → Flame Cells - Annelids (Earthworms) → Nephridia - Arthropods (Insects) → Malpighian Tubules - Protozoa → Contractile Vacuole (for osmoregulation)

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165. 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 animal phylum from the given options whose adult members do not exhibit radial symmetry.

Step 2: Analyzing the Symmetry of Each Phylum:
- **(A) Echinodermata:** Adult echinoderms (like starfish, sea urchins) are a classic example of pentamerous **radial symmetry**. Interestingly, their larvae exhibit bilateral symmetry.
- **(B) Ctenophora:** Ctenophores (comb jellies) exhibit **biradial symmetry**, which is a type of radial symmetry where the body can be divided into two identical halves by two planes.
- **(C) Hemichordata:** Hemichordates (like the acorn worm, *Balanoglossus*) are worm-like, deuterostome animals. They exhibit **bilateral symmetry** throughout their life cycle. Their body can be divided into equal left and right halves along a single sagittal plane.
- **(D) Coelenterata (Cnidaria):** Coelenterates (like jellyfish, sea anemones, corals) are characterized by **radial symmetry**.

Step 3: Final Answer:
Among the given options, only Hemichordata consists of animals that are exclusively bilaterally symmetrical as adults.

Quick Tip

When thinking about symmetry, associate phyla with their dominant type: - Porifera: Asymmetrical - Cnidaria Ctenophora: Radial - Echinodermata: Radial (adults), Bilateral (larvae) - a unique case! - Most other major phyla (Platyhelminthes to Chordata, including Hemichordata): Bilateral

---

166. 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 that the Human Immunodeficiency Virus (HIV) uses as a "factory"to replicate itself.

Step 2: Detailed Explanation:
HIV is a retrovirus that primarily targets the human immune system. Its main target cells are

a specific type of lymphocyte called **Helper T-cells (T_H cells)**.
- These T_H cells have a protein called CD4 on their surface, which acts as a receptor for the HIV virus.
- Once HIV enters a helper T-cell, it uses the enzyme reverse transcriptase to convert its viral RNA into DNA.
- This viral DNA is then integrated into the host cell's own DNA.
- The infected T_H cell is then forced to produce new virus particles, which are released to infect other T_H cells.
- This process of replication and destruction of T_H cells leads to a progressive weakening of the immune system, resulting in Acquired Immuno-Deficiency Syndrome (AIDS).

Other cells listed like B-lymphocytes, eosinophils, and basophils are not the primary target for HIV replication.

Step 3: Final Answer:
HIV undergoes replication and produces progeny viruses primarily inside Helper T-cells (T_H cells).

Quick Tip

Remember that HIV attacks the "general"of the immune system's army, which is the Helper T-cell. By destroying the generals, the entire immune defense collapses, leading to AIDS.

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167. 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 only correct statement among the four options related to environmental pollution.

Step 2: Evaluating Each Statement:
- **(A) Algal Bloom decreases fish mortality:** This is **incorrect**. Algal blooms lead to a depletion of dissolved oxygen in the water (hypoxia) when the algae die and are decomposed

by bacteria. This lack of oxygen causes a massive increase in fish mortality.
- **(B) Eutrophication refers to increase in domestic sewage and waste water in lakes.:** This is **incorrect**. Eutrophication is the natural or artificial addition of nutrients (like nitrates and phosphates) to a water body, which leads to increased primary productivity (like algal blooms). While domestic sewage is a major cause of eutrophication, the term itself refers to the nutrient enrichment, not the sewage.
- **(C) Biomagnification refers to increase in concentration of the toxicant at successive trophic levels.:** This is **correct**. This is the precise definition of biomagnification (or bioamplification). Toxic substances that are not easily metabolized, such as DDT or mercury, accumulate in organisms and their concentration increases up the food chain.
- **(D) Presence of large amount of nutrients in water restricts 'Algal Bloom':** This is **incorrect**. A large amount of nutrients (eutrophication) is the primary cause that *promotes* or *causes* algal blooms.

Step 3: Final Answer:
The only correct statement is the definition of biomagnification.

Quick Tip

For environmental terms, be precise with definitions: - **Eutrophication** = Nutrient enrichment. - **Algal Bloom** = Consequence of eutrophication. - **Biomagnification** = Toxin concentration **magnifies** up the food chain.

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168. 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. The key distinction is between diseases caused by bacteria (usually curable) and those caused by viruses (often manageable but not curable).

Step 2: Analyzing the Options:
- **(A) HIV Infection:** Caused by the Human Immunodeficiency Virus (HIV). It is a viral disease and is currently not curable, though it can be managed with antiretroviral therapy (ART).

- **(B) Genital herpes:** Caused by the Herpes Simplex Virus (HSV). It is a viral disease and is not curable. Antiviral medications can manage outbreaks, but the virus remains in the body.
- **(C) Gonorrhoea:** Caused by the bacterium *Neisseria gonorrhoeae*. As a bacterial infection, it is completely curable with a course of appropriate antibiotics, especially if diagnosed early.
- **(D) Hepatitis-B:** Caused by the Hepatitis B Virus (HBV). It is a viral infection that can become chronic and is not curable in its chronic form. A vaccine is available for prevention.

Step 3: Final Answer:
Among the given options, only Gonorrhoea is a bacterial STD and is completely curable with antibiotics.

Quick Tip

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

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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 requires matching different parts of the human eye (List I) with their correct description or function (List II).

Step 2: Matching Each Part of the Eye:
- **A. Fovea:** The fovea (or fovea centralis) is a small pit in the center of the macula lutea of the retina. It is densely packed with cone cells and is responsible for sharp, detailed central vision. It is the **point of greatest visual acuity or resolution**. So, **A matches III**.
- **B. Iris:** This is the pigmented part of the eye that gives it its color. It is a muscular diaphragm that controls the size of the pupil, thus regulating the amount of light entering the eye. It is

the **visible coloured portion of eye that regulates diameter of pupil**. So, **B matches I**.
- **C. Blind spot:** This is the area on the retina where the optic nerve exits the eyeball to connect to the brain. Because this area has no photoreceptor cells (rods or cones), it cannot detect light. It is the **point where optic nerve leaves the eyeball and photoreceptor cells are absent**. So, **C matches IV**.
- **D. Sclera:** This is the tough, white, fibrous outer layer of the eyeball that protects the inner components and maintains the shape of the eye. It is the **external layer of eye formed of dense connective tissue**. So, **D matches II**.

Step 3: Compiling the Correct Match:
The correct matches are: A → III, B → I, C → IV, D → II. This combination corresponds to option (B).

Quick Tip

For the eye, remember these key associations: - **Fovea** = **F**ocus (sharpest vision). - **Iris** = Color and pupil control. - **Blind spot** = No photoreceptors, where optic nerve leaves. - **Sclera** = **S**upport (tough outer white layer).

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170. 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 requires an evaluation of two statements, one concerning the male reproductive system and the other concerning the female reproductive system.

Step 2: Analyzing Statement I:
"Vas deferens receives a duct from seminal vesicle and opens into urethra as the ejaculatory duct."

This statement accurately describes the pathway of sperm. The vas deferens carries sperm from the epididymis. Just before it reaches the prostate gland, it is joined by the duct from the seminal vesicle. This union forms the ejaculatory duct, which then passes through the prostate and empties into the urethra. Therefore, Statement I is **true**.

Step 3: Analyzing Statement II:
"The cavity of the cervix is called cervical canal which along with vagina forms birth canal."
This statement correctly describes the anatomy relevant to childbirth (parturition). The cervix is the lower, narrow part of the uterus. Its central channel is the cervical canal. During birth, the fetus passes from the uterus, through the cervical canal, and then through the vagina to the outside. This combined passage is known as the birth canal. Therefore, Statement II is **true**.

Step 4: Final Answer:
Both statements are anatomically correct.

Quick Tip

For reproductive anatomy, tracing pathways is key. - Male: Testis → Epididymis → Vas deferens → Ejaculatory duct (joined by seminal vesicle) → Urethra. - Female (Birth): Uterus → Cervical canal → Vagina. Visualizing these paths helps in remembering the sequence and connections.

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171. 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 us to evaluate two statements about the organization and packaging of DNA in prokaryotic and eukaryotic cells, specifically concerning the charges of DNA and associated proteins.

Step 2: Analyzing Statement I:
"In prokaryotes, the positively charged DNA is held with some negatively charged proteins in a region called nucleoid."
This statement contains a fundamental error. DNA is a nucleic acid, and the phosphate groups in its backbone give it a strong **negative charge**. In prokaryotes, this negatively charged DNA is organized into a nucleoid, associated with some **positively charged** (non-histone) proteins that help in packaging. The statement incorrectly claims DNA is positively charged and the proteins are negatively charged. Therefore, Statement I is **incorrect**.

Step 3: Analyzing Statement II:
"In eukaryotes, the negatively charged DNA is wrapped around the positively charged histone octamer to form nucleosome."
This statement is **correct**. In eukaryotes, the packaging of DNA is highly organized. 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), which allows them to bind tightly to the negatively charged DNA. This fundamental unit of DNA packaging is called a nucleosome.

Step 4: Final Answer:
Statement I is incorrect, but Statement II is true.

Quick Tip

Always remember: DNA is an **acid** (Deoxyribonucleic Acid), and due to its phosphate backbone, it is always **negatively charged**. Any protein that needs to bind directly to DNA for packaging, like histones, must be **positively charged**. Opposite charges attract.

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172. 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 structure that prevents the contents of the large intestine (specifically the caecum, its starting point) from flowing back into the small intestine.

Step 2: Analyzing the Options:
- **(A) Pyloric sphincter:** This sphincter is 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.
- **(B) Sphincter of Oddi:** This sphincter controls the flow of bile and pancreatic juice from the common bile duct and pancreatic duct into the duodenum.
- **(C) Ileo-caecal valve:** This valve (or sphincter) is 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 digested food to pass from the small intestine into the large intestine and to prevent the backflow of material.
- **(D) Gastro-oesophageal sphincter:** Also known as the cardiac sphincter, it is located at the junction of the esophagus and the stomach, preventing the backflow of stomach acid into the esophagus.

Step 3: Final Answer:
The structure that prevents backflow from the caecum into the ileum is the ileo-caecal valve.

Quick Tip

The names of sphincters and valves often tell you 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 **oesophagus**.

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173. 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 about the use and function of electrostatic precipitators in thermal power plants.

Step 2: Analyzing Statement I:
"Electrostatic precipitator is most widely used in thermal power plant."
This statement is **correct**. Thermal power plants burn coal, which produces large amounts of fly ash (particulate matter). Electrostatic precipitators are highly efficient (up to 99%) at removing these particulate pollutants from the exhaust gases and are the preferred method for this purpose in such industries.

Step 3: Analyzing Statement II:
"Electrostatic precipitator in thermal power plant removes ionising radiations"
This statement is **incorrect**. The function of an electrostatic precipitator is to remove **particulate matter** (like dust and smoke particles) from a gas stream. It works by charging the particles and then collecting them on oppositely charged plates. It does not remove gaseous pollutants (like SO_2) or ionizing radiations.

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

Quick Tip

Remember the functions of major pollution control devices: - **Electrostatic Precipitator**: Removes **P**articulate matter. - **Scrubber**: Removes **S**ulfur dioxide (SO_2) gas. - **Catalytic Converter**: Converts harmful gases (CO, NOx, hydrocarbons) into harmless ones in automobiles.

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174. 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:
This Assertion-Reason question is about the types of nephrons found in the kidney and their

structural differences.

Step 2: Analyzing Assertion A:
"Nephrons are of two types: Cortical & Juxta medullary, based on their relative position in cortex and medulla."
This statement is **true**. Based on the location of the renal corpuscle (glomerulus and Bowman's capsule) in the renal cortex, nephrons are classified into two main types: cortical nephrons (which are more numerous and have their corpuscles in the outer cortex) and juxtamedullary nephrons (which have their corpuscles deep in the cortex, near the medulla).

Step 3: Analyzing Reason R:
"Juxta medullary nephrons have short loop of Henle whereas, cortical nephrons have longer loop of Henle."
This statement is **false**. It has the descriptions reversed. - **Juxtamedullary nephrons** are characterized by having a very **long loop of Henle** that extends deep into the medulla. This long loop is crucial for creating the concentration gradient needed to produce concentrated urine. - **Cortical nephrons** have a **short loop of Henle** that only extends slightly into the medulla, or not at all.

Step 4: Final Answer:
Assertion A is a true statement, but Reason R is a false statement.

Quick Tip

Associate "Juxtamedullary"with "juxtaposed to the medulla"(deep). These deep nephrons need a **long** loop of Henle to go deep into the medulla to create the concentration gradient. Cortical nephrons, being superficial, have short loops.

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175. 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 function performed by the cytoskeleton from the given options.

Step 2: Detailed Explanation:
The cytoskeleton is a network of protein filaments (microtubules, microfilaments, and intermediate

filaments) in the cytoplasm of a eukaryotic cell. It has several crucial functions:
- **Mechanical Support:** It provides structural support to the cell and maintains its shape.
- **Motility:** It is directly involved in various forms of cell movement. Cilia and flagella, which are responsible for the movement of cells or the movement of fluid over cell surfaces, are made of microtubules. Amoeboid movement is achieved through the action of microfilaments (actin).
- **Intracellular Transport:** It acts as a trackway for the movement of organelles and vesicles within the cell (a form of transportation, but motility is a more direct answer from the options).
- **Cell Division:** Microtubules form the mitotic spindle, which is essential for separating chromosomes during mitosis and meiosis.

Now let's evaluate the options:
- (A) Transportation: While the cytoskeleton is involved in intracellular transport, 'motility' is a more direct and universally recognized function.
- (B) Nuclear division: This is a function of the mitotic spindle, which is made of cytoskeletal elements (microtubules). However, motility is a broader function.
- (C) Protein synthesis: This is carried out by ribosomes, not the cytoskeleton.
- (D) Motility: This is a key and defining function of the cytoskeleton, encompassing cell movement, amoeboid movement, and the beating of cilia and flagella. It is the most appropriate answer among the choices.

Step 3: Final Answer:
Among the given options, motility is a primary function carried out by the cytoskeleton.

Quick Tip

Think of the cytoskeleton as the cell's "bones and muscles."Just like our skeleton gives us shape and our muscles allow for movement, the cytoskeleton provides mechanical support and is essential for all forms of cellular motility.

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176. 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 about the mutation and evolution rates of RNA and RNA viruses.

Step 2: Analyzing Statement I:
"RNA mutates at a faster rate."
This statement is **true**. RNA is inherently less stable than DNA. Furthermore, the enzymes that replicate RNA (RNA polymerases and reverse transcriptases) typically 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.

Step 3: Analyzing Statement II:
"Viruses having RNA genome and shorter life span mutate and evolve faster."
This statement is also **true**. The high mutation rate of RNA (as stated in Statement I) provides a constant source of genetic variation. When combined with a short life span (which means many generations can be produced in a short time), natural selection can act very quickly on this variation. This leads to rapid evolution, which is why RNA viruses like influenza and HIV can quickly develop drug resistance or evade the immune system.

Step 4: Final Answer:
Both statements are correct and logically related. The high mutation rate of RNA genomes allows for the rapid evolution observed in RNA viruses.

Quick Tip

Remember the link: Unstable molecule (RNA) + sloppy copying (no proofreading) = High Mutation Rate. High Mutation Rate + Fast Reproduction = Rapid Evolution. This explains why we need a new flu shot every year.

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177. 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 for the Vital Capacity (VC) of the lungs, which is a

standard measure in respiratory physiology.

Step 2: Defining Respiratory Volumes and Capacities:
- **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 maximal forced expiration. This air cannot be voluntarily expelled.

Vital Capacity (VC) is defined as the maximum amount of air a person can exhale from the lungs after a maximum inhalation. It is the sum of the three volumes that can be moved voluntarily.

Vital Capacity (VC) = Tidal Volume (TV)+Inspiratory Reserve Volume (IRV)+Expiratory Reserve Volu

Let's check the options:
- (A) IRV + ERV + TV: This is the correct formula for Vital Capacity.
- (B) IRV + ERV: This is incorrect; it misses the Tidal Volume.
- (C) IRV + ERV + TV + RV: This sum is equal to the Total Lung Capacity (TLC), not the Vital Capacity.
- (D) This formula is incorrect.

Step 3: Final Answer:
The vital capacity of the lung is the sum of Inspiratory Reserve Volume, Expiratory Reserve Volume, and Tidal Volume.

Quick Tip

Remember "Vital"capacity is the volume of air vital for life that you can actively control. It includes everything except the "Residual"volume, which is the air that always remains in the lungs. Total Lung Capacity = Vital Capacity + Residual Volume.

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178. 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 us to evaluate the correctness of two statements regarding the classification of connective tissues.

Step 2: Analyzing Statement I:
"Ligaments are dense irregular tissue."
Ligaments connect bone to bone. They are designed to withstand strong pulling forces in one direction. To achieve this, their collagen fibers are arranged in parallel bundles. This parallel arrangement is characteristic of **dense regular connective tissue**, not dense irregular tissue (where fibers are arranged randomly, like in the dermis of the skin). Therefore, Statement I is **false**.

Step 3: Analyzing Statement II:
"Cartilage is dense regular tissue."
Cartilage is a type of **specialized connective tissue**, distinct from the "dense connective tissue"category. It has a firm, pliable matrix containing chondroitin salts and is not characterized by densely packed collagen fibers in the same way as tendons and ligaments. Therefore, Statement II is **false**.

Step 4: Final Answer:
Since both statements misclassify the tissues, both are false.

Quick Tip

Remember the main categories of connective tissue: - **Dense Regular:** Fibers are parallel. Example: Tendons and Ligaments (T-L).
- **Dense Irregular:** Fibers are random. Example: Dermis of skin.
- **Specialized:** Cartilage, Bone, Blood.
This classification helps avoid confusion.

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179. 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 of a standard Electrocardiogram (ECG) with the electrical event in the heart that they represent.

Step 2: Matching Each ECG Wave:
- **A. P-wave:** This represents the electrical excitation, or **depolarisation, of the atria**. This leads to the contraction of both atria. So, **A matches III**.
- **C. QRS complex:** This complex represents the **depolarisation of the ventricles**, which initiates ventricular contraction (systole). So, **C matches IV**.
- **D. T-wave:** This represents the return of the ventricles from the excited to the normal state, which is called **repolarisation of the ventricles**. The end of the T-wave marks the end of systole. So, **D matches II**.
- **B. Q-wave:** The Q wave is the first downward deflection of the QRS complex. The entire QRS complex marks the onset of ventricular depolarization, which triggers ventricular contraction (systole). Therefore, the start of the QRS (including the Q-wave) signifies the **beginning of systole**. So, **B matches I**.

Step 3: Compiling the Correct Match:
The correct matches are: A $\rightarrow$ III, B $\rightarrow$ I, C $\rightarrow$ IV, D $\rightarrow$ II. This combination corresponds to option (B).

Quick Tip

Remember the sequence for ECG: 1. **P**-wave = Atrial de**P**olarization. 2. **QRS** complex = Ventricular depola**RiS**ation. 3. **T**-wave = Ventricular repolariza**T**ion. Atrial repolarization is masked by the much larger QRS complex.

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180. 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. A cloning vector is a DNA molecule that can carry foreign DNA into a host cell and replicate there.

Step 2: Analyzing the Options:
- **(B) BAC (Bacterial Artificial Chromosome):** This is a high-capacity cloning vector based on a functional fertility plasmid (F-plasmid) of *E. coli*. It is used to clone very large DNA fragments (100-300 kb).
- **(C) YAC (Yeast Artificial Chromosome):** This is a cloning vector that can carry extremely large DNA fragments (over 1000 kb) and is replicated in yeast cells.
- **(D) pBR322:** This is one of the first widely used plasmid cloning vectors in *E. coli*. It is a small, artificial plasmid used for cloning smaller DNA fragments.
- **(A) Probe:** A probe is a single-stranded DNA or RNA fragment that is labeled (e.g., radioactively or fluorescently). It is used to detect the presence of a complementary nucleic acid sequence (the target) in a sample through hybridization. It is a tool for detection and identification, not a vehicle for carrying and replicating foreign DNA.

Step 3: Final Answer:
A probe is a detection tool, while BAC, YAC, and pBR322 are all types of cloning vectors. Therefore, a probe is not a cloning vector.

Quick Tip

Think of the function: a **vector** is like a vehicle (to carry DNA), while a **probe** is like a detective's tool (to find a specific DNA sequence). They have distinct purposes in molecular biology.

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181. 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 related to the factors affecting enzyme activity: temperature and inhibitors.

Step 2: Analyzing Statement I:
This statement describes the effect of temperature on enzyme activity.
- **Low temperature:** Freezing or low temperatures do not break the chemical bonds of an enzyme. They reduce the kinetic energy of the molecules, causing the enzyme to become temporarily inactive. This effect is reversible; if the temperature is raised back to the optimum, the enzyme regains its activity.
- **High temperature:** High temperatures provide enough kinetic energy to break the weak hydrogen bonds that maintain the enzyme's specific three-dimensional (tertiary) structure. This irreversible change in shape is called denaturation, which destroys the active site and thus the enzyme's activity permanently.
Therefore, Statement I is **true**.

Step 3: Analyzing Statement II:
This statement defines a specific type of enzyme inhibition. An inhibitor that is structurally similar to the substrate can bind to the enzyme's active site, competing with the actual substrate. This type of inhibition is correctly known as **competitive inhibition**. Therefore, Statement II is **true**.

Step 4: Final Answer:
Both Statement I and Statement II are correct statements regarding enzyme kinetics.

Quick Tip

Remember the temperature rule for enzymes: Cold → Inactive (Reversible), Hot → Denatured (Irreversible). For inhibitors, remember: Competitive → Competes for the active site (structurally similar to substrate).

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182. 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:
This is an Assertion-Reason question concerning the role of the endometrium in the menstrual cycle and pregnancy.

Step 2: Analyzing Assertion A:
"Endometrium is necessary for implantation of blastocyst."
This is a correct statement. The endometrium is the inner lining of the uterus, which becomes thick, vascularized, and rich in glands under the influence of hormones to prepare for pregnancy. The blastocyst must embed itself into this receptive endometrium to establish pregnancy, a process called implantation. So, Assertion A is **true**.

Step 3: Analyzing Reason R:
"In the absence of fertilization, the corpus luteum degenerates that causes disintegration of endometrium."
This is also a correct statement. 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, progesterone levels fall, and the endometrium breaks down, leading to menstruation. So, Reason R is **true**.

Step 4: Linking Assertion and Reason:
Now, we must check if Reason R correctly explains Assertion A. Reason R explains what happens to the endometrium when fertilization *fails* (i.e., it explains menstruation). Assertion A states why the endometrium is necessary when fertilization *succeeds*. The reason the endometrium is necessary for implantation is that it provides a nourishing, receptive site for the blastocyst to attach and develop. While both statements are true and involve the endometrium, the Reason describes the mechanism of menstruation, not the reason for implantation. Therefore, R is NOT the correct explanation for A.

Step 5: Final Answer:
Both A and R are true statements, but R does not correctly explain A.

Quick Tip

In Assertion-Reason questions, after confirming both statements are true, ask "Why?"for the Assertion. "Why is the endometrium necessary for implantation?"The answer is "Because it provides nourishment and attachment."The Reason statement explains menstruation, which is a different process. Thus, the explanation is incorrect.

183. 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 the organelles from the given list that are not part of the endomembrane system.

Step 2: Detailed Explanation:
The endomembrane system is a group of membranes and organelles in eukaryotic cells that work together through direct physical contact or by the transfer of membrane vesicles. Their functions are coordinated and include synthesis of proteins and lipids, and their transport into membranes, organelles, or out of the cell.
The core components of the endomembrane system are:
- Nuclear Envelope
- Endoplasmic Reticulum (B)
- Golgi Apparatus/Complex (D)
- Lysosomes
- Vacuoles
- Plasma Membrane

The following organelles are not part of the endomembrane system because their functions are distinct and they are not connected through the vesicle transport system:
- **Mitochondria (A):** They are semi-autonomous organelles responsible for cellular respiration and have their own DNA.
- **Chloroplasts (C):** They are semi-autonomous organelles responsible for photosynthesis in plant cells and have their own DNA.
- **Peroxisomes (E):** They are small organelles involved in various metabolic reactions, including breaking down fatty acids and detoxifying harmful substances. They are not part of the vesicle flow.

Therefore, Mitochondria, Chloroplasts, and Peroxisomes are not part of the endomembrane

system.

Step 3: Final Answer:
The organelles not part of the endomembrane system are A, C, and E.

Quick Tip

Remember that the endomembrane system is essentially a cellular "manufacturing and shipping"network. Mitochondria and Chloroplasts are the "power plants"of the cell and are considered separate. Peroxisomes are like specialized "recycling/detox centers"that also function independently.

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184. 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 (List I) with their source or target organ (List II).

Step 2: Matching Each Hormone:
- **A. CCK (Cholecystokinin):** This is a gastrointestinal hormone secreted by the small intestine. It acts on the **Pancreas** to stimulate the secretion of pancreatic enzymes and also on the gallbladder to cause contraction. So, **A matches IV**.
- **B. GIP (Gastric Inhibitory Peptide):** This hormone is secreted by the small intestine. It inhibits gastric secretions and motility, so its target is the **Gastric gland**. So, **B matches III**.
- **C. ANF (Atrial Natriuretic Factor):** This hormone is secreted by the atrial walls of the **Heart** in response to high blood pressure. It causes vasodilation and helps reduce blood pressure. So, **C matches II**.
- **D. ADH (Antidiuretic Hormone or Vasopressin):** This hormone is produced by the hypothalamus and released by the posterior pituitary. It acts on the distal tubules and collecting

ducts of the **Kidney** to increase water reabsorption. So, **D matches I**.

Step 3: Compiling the Correct Match:
The correct matches are: A → IV, B → III, C → II, D → I. This corresponds to option (B).

Quick Tip

Create associations for hormones: - **CCK** → controls "chole"(bile/gallbladder) and pancreas. - **GIP** → **G**astric **I**nhibitory **P**eptide (name gives away the target). - **ANF** → **A**trial (from the heart's atria). - **ADH** → **A**nti-**D**iuretic (acts on kidney to prevent diuresis/water loss).

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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 or products with their correct category.

Step 2: Matching Each Item:
- **A. Vasectomy:** This is a permanent method of contraception for males where the vas deferens is cut and tied to prevent sperm from entering the ejaculate. It is a **Surgical method** (sterilization). So, **A matches III**.
- **B. Coitus interruptus:** Also known as the withdrawal method, this involves the male withdrawing the penis from the vagina before ejaculation. It is based on avoiding insemination and is classified as a **Natural method**. So, **B matches IV**.
- **C. Cervical caps:** These are devices made of rubber that are inserted into the vagina to cover the cervix before intercourse. They physically prevent sperm from entering the uterus. This is a **Barrier method**. So, **C matches II**.
- **D. Saheli:** This is the brand name for Centchroman, a non-steroidal contraceptive pill taken

orally. It is an **Oral method** of contraception. So, **D matches I**.

Step 3: Compiling the Correct Match:
The correct matches are: A → III, B → IV, C → II, D → I. This combination corresponds to option (C).

Quick Tip

Organize contraceptive methods into categories:
- **Natural:** Rhythm method, Coitus interruptus, Lactational amenorrhea.
- **Barrier:** Condoms, Diaphragms, Cervical caps, Vaults.
- **IUDs:** Copper T, Multiload 375.
- **Oral/Hormonal:** 'The pill' (e.g., Saheli), injectables, implants.
- **Surgical/Terminal:** Vasectomy (male), Tubectomy (female).

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186. 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:

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

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

Solution:

Step 1: Understanding the Question:
The question requires matching the items in List I (structures/cells) with their correct description or type in List II (tissue types).

Step 2: Detailed Explanation:
A. Mast cells: Mast cells are component cells of connective tissue, specifically found in abundance in areolar connective tissue. They are involved in inflammatory and allergic reactions. So, **A matches with II (Areolar connective tissue)**.

B. Inner surface of bronchiole: The inner lining of smaller bronchioles is made of ciliated cuboidal or columnar epithelium. The cilia help in moving mucus and trapped particles out of

the respiratory tract. So, **B matches with I (Ciliated epithelium)**.

C. Blood: Blood is a fluid connective tissue that consists of plasma, red blood cells, white blood cells, and platelets. It is considered a specialised connective tissue because it has a matrix (plasma) and originates from mesoderm. So, **C matches with IV (specialised connective tissue)**.

D. Tubular parts of nephron: The tubular parts of a nephron, such as the Proximal Convoluted Tubule (PCT) and Distal Convoluted Tubule (DCT), are lined with cuboidal epithelium. The PCT has cuboidal epithelium with microvilli. So, **D matches with III (Cuboidal epithelium)**.

Step 3: Final Answer:
The correct matching is: A-II, B-I, C-IV, D-III. This corresponds to option (4).

Quick Tip

For "Match the Following"questions on tissues, focus on the location and function. Epithelium is for lining/covering, connective tissue for support/transport, muscular for movement, and nervous for control. Knowing the sub-types and their specific locations (e.g., ciliated epithelium in bronchioles, cuboidal in nephron tubules) is key.

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

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

Correct Answer: (1) It decreases the productivity of inbred population, after continuous inbreeding.

Solution:

Step 1: Understanding the Question:
The question asks to identify the statement that is NOT an advantage of inbreeding. Inbreeding refers to the mating of more closely related individuals within the same breed for 4-6 generations.

Step 2: Detailed Explanation:
Let's analyze the effects of inbreeding mentioned in the options:

(1) It decreases the productivity of inbred population, after continuous inbreeding.
This phenomenon is known as **inbreeding depression**. It is a major **disadvantage** of inbreeding,

characterized by reduced fertility, lower productivity, and decreased vigor. Since it is a disadvantage, it is certainly "NOT an advantage".

(2) It decreases homozygosity.
This statement is factually **incorrect**. A primary genetic consequence of inbreeding is the **increase** in homozygosity. It brings homozygous purelines. Therefore, decreasing homozygosity is not an effect, let alone an advantage.

(3) It exposes harmful recessive genes that are eliminated by selection.
By increasing homozygosity, inbreeding causes harmful recessive alleles to express themselves. This allows breeders to identify individuals carrying these undesirable alleles and eliminate them from the breeding population through selection. This is a significant **advantage** of inbreeding.

(4) Elimination of less desirable genes and accumulation of superior genes takes place due to it.
Following from the previous point, by selective mating of superior individuals and elimination of undesirable ones, inbreeding helps in accumulating superior genes and developing a pureline. This is also a key **advantage**.

Step 3: Final Answer:
The question asks what is NOT an advantage.
- Options (3) and (4) are clear advantages.
- Option (1) describes inbreeding depression, which is the primary disadvantage.
- Option (2) is a false statement about the effect of inbreeding.
Both (1) and (2) are not advantages. However, option (1) describes a real outcome of inbreeding which is a disadvantage. It is the most direct answer to the question. A decrease in productivity is a negative consequence, hence not an advantage.

Quick Tip

Remember the duality of inbreeding:
Advantage: Increases homozygosity, helps create pure lines, and exposes harmful recessive alleles for removal.
Disadvantage: Can lead to inbreeding depression (reduced fertility and productivity).

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188. 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:

(1) D and E only

(2) A and D only
(3) B and C only
(4) C and D only

Correct Answer: (4) C and D only

Solution:

Step 1: Understanding the Question:
The question asks to identify the functions from the given list that are NOT regulated by the thyroid hormone.

Step 2: Detailed Explanation:
Let's analyze the role of thyroid hormone (thyroxine) in each function:
A. Maintenance of water and electrolyte balance: Thyroid hormones do have an influence on this, but the primary control is by hormones like Aldosterone and ADH. However, thyroid hormone does play a role.
B. Regulation of basal metabolic rate (BMR): This is one of the primary and most important functions of the thyroid hormone. It regulates the body's metabolism.
C. Normal rhythm of sleep-wake cycle: This is primarily controlled by the hormone **melatonin**, which is secreted by the pineal gland. It is not a function of the thyroid hormone.
D. Development of immune system: The development and maturation of T-lymphocytes, a key component of the immune system, is primarily regulated by the hormone **thymosin** from the thymus gland. This is not a function of the thyroid hormone.
E. Support the process of R.B.Cs formation: Thyroid hormones support erythropoiesis (the formation of red blood cells).

Step 3: Final Answer:
Based on the analysis, the normal rhythm of the sleep-wake cycle (C) and the development of the immune system (D) are not under the control of the thyroid hormone. Therefore, the correct option is (4).

Quick Tip

For endocrine system questions, create a chart listing each gland, the hormones it secretes, and their primary functions. This helps in quickly associating a function with the correct hormone and gland, especially for questions asking what a hormone does *not* do.

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189. 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:

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

Correct Answer: (4) B and C only

Solution:

Step 1: Understanding the Question:
The question requires us to identify the correct statements about basophils, a type of white blood cell (WBC).

Step 2: Detailed Explanation:
Let's evaluate each statement:
A. Basophils are most abundant cells of the total WBCS.
This statement is incorrect. The most abundant WBCs are Neutrophils (60-65%), while basophils are the least abundant (0.5-1%).

B. Basophils secrete histamine, serotonin and heparin.
This statement is correct. The granules of basophils contain these chemicals, which are released during inflammatory and allergic reactions.

C. Basophils are involved in inflammatory response.
This statement is correct. By secreting substances like histamine, basophils mediate inflammatory responses.

D. Basophils have kidney shaped nucleus.
This statement is incorrect. Basophils typically have a bilobed or S-shaped nucleus, which is often obscured by their large granules. Monocytes have a kidney-shaped nucleus.

E. Basophils are agranulocytes.
This statement is incorrect. Basophils are classified as granulocytes because of the presence of prominent granules in their cytoplasm, along with neutrophils and eosinophils.

Step 3: Final Answer:
Based on the analysis, only statements B and C are correct. Therefore, the correct option is (4).

Quick Tip

To remember the relative abundance of WBCs, use the mnemonic: "**N**ever **L**et **M**onkeys **E**at **B**ananas"which stands for Neutrophils > Lymphocytes > Monocytes > Eosinophils > Basophils.

190. 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 brain structures responsible for regulating emotions (excitement, pleasure, rage, fear) and basic drives like sexual behavior.

Step 2: Analyzing the Brain Structures and their Functions:
- **Limbic System:** This is a complex set of brain structures, including the amygdala, hippocampus, and parts of the thalamus and hypothalamus. It is often referred to as the "emotional brain"because it is the primary center for emotional responses, motivation, and memory formation.
- **Hypothalamus:** Located just below the thalamus, it is a key control center for the autonomic nervous system and the endocrine system. It regulates many fundamental behaviors and drives, including body temperature, hunger, thirst, and **sexual behavior**.

The combination of the limbic system and the hypothalamus is responsible for the integration of emotional expression and behavioral drives.

Let's look at the other options: - (A) Corpus callosum connects the two cerebral hemispheres; Thalamus is a major relay station for sensory information. - (C) Corpora quadrigemina are reflex centers for vision and hearing; Hippocampus is part of the limbic system but is mainly associated with memory. - (D) Brain stem controls basic vital functions like breathing and heart rate; Epithalamus contains the pineal gland (melatonin).

Step 3: Final Answer:
The limbic system and hypothalamus together are the principal centers for regulating emotions and drives like sexual behavior.

Quick Tip

Associate the **Limbic System** with feelings and emotions. Associate the **Hypothalamus** with the "four F's"of basic drives: Fighting, Fleeing, Feeding, and... Mating (sexual behavior). Together, they control emotional behavior.

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

(1) Presence of anal cerci
(2) Dark brown body colour and anal cerci
(3) Presence of anal styles
(4) Presence of sclerites

Correct Answer: (3) Presence of anal styles

Solution:

Step 1: Understanding the Question:
The question asks to identify a feature that distinguishes male and female cockroaches, which is known as sexual dimorphism.

Step 2: Detailed Explanation:
Let's evaluate each option:
(1) Presence of anal cerci: Anal cerci are a pair of jointed filamentous structures present at the posterior end of the abdomen. They are found in **both male and female** cockroaches, so they are not a distinguishing feature for sexual dimorphism.

(2) Dark brown body colour and anal cerci: Body colour can vary and is not a reliable feature for distinguishing sexes. As mentioned above, anal cerci are present in both sexes.

(3) Presence of anal styles: Anal styles are a pair of short, unjointed, thread-like structures located ventrally on the 9th abdominal sternite. These are present **only in male** cockroaches and are absent in females. This is a key characteristic of sexual dimorphism in cockroaches.

(4) Presence of sclerites: Sclerites are the hardened plates that form the exoskeleton of the cockroach. They are present in both males and females.

Step 3: Final Answer:
The presence of anal styles exclusively in males is the correct feature for identifying sexual dimorphism in cockroaches.

Quick Tip

Remember the key difference: Anal Cerci are present in both male and female cockroaches, while Anal Styles are present only in males. This is a very common point of confusion and a frequently tested topic.

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192. Which one of the following is the sequence on corresponding coding strand, if the sequence on mRNA formed is as follows 5' AUCGAUCGAUCGAUCGAUCG

AUCG AUCG 3'?

(1) 3' ATCGATCGATCGATCGATCG ATCGATCG 5'
(2) 5' UAGCUAGCUAGCUAGCUA GCUAGC UAGC 3'
(3) 3' UAGCUAGCUAGCUAGCUAGCUA GCUAGCUAGC 5'
(4) 5' ATCGATCGATCGATCGATCG ATCGATCG 3'

Correct Answer: (4) 5' ATCGATCGATCGATCGATCG ATCGATCG 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 2: Key Formula or Approach:
There are two strands of DNA involved in transcription: 1. **Template Strand (or non-coding strand):** This is the strand from which the mRNA is transcribed. Its sequence is complementary to the mRNA (with T instead of U). 2. **Coding Strand (or non-template strand):** This strand is not used for transcription. Its sequence is identical to the mRNA sequence, with the only difference being that Thymine (T) is present in DNA instead of Uracil (U) in RNA. Both the coding strand and the mRNA have the same polarity (5' to 3' orientation).

Step 3: Detailed Explanation:
The given mRNA sequence is:
5' AUCGAUCGAUCGAUCGAUCG AUCG AUCG 3'

To find the sequence of the coding strand, we need to apply the rule: same sequence as mRNA, but replace all Uracil (U) with Thymine (T). The polarity will remain the same (5' to 3').

mRNA: 5' A **U** C G A **U** C G ... 3'
Coding Strand DNA: 5' A **T** C G A **T** C G ... 3'

Applying this to the full sequence:
mRNA: 5' AUCGAUCGAUCGAUCGAUCG AUCG AUCG 3'
Coding Strand: 5' ATCGATCGATCGATCGATCG ATCGATCG 3'

Now, let's check the options: (1) Incorrect polarity (3' to 5'). (2) Contains 'U', so it's an RNA sequence. (3) Contains 'U' and has incorrect polarity. (4) Matches our derived sequence exactly in both sequence and polarity (5' to 3').

Step 4: Final Answer:
The correct sequence for the coding strand is 5' ATCGATCGATCGATCGATCG ATCGATCG 3'.

Quick Tip

A simple trick for these questions: "Coding strand is same as mRNA". Just remember to swap every 'U' back to a 'T'. Don't get confused with the template strand, which would be complementary.

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193. 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:

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

Correct Answer: (4) B, C and D only

Solution:

Step 1: Understanding the Question:
The question asks to identify the structures responsible for excretion in a cockroach from the given list.

Step 2: Detailed Explanation:
Let's analyze the function of each structure:
A. Phallic gland: This is a part of the male reproductive system and is involved in forming spermatophores. It has no excretory function.
B. Uricose gland: Also known as the utriculi majores of the mushroom gland in male cockroaches, these glands store and excrete uric acid. They have an excretory function.
C. Nephrocytes: These are specialized cells found in the body cavity that absorb and store nitrogenous wastes from the hemolymph, playing a role in excretion.
D. Fat body: The fat body in cockroaches has multiple functions, including storage of nutrients and also the synthesis and storage of uric acid. Thus, it serves an excretory function (urates are stored in urate cells).
E. Collaterial glands: These are part of the female reproductive system and secrete the protective egg case called the ootheca. They have no excretory function.
The primary excretory organs are the Malpighian tubules, but they are not listed. Among the given options, the Uricose gland, Nephrocytes, and Fat body are all involved in excretion.

Step 3: Final Answer:
The correct combination of excretory structures is B, C, and D.

Quick Tip

Remember that excretion in cockroaches is not limited to Malpighian tubules. The fat body, nephrocytes, and uricose glands are important accessory excretory structures. Distinguish these from reproductive structures like phallic glands and collaterial glands.

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194. The unique mammalian characteristics are:

(1) pinna, monocondylic skull and mammary glands
(2) hairs, tympanic membrane and mammary glands
(3) hairs, pinna and mammary glands
(4) hairs, pinna and indirect development

Correct Answer: (3) hairs, pinna and mammary glands

Solution:

Step 1: Understanding the Question:
The question asks to identify a set of characteristics that are unique to mammals. This means these features are found in mammals but not in other classes of vertebrates.

Step 2: Detailed Explanation:
Let's analyze each option:
(1) pinna, monocondylic skull and mammary glands: - Pinna (external ear) is characteristic of most mammals. - Mammary glands are unique to mammals. - **Monocondylic skull** (a skull with a single occipital condyle) is found in reptiles and birds. Mammals have a **dicondylic skull** (two occipital condyles). Thus, this option is incorrect.

(2) hairs, tympanic membrane and mammary glands: - Hairs and mammary glands are unique to mammals. - The **tympanic membrane** (eardrum) is not unique to mammals; it is also present in amphibians, reptiles, and birds. Thus, this option is incorrect.

(3) hairs, pinna and mammary glands: - **Hairs (or fur):** The presence of hair on the body is a defining and unique characteristic of mammals. - **Pinna (external ear):** The fleshy external ear is characteristic of most mammals. - **Mammary glands:** The presence of milk-producing glands to nourish young is the most definitive characteristic of mammals. All three features listed in this option are uniquely mammalian.

(4) hairs, pinna and indirect development: - Hairs and pinna are mammalian characteristics. - **Indirect development** (involving a larval stage) is not a feature of mammals. Mammals exhibit **direct development**. Thus, this option is incorrect.

Step 3: Final Answer:
The combination of hairs, pinna, and mammary glands represents a set of uniquely mammalian

characteristics.

Quick Tip

The three most universally accepted unique characteristics of mammals are: 1. Presence of hair/fur. 2. Presence of mammary glands. 3. Presence of three middle ear ossicles (malleus, incus, stapes). Also, a dicondylic skull and a muscular diaphragm are key features.

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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 (types of growth and age pyramids) with their correct descriptions.

Step 2: Matching Each Item:
- **A. Logistic growth:** This model of population growth describes a situation where growth is limited by environmental factors and the carrying capacity (K) of the environment. It corresponds to a **limited resource availability condition**. It produces an S-shaped curve. So, **A matches II**.
- **B. Exponential growth:** This model describes population growth in an idealized environment with no resource limitations. It corresponds to an **unlimited resource availability condition**. It produces a J-shaped curve. So, **B matches I**.
- **C. Expanding age pyramid:** This is a population pyramid with a very broad base, indicating that the percentage of **pre-reproductive individuals is the largest**. This signifies rapid future growth. So, **C matches III**.
- **D. Stable age pyramid:** This is a bell-shaped pyramid where the number of pre-reproductive

individuals is roughly equal to the number of reproductive individuals. It indicates that the population size will remain relatively constant. Thus, the **percent individuals of pre-reproductives and reproductive age group are same** (or similar). So, **D matches IV**.

Step 3: Compiling the Correct Match:
The correct matches are: A → II, B → I, C → III, D → IV. This corresponds to option (B).

Quick Tip

For growth curves: **E**xponential = **E**ndless resources (J-shape). **L**ogistic = **L**imited resources (S-shape). For age pyramids: **Expanding** = looks like a classic **pyramid** (broad base). **Stable** = looks like a **bell** or column (base is not much wider than the middle).

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196. 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:

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

Correct Answer: (3) B and C only

Solution:

Step 1: Understanding the Question:
The question asks us to identify the correct statements describing the characteristic features of the phylum Chordata from the given list.

Step 2: Detailed Explanation:
Let's analyze each statement:
A. Presence of a mid-dorsal, solid and double nerve cord.
This statement is incorrect. Chordates possess a **dorsal, hollow, and single** nerve cord. A solid and double ventral nerve cord is characteristic of non-chordates like annelids and arthropods.

B. Presence of closed circulatory system.
This statement is correct. All chordates have a closed circulatory system, where blood flows within a network of vessels (arteries, veins, and capillaries).

C. Presence of paired pharyngeal gillslits.
This statement is correct. Pharyngeal gill slits are present in all chordates at some stage of their life. They are used for filter-feeding in protochordates and for respiration in aquatic vertebrates.

D. Presence of dorsal heart.
This statement is incorrect. Chordates have a **ventral** heart, located on the front side of the body below the gut. A dorsal heart is found in non-chordates.

E. Triploblastic pseudocoelomate animals.
This statement is incorrect. Chordates are triploblastic (having three germ layers) but are **coelomates** (possessing a true coelom or body cavity). Pseudocoelomates include phyla like Aschelminthes.

Step 3: Final Answer:
Based on the analysis, only statements B and C are correct for chordates. Therefore, the correct option combines B and C.

Quick Tip

To master questions on animal classification, focus on the four key diagnostic features of Chordata: 1) Notochord, 2) Dorsal hollow nerve cord, 3) Pharyngeal gill slits, and 4) Post-anal tail. Also, contrast them with the features of non-chordates (e.g., ventral solid nerve cord, dorsal heart).

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197. 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:

(1) C and D only
(2) A, B and C only
(3) B and C only
(4) A, C and D only

Correct Answer: (3) 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 2: Detailed Explanation:
A. Muscle bundles are held together by collagenous connective tissue layer called fascicle.
This statement is incorrect. A muscle bundle itself is called a **fascicle**. The connective tissue layer that surrounds a fascicle is called the **perimysium**. The statement wrongly identifies the connective tissue as the fascicle.

B. Sarcoplasmic reticulum of muscle fibre is a store house of calcium ions.
This statement is correct. The sarcoplasmic reticulum, the endoplasmic reticulum of muscle cells, plays a crucial role in muscle contraction by storing and releasing calcium ions (Ca^{2+}).

C. Striated appearance of skeletal muscle fibre is due to distribution pattern of actin and myosin proteins.
This statement is correct. The characteristic light (I-bands) and dark (A-bands) striations of skeletal muscle are due to the highly organized, repeating arrangement of thin (actin) and thick (myosin) myofilaments.

D. M line is considered as functional unit of contraction called sarcomere.
This statement is incorrect. The functional unit of muscle contraction is the **sarcomere**, which is defined as the region of a myofibril between two successive Z-lines. The M-line is a protein structure that runs down the center of the thick filament (myosin) in the middle of the A-band.

Step 3: Final Answer:
Based on the analysis, only statements B and C are correct. Therefore, the correct option is (3).

Quick Tip

To avoid confusion in muscle structure: A muscle fiber (cell) contains myofibrils. A bundle of muscle fibers is a fascicle. A bundle of fascicles forms the whole muscle. The functional unit is the sarcomere (Z-line to Z-line). The M-line is just the middle of the sarcomere.

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198. 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:

(1) B and E only
(2) A and C only
(3) B and D only

(4) A, C and E only

Correct Answer: (3) B and D only

Solution:

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

Step 2: Detailed Explanation:
A. Tetrad formation is seen during Leptotene.
This is incorrect. Tetrad formation, or the pairing of homologous chromosomes (synapsis), occurs during the **Zygotene** stage of Prophase I.

B. During Anaphase, the centromeres split and chromatids separate.
This is correct. This event characterizes Anaphase of mitosis and Anaphase II of meiosis, where sister chromatids are pulled to opposite poles.

C. Terminalization takes place during Pachytene.
This is incorrect. Crossing over occurs during Pachytene. The terminalization of chiasmata (movement towards the end of chromatids) begins in Diplotene and is completed in **Diakinesis**.

D. Nucleolus, Golgi complex and ER are reformed during Telophase.
This is correct. Telophase is characterized by the reversal of prophase events. The nuclear envelope reforms, and organelles like the nucleolus, Golgi complex, and ER reappear.

E. Crossing over takes place between sister chromatids of homologous chromosome.
This is incorrect. Crossing over is the exchange of genetic material between **non-sister chromatids** of homologous chromosomes.

Step 3: Final Answer:
From the analysis, statements B and D are the only correct ones. Therefore, the correct option is (3).

Quick Tip

To memorize the stages of Prophase I, use the mnemonic: "**L**azy **Z**ebras **P**ush **D**own **D**oors"for Leptotene, Zygotene, Pachytene, Diplotene, and Diakinesis. Associate the key event with each stage (Leptotene - condensation, Zygotene - synapsis, Pachytene - crossing over, Diplotene - chiasmata visible, Diakinesis - terminalization).

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199. 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 set of correct statements regarding the regulation of kidney function and blood pressure.

Step 2: Evaluating Each Statement:
- **A. An excessive loss of body fluid from the body switches off osmoreceptors.** This is **incorrect**. Excessive fluid loss (dehydration) increases the osmolarity of the blood. This change *activates* or *stimulates* the osmoreceptors in the hypothalamus, which then triggers the release of ADH.
- **B. ADH facilitates water reabsorption to prevent diuresis.** This is **correct**. This is the primary function of Anti-Diuretic Hormone (ADH). It increases the permeability of the distal convoluted tubule and collecting duct to water, leading to more water being reabsorbed into the blood, thus producing more concentrated urine and preventing water loss (diuresis).
- **C. ANF causes vasodilation.** This is **correct**. Atrial Natriuretic Factor (ANF) is released by the heart's atria in response to high blood pressure. It acts to lower blood pressure by causing the dilation (widening) of blood vessels.
- **D. ADH causes increase in blood pressure.** This is **correct**. At high concentrations, ADH (also known as vasopressin) causes vasoconstriction (narrowing of blood vessels), which leads to an increase in blood pressure.
- **E. ADH is responsible for decrease in GFR.** This is **incorrect**. The vasoconstrictor effect of ADH can help to maintain or even increase blood pressure, which in turn helps to maintain a stable Glomerular Filtration Rate (GFR). ADH does not primarily act to decrease GFR; that is more a function of the ANF mechanism.

Step 3: Final Answer:
The correct statements are B, C, and D.

Quick Tip

Remember the opposing hormones:
- **ADH** (from hypothalamus/pituitary): Released when you're dehydrated. It **A**dds **D**a $\mathbf{H_2O}$ back to blood, constricts vessels, increases BP.
- **ANF** (from heart): Released when BP is high. It's the "antagonist."It causes vasodilation to decrease BP.

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200. 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:

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

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

Solution:

Step 1: Understanding the Question:
The question presents two statements related to the cell cycle and asks us to evaluate their correctness.

Step 2: Detailed Explanation:
Analysis of Statement I:
"During G_0 phase of cell cycle, the cell is metabolically inactive."
This statement is **incorrect**. The G_0 phase, or quiescent stage, is a state where cells exit the cell cycle and do not divide. However, these cells remain **metabolically active**. They perform their specialized functions, grow in size, and synthesize proteins, but they do not replicate their DNA or prepare for division unless triggered by specific signals.

Analysis of Statement II:
"The centrosome undergoes duplication during S phase of interphase."
This statement is **correct**. The S phase (Synthesis phase) of the interphase is characterized by DNA replication. Along with DNA replication, the duplication of the centrosome also occurs in the cytoplasm during the S phase. This ensures that each daughter cell will receive one centrosome after mitosis.

Step 3: Final Answer:
Since Statement I is incorrect and Statement II is correct, the most appropriate option is (1).

Quick Tip

Do not confuse "quiescent"(non-dividing) with "inactive". Cells in the G_0 phase are very much active in terms of metabolism and performing their physiological roles. For example, neurons are in a permanent G_0 phase but are highly metabolically active.
