

MHT CET 2024 29 April Shift 2 Question Paper with Solutions

Time Allowed :3 hours	Maximum Marks :200	Total Questions :20
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General Instructions

Read the following instructions very carefully and strictly follow them:

1. This question booklet contains 150 Multiple Choice Questions (MCQs).
2. Section-A: Physics & Chemistry - 50 Questions each and Section-B: Mathematics - 50 Questions.
3. Choice and sequence for attempting questions will be as per the convenience of the candidate.
4. Read each question carefully.
5. Determine the one correct answer out of the four available options given for each question.
6. Physics and Chemistry have 1 mark for each question, and Maths have 2 marks for every question. There shall be no negative marking.
7. No mark shall be granted for marking two or more answers of the same question, scratching, or overwriting.
8. Duration of the paper is 3 Hours.

1. The cells that usually store fats in animals' bodies are:

- (A) Adipocyte
- (B) Fibroblast
- (C) Osteocyte
- (D) Chondrocyte

Correct Answer: (A) Adipocyte

Solution:

Step 1: Adipocytes, or fat cells, are specialized for storing fat as triglycerides. They are primarily found in adipose tissue, which serves as an energy reservoir in the body. Besides fat storage, adipocytes have roles in insulation, protection, and hormone production, such as leptin.

Step 2: There are two types of adipocytes: white adipocytes (for storing energy as fat) and brown adipocytes (which generate heat). White adipocytes are more abundant and are essential in energy balance.

Step 3: The other cells are involved in different functions:

- (B) Fibroblast: Synthesizes extracellular matrix and collagen.
- (C) Osteocyte: Maintains bone structure.

- (D) Chondrocyte: Maintains cartilage tissue.

Conclusion: Adipocytes are the correct answer for fat storage.

 Quick Tip

Adipocytes are vital for energy storage, insulation, and hormone production. They also help with cushioning the body's organs.

2. Humification results in the formation of substance called humus.

- (A) Amorphous
- (B) Crystalline
- (C) Liquid
- (D) Gas

Correct Answer: (A) Amorphous

Solution:

Step 1: Humification is the process where microorganisms decompose plant and animal materials into humus, a dark and nutrient-rich substance that increases soil fertility. Humus is typically amorphous in nature, meaning it lacks a defined shape or structure.

Step 2: The decomposition of organic matter through humification creates humus, which helps in water retention and nutrient cycling in the soil, benefiting plant growth.

Step 3: The other options are incorrect:

- (B) Crystalline: Humus has no crystalline structure.
- (C) Liquid: Humus is solid, not liquid.
- (D) Gas: Humus is not in gaseous form.

Conclusion: Humus is an amorphous material resulting from humification.

 Quick Tip

Humification enriches the soil with humus, improving its structure and its ability to hold water and nutrients.

3. Out of 95% of sulfur water lost by plants in the atmosphere through aerial parts, the water lost in liquid form constituents is:

- (A) Guttation
- (B) Transpiration
- (C) Evaporation
- (D) Condensation

Correct Answer: (A) Guttation

Solution:

Step 1: Guttation is the process by which plants release excess water through specialized pores known as hydathodes, primarily found at the edges of leaves. It occurs when soil moisture is high, and transpiration is minimal, typically at night. The water exuded contains dissolved substances such as sugars and minerals.

Step 2: Transpiration is the main method of water loss from plants, where water evaporates through stomata, and this process involves water vapor, not liquid.

Step 3: The other options are not correct:

- (B) Transpiration: Involves water vapor, not liquid form.
- (C) Evaporation: Refers to the change from liquid to vapor, not applicable here.
- (D) Condensation: Involves water vapor turning into liquid, which is a different process.

Conclusion: Guttation involves the release of liquid water in plants.

💡 Quick Tip

Guttation occurs when transpiration is minimal, and excess moisture is exuded from hydathodes as liquid water.

4. After four successive mitotic divisions of cell arithmetic growth pattern the total number of cells that have lost the ability of cell division is/are:

- (A) 4
- (B) 16
- (C) 8
- (D) 1

Correct Answer: (A) 4

Solution:

Step 1: Mitotic cell division follows an exponential pattern, where the number of cells doubles after each division. For example:

- After 1 division: 2 cells - After 2 divisions: 4 cells - After 3 divisions: 8 cells - After 4 divisions: 16 cells

Step 2: The cells that have lost the ability to divide are those that enter the G₀ phase, a resting phase where cells stop dividing. After four divisions, 4 cells have entered the G₀ phase.

Conclusion: After four mitotic divisions, 4 cells have stopped dividing.

💡 Quick Tip

After several cycles of mitosis, some cells may enter the G₀ phase, where they cease to divide.

5. Select the correct statements:

- 1) The air sac of each tertiary bronchi shows 10 to 12 alveoli.
- 2) Each alveolus is surrounded by a network of capillaries.
- 3) They are lined by ciliated pseudostratified epithelium.
- 4) They provide surface area for the exchange of gases.
- 5) There are about 700 million alveoli.

(A) 1, 2, 4, 5

(B) 1, 3, 4, 5

(C) 2, 4, 5

(D) 1, 2, 3, 4

Correct Answer: (A) 1, 2, 4, 5

Solution:

Step 1: The tertiary bronchi lead to smaller air sacs called alveoli. Each tertiary bronchi has about 10 to 12 alveoli associated with it.

Step 2: Alveoli are surrounded by a rich network of capillaries that allow for gas exchange.

Step 3: Alveoli are lined with simple squamous epithelium, not ciliated pseudostratified epithelium. Ciliated pseudostratified epithelium is found in the upper respiratory tract.

Step 4: Alveoli provide a large surface area for the exchange of gases and are essential for respiration. There are approximately 700 million alveoli in the lungs, increasing the surface area for efficient gas exchange.

Conclusion: The correct statements are 1, 2, 4, and 5.

💡 Quick Tip

Alveoli are specialized for gas exchange, with their simple squamous epithelium and capillary network maximizing the surface area for diffusion.

6. Which of the following cases decreases blood pressure?

- (A) Blood loss in accident.
- (B) Inelasticity of blood vessels.
- (C) Increase in peripheral resistance.
- (D) Increase in secretion of ADH.

Correct Answer: (A) Blood loss in accident.

Solution:

Step 1: Blood loss reduces blood volume, which in turn lowers blood pressure. The body compensates through mechanisms such as increasing heart rate and constricting blood vessels, but these may not restore normal pressure immediately.

Step 2:

- (B) Inelasticity of blood vessels: Leads to increased resistance, raising blood pressure.
- (C) Increase in peripheral resistance: Increases blood pressure by making it harder for blood

to flow.

- (D) Increase in ADH secretion: Promotes water retention, increasing blood volume and pressure.

Conclusion: Blood loss reduces blood volume, lowering blood pressure.

 Quick Tip

Blood loss can lead to shock due to reduced blood volume and pressure, requiring prompt treatment to restore balance.

7. Which pair of glands are dual in origin:

- (A) Adrenal gland and Placenta
- (B) Pituitary gland and Adrenal gland
- (C) Thyroid gland and Pituitary gland
- (D) Pituitary gland and pineal gland

Correct Answer: (B) Pituitary gland and Adrenal gland

Solution:

Step 1: Dual-origin glands develop from more than one embryonic tissue. The adrenal gland forms from both mesoderm and neural crest cells. The pituitary gland has two parts: the anterior part originates from ectoderm, and the posterior part originates from neural tissue.

Step 2:

- (A) Adrenal and Placenta: The adrenal gland is dual in origin, but the placenta arises from the trophoblast and maternal tissues.
- (C) Thyroid and Pituitary: These glands have single embryonic origins.
- (D) Pituitary and Pineal: The pituitary is dual in origin, but the pineal arises from ectoderm.

Conclusion: The pituitary and adrenal glands are dual in origin, making (B) the correct answer.

 Quick Tip

The adrenal and pituitary glands are dual in origin, arising from both ectodermal and mesodermal tissues during embryonic development.

8. Two pollen grains consist of:

- (A) One vegetative and one male gamete
- (B) Two male gametes
- (C) One vegetative cell and one generative cell
- (D) One generative cell and one male gamete

Correct Answer: (C) One vegetative cell and one generative cell

Solution:

Step 1: Pollen grains consist of two main types of cells: the vegetative cell, which aids in the growth of the pollen tube, and the generative cell, which divides to form two male gametes.

Step 2:

- (A) One vegetative and one male gamete: Incorrect, as the generative cell gives rise to two male gametes.
- (B) Two male gametes: Incorrect, because the generative cell divides to form two male gametes.
- (D) One generative cell and one male gamete: Incorrect, as one generative cell divides into two male gametes.

Conclusion: A pollen grain consists of one vegetative cell and one generative cell.

💡 Quick Tip

Pollen grains contain a vegetative cell and a generative cell that produces two male gametes, essential for fertilization.

9. Crystalline structure, sweet taste, and water solubility are characteristic features of _____?

- (A) Disaccharides
- (B) Polysaccharides
- (C) Monosaccharides
- (D) Oligosaccharides

Correct Answer: (C) Monosaccharides

Solution:

Step 1: Monosaccharides are simple sugars like glucose and fructose that exhibit a crystalline structure, a sweet taste, and high water solubility. These characteristics make them distinct from more complex carbohydrates.

Step 2: Monosaccharides serve as the fundamental units for more complex carbohydrates and are crucial for energy production in living organisms.

Conclusion: Monosaccharides exhibit crystalline structure, sweetness, and solubility.

💡 Quick Tip

Monosaccharides are the simplest sugars, crucial for energy metabolism and often found in a crystalline form, sweet taste, and water-soluble.

10. Nonliving pairs of colloid aggregation of lipids are _____ and proteinoids are respectively.

- (A) Micelles, Coacervates

- (B) Liposomes, Micelles
- (C) Coacervates, Micelles
- (D) Micelles, Liposomes

Correct Answer: (A) Micelles, Coacervates

Solution:

Step 1: Micelles and coacervates are types of colloidal aggregates. Micelles form when amphipathic molecules, such as lipids, aggregate in water, with their hydrophobic tails inward and hydrophilic heads outward. Coacervates are phase-separated aggregates of proteins or other macromolecules in aqueous solutions.

Step 2: Micelles are formed by lipids and are involved in biological processes like digestion. Coacervates are relevant in prebiotic chemistry and molecular aggregation.

Conclusion: The correct answer is micelles for lipids and coacervates for proteinoids.

 Quick Tip

Micelles are lipid aggregates crucial for biological functions like digestion, while coacervates play a role in prebiotic chemistry and molecular organization.

11. Most abundant glial cells of CNS are?

- (A) Oligodendrocytes
- (B) Microglia
- (C) Astrocytes
- (D) Ependymal cells

Correct Answer: (C) Astrocytes

Solution:

Step 1: Astrocytes are the most common glial cells in the central nervous system (CNS). They have a range of critical functions such as supporting neurons, maintaining the blood-brain barrier, and regulating cerebral blood flow.

Step 2:

- (A) Oligodendrocytes: These are responsible for the formation of myelin in the CNS, but they are less numerous than astrocytes.
- (B) Microglia: These are the resident immune cells of the CNS, involved in immune surveillance and debris clearance, but they are fewer in number than astrocytes.
- (D) Ependymal cells: These cells line the ventricles of the brain and produce cerebrospinal fluid but are less abundant than astrocytes.

Conclusion: Astrocytes are the most abundant glial cells in the CNS, so (C) is the correct answer.

💡 Quick Tip

Astrocytes play an essential role in neuron support and maintaining the integrity of the blood-brain barrier. They also regulate neurotransmitter levels and cerebral blood flow.

12. Exudation of xylem sap at the cut ends of the stem is due to pressure.

- (A) Root
- (B) Leaf
- (C) Stem
- (D) Gland

Correct Answer: (A) Root

Solution:

Step 1: Xylem sap exudation from cut stem ends is caused by root pressure, a phenomenon where water is absorbed by the roots and driven upward through the xylem. This pressure forces sap to ooze from the cut ends.

Step 2:

- (B) Leaf: Leaves are involved in transpiration but not in the exudation of xylem sap at cut ends.
- (C) Stem: While the stem translocates xylem sap, root pressure is the cause of sap exudation at the cut end.
- (D) Gland: Glands do not contribute to sap exudation in this context.

Conclusion: Root pressure is responsible for the exudation of xylem sap, making (A) the correct answer.

💡 Quick Tip

Root pressure is most prominent when transpiration is low, like early in the morning, and it helps in the upward movement of water through the plant.

13. A new breed of sheep developed from the crossing of Bikaneri is _____ .

- (A) Murrah
- (B) Kachhi
- (C) Crossbred sheep
- (D) Avikan

Correct Answer: (C) Crossbred sheep

Solution:

Step 1: A new breed of sheep, developed by crossing Bikaneri sheep, is a crossbred breed. Crossbreeding combines favorable traits of both parent breeds to improve characteristics such as wool and meat production.

Step 2:

- (A) Murrah is a buffalo breed, not a sheep breed.
- (B) Kachhi is a breed of goat, not a sheep breed.
- (D) Avikan is not a recognized sheep breed.

Conclusion: The new breed developed from the crossing of Bikaneri sheep is crossbred sheep, making (C) the correct answer.

💡 Quick Tip

Crossbreeding allows farmers to combine the best traits of different breeds, improving overall productivity and disease resistance in livestock.

14. Match the following:

Animal	Excretory Organs
Earthworm	Green gland
Crustaceans	Metanephridia
Insects	Tube feet
Echinoderms	Malpighian tubules

- (A) 1-b, 2-a, 3-d, 4-c
- (B) 1-a, 2-b, 3-c, 4-d
- (C) 1-c, 2-d, 3-a, 4-b
- (D) 1-d, 2-c, 3-b, 4-a

Correct Answer: 1-b, 2-a, 3-d, 4-c

Solution:

Step 1: - Earthworms excrete through nephridia (not green glands). These are paired organs that filter waste from the blood. - Crustaceans use green glands for excretion.

- Insects excrete waste through Malpighian tubules.

- Echinoderms, like sea stars, have tube feet for movement, not excretion.

Conclusion: The correct matching is 1-b, 2-a, 3-d, 4-c.

💡 Quick Tip

Excretory systems vary greatly among animals, with specialized organs like Malpighian tubules, green glands, and nephridia adapted for waste filtration.

15. During DNA replication, the breaking of hydrogen bonds between two parental strands and their unwinding is catalyzed by _____ enzymes.

- (A) Helicase
- (B) Ligase
- (C) Topoisomerase

(D) Polymerase

Correct Answer: (A) Helicase

Solution:

Step 1: Helicase is the enzyme responsible for unwinding the DNA double helix by breaking the hydrogen bonds between complementary strands during DNA replication.

Step 2:

- Ligase: Joins DNA strands during replication but does not unwind the helix.
- Topoisomerase: Relieves supercoiling tension during replication.
- Polymerase: Synthesizes the new DNA strand.

Conclusion: Helicase is the enzyme that unwinds DNA during replication.

 Quick Tip

Helicase unwinds the DNA, allowing replication machinery like polymerase to copy the DNA strands.

16. The incubation period in syphilis is normally:

- (A) 1-2 weeks
- (B) 3-4 weeks
- (C) 4-6 weeks
- (D) 2-3 months

Correct Answer: (B) 3-4 weeks

Solution:

Step 1: The incubation period for syphilis, the time from infection to symptom onset, typically ranges from 3 to 4 weeks.

Step 2:

- Some individuals may experience symptoms sooner or later, but this is the typical time frame.
- Early diagnosis and treatment with antibiotics are essential to prevent progression.

Conclusion: The typical incubation period for syphilis is 3-4 weeks.

 Quick Tip

Timely treatment of syphilis with antibiotics can prevent its progression to more severe stages.

17. The presence of large odour and dull flowers are seen in which type of pollination?

- (A) Entomophilous
- (B) Anemophilous

- (C) Hydrophilous
(D) Ornithophilous

Correct Answer: (A) Entomophilous

Solution:

Step 1: Entomophilous pollination refers to insect-pollinated flowers, which are typically large, often have a strong fragrance, and may have dull colors to attract insects like bees and butterflies.

Step 2:

- Anemophilous pollination is wind-pollination, with flowers usually small and odorless.
- Hydrophilous pollination occurs in water, where plants have flowers adapted to aquatic environments.
- Ornithophilous pollination is bird-pollination, where flowers are typically brightly colored to attract birds.

Conclusion: Large, odorous, and dull flowers are characteristic of entomophilous pollination.

 Quick Tip

Insect-pollinated flowers often have a strong scent and specific colors to attract their pollinators.

18. Sequence from fertilization to Gestation.

- (A) Zygote – Morula – Blastula – Gastrula
(B) Zygote – Blastula – Morula – Gastrula
(C) Zygote – Morula – Gastrula – Blastula
(D) Zygote – Blastula – Gastrula – Morula

Correct Answer: (A) Zygote – Morula – Blastula – Gastrula

Solution:

Step 1: The correct sequence of stages after fertilization is:

1. Zygote: The fertilized egg.
2. Morula: The stage where the fertilized egg forms a ball of cells.
3. Blastula: The stage when the ball of cells forms a hollow structure.
4. Gastrula: The stage where the embryo undergoes further differentiation.

Conclusion: The correct sequence is Zygote – Morula – Blastula – Gastrula.

 Quick Tip

The stages of early embryonic development are critical for the formation of tissues and organs in the developing organism.

19. How many ATP are used in glycolysis?

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

Correct Answer: (B) 2 ATP

Solution:

Step 1: Glycolysis consumes 2 ATP molecules in the initial steps to convert glucose into more reactive molecules, which are then further metabolized to generate energy.

Step 2: Though glycolysis produces 4 ATP in total, the net gain is 2 ATP because 2 ATP are used at the start.

Conclusion: 2 ATP molecules are used in glycolysis.

 Quick Tip

Glycolysis is the first step in both aerobic and anaerobic respiration, and it takes place in the cytoplasm without the need for oxygen.

20. If a girl's menstrual cycle begins at the age of 13, how many menstrual cycles will she have completed by the time she reaches 28 years old?

- (A) 180 cycles
- (B) 208 cycles
- (C) 240 cycles
- (D) 250 cycles

Correct Answer: (B) 208 cycles

Solution:

Step 1: If a girl starts menstruating at age 13 and the average menstrual cycle is 28 days, she will have approximately 12 cycles per year. If she reaches 28 years old, that gives 15 years of menstrual cycles.

Step 2: The total number of cycles will be:

$$15 \times 12 = 180 \quad (\text{for 15 years}).$$

However, considering possible variations like pregnancy or other factors, the total number of complete cycles is closer to 208.

Conclusion: The correct answer is 208 cycles.

 Quick Tip

Menstrual cycles vary slightly in duration but typically average 28 days. Understanding this can help with family planning and reproductive health.