

MHT CET 30 April Shift 2 Question Paper with Solutions

Total Time Allowed : 3 hours	Maximum Marks : 200	Total Questions : 17	Questions to be answered :17
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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).
Section-A: Physics Chemistry - 50 Questions each and
Section-B: Mathematics - 50 Questions.
- (2) Choice and sequence for attempting questions will be as per the convenience of the candidate.
- (3) Read each question carefully.
- (4) Determine the one correct answer out of the four available options given for each question. (5) Each question with correct response shall be awarded one (1) mark. There shall be no negative marking.
- (6) No mark shall be granted for marking two or more answers of same question, scratching or overwriting.
- (7) Duration of paper is 3 Hours.

1. Which enzyme converts trypsinogen into trypsin?

Correct Answer: Enterokinase

Solution:

1. Trypsinogen is an inactive precursor (zymogen) of the enzyme trypsin, which plays a crucial role in the digestion of proteins.
2. Enterokinase, also known as enteropeptidase, is an enzyme secreted by the cells of the duodenum. It specifically cleaves trypsinogen to activate it into trypsin.

Conclusion: Therefore, the enzyme responsible for converting trypsinogen into its active form, trypsin, is enterokinase.

💡 Quick Tip

Enterokinase activation of trypsinogen is essential for initiating the cascade of digestive enzymes necessary for protein digestion in the small intestine.

2. How many DNA copies are produced after five cycles of PCR (Polymerase Chain Reaction)?

Correct Answer: 32

Solution:

Step 1: PCR amplification is an exponential process where the number of DNA copies doubles with each cycle.

Step 2: The formula to calculate the number of copies after n cycles is:

$$\text{Number of copies} = 2^n$$

Calculation:

$$2^5 = 32$$

Conclusion: After five cycles of PCR, $2^5 = 32$ DNA copies are produced.

💡 Quick Tip

Each PCR cycle exponentially increases the number of DNA copies, making PCR a powerful technique for amplifying specific DNA sequences from small initial quantities.

3. Which of the following is a function of the hypothalamus?

1. Homeostasis
2. Memory Formation
3. Visual Processing
4. Motor Coordination

Correct Answer: 1. Homeostasis

Solution: The hypothalamus is a crucial part of the brain involved in various autonomic and endocrine functions.

Among the listed options:

- **Homeostasis:** The hypothalamus regulates body temperature, hunger, thirst, and other homeostatic processes.
- **Memory Formation:** This function is primarily associated with the hippocampus.
- **Visual Processing:** This is managed by the occipital lobe.
- **Motor Coordination:** The cerebellum and motor cortex are responsible for this function.

Conclusion: Therefore, the primary function of the hypothalamus among the options provided is homeostasis.

 Quick Tip

The hypothalamus plays a vital role in maintaining the body's internal balance by regulating various physiological processes such as temperature, hunger, and hormonal activity.

4. Cerebrospinal fluid (CSF) uses were given below. Identify the incorrect use by eliminating it.

1. Cushioning the brain and spinal cord
2. Removing metabolic waste
3. Transporting nutrients to the brain
4. Transmitting nerve impulses

Correct Answer: 4. Transmitting nerve impulses

Solution: Evaluating each option:

- **Cushioning the brain and spinal cord:** CSF acts as a shock absorber, protecting the central nervous system.
- **Removing metabolic waste:** CSF helps in the removal of waste products from the brain.
- **Transporting nutrients to the brain:** CSF delivers essential nutrients to neural tissues.
- **Transmitting nerve impulses:** Nerve impulses are transmitted by neurons through electrical and chemical signals, not by CSF.

Conclusion: The incorrect use of CSF among the options is transmitting nerve impulses.

 Quick Tip

While CSF serves several vital functions in protecting and nourishing the brain and spinal cord, it does not play a role in the direct transmission of nerve impulses.

5. What type of relationship exists between sea anemones and clownfish?

1. Predation
2. Mutualism
3. Parasitism
4. Competition

Correct Answer: 2. Mutualism

Solution: The nature of the relationship between sea anemones and clownfish by analyzing each option:

- **Predation:** This implies one organism preys on the other, which is not the case here.
- **Mutualism:** Both species benefit from the relationship. Clownfish receive protection from predators by living among the sea anemone's stinging tentacles, while sea anemones benefit from the nutrients provided by the clownfish through their waste.
- **Parasitism:** This involves one organism benefiting at the expense of the other, which does not describe their interaction.
- **Competition:** This would involve both species vying for the same resources, which is not applicable here.

Conclusion: The relationship between sea anemones and clownfish is mutualistic, as both species benefit from each other.

 Quick Tip

Mutualism is a type of symbiotic relationship where both participating species gain benefits, enhancing their survival and reproductive success.

6. What was the historical use of cellophane tubes in hemodialysis?

1. Providing structural support to dialysis machines
2. Acting as semipermeable membranes
3. Delivering medication to patients
4. Filtering blood cells directly

Correct Answer: 2. Acting as semipermeable membranes

Solution: Examine the role of cellophane tubes :

- **Providing structural support to dialysis machines:** Cellophane tubes are not used for structural purposes.
- **Acting as semipermeable membranes:** Historically, cellophane was utilized in hemodialysis machines for its semipermeable properties, allowing selective passage of substances like toxins and excess salts from the blood while retaining blood cells and essential proteins.
- **Delivering medication to patients:** Cellophane tubes are not used for medication delivery.
- **Filtering blood cells directly:** While cellophane membranes allow for filtration, their primary role was to act as semipermeable barriers rather than directly filtering blood cells.

Conclusion: The historical use of cellophane tubes in hemodialysis was primarily due to their semipermeable properties, enabling effective dialysis by filtering waste products from the blood.

 Quick Tip

Semipermeable membranes are crucial in hemodialysis as they allow the selective removal of waste products and excess fluids from the blood while retaining necessary blood components.

7. Which of the following statements about the pharynx and larynx is/are correct?

1. The pharynx serves as a pathway for both food and air.
2. The larynx is involved in the production of sound.
3. The pharynx contains the vocal cords.
4. The larynx prevents food from entering the trachea.

Choose the correct options from the given below:

- (1) 1 and 2 only
- (2) 1,2 and 4
- (3) 1,2 and 3
- (4) 1,2,3 and 4

Correct Answer: (2) 1, 2, and 4 are correct.

Solution: The pharynx is a muscular tube that serves as a pathway for both food (ingested through the mouth) and air (inhaled through the nose). The larynx, commonly known as the voice box, is responsible for sound production and also functions to prevent food and liquid from entering the trachea during swallowing. The vocal cords are located within the larynx, not the pharynx, making statement 3 incorrect.

 Quick Tip

The pharynx and larynx play crucial roles in both the respiratory and digestive systems, ensuring that air and food are directed to their appropriate pathways.

8. Arrange the following steps of the action potential mechanism in the correct order:

1. Depolarization
2. Repolarization
3. Polarization
4. Resting Potential

Choose the correct options from the given below:

- (1) 1, 3, 2, 4
- (2) 1, 2, 3, 4
- (3) 4, 3, 2, 1
- (4) 3, 1, 2, 4

Correct Answer: (4) 3, 1, 2, 4

Polarization → Depolarization → Repolarization → Resting Potential

Solution: The correct sequence of events during an action potential starts with polarization, where the neuron is at its resting potential. Upon stimulation, depolarization occurs as sodium ions enter the cell, followed by repolarization where potassium ions exit the cell to restore the negative internal environment. Finally, the neuron returns to its resting potential.

 Quick Tip

Understanding the order of action potential phases is essential for comprehending how neurons transmit electrical signals.

9. Which of the following is a primary source of ethylene?

1. Animals, particularly mammals
2. Plants, particularly fruits
3. Fungi, particularly molds
4. Bacteria, particularly soil bacteria

Correct Answer: 2. Plants, particularly fruits

Solution: Ethylene is a plant hormone involved in the regulation of various physiological processes, including fruit ripening, flower wilting, and leaf fall. It is primarily produced by plants, especially ripening fruits, making option 2 the correct source.

 Quick Tip

Ethylene's role in fruit ripening is utilized commercially to control and accelerate the maturation process of fruits.

10. What is the definition of geitonogamy?

1. Transfer of pollen from the anther of one flower to the stigma of another flower on the same plant.
2. Transfer of pollen from the anther of one plant to the stigma of a flower on a different plant.
3. Self-pollination where pollen from the same flower fertilizes the ovule.
4. Cross-pollination between genetically distinct individuals.

Correct Answer: 1. Transfer of pollen from the anther of one flower to the stigma of another flower on the same plant.

Solution: Geitonogamy refers to a form of self-pollination where pollen is transferred between different flowers of the same plant. This is distinct from autogamy, where pollen fertilizes ovules within the same flower, and from allogamy, which involves pollination between different plants.

 Quick Tip

Geitonogamy can lead to inbreeding and reduced genetic diversity since it involves pollination within the same plant.

11. What is the definition of spermatogenesis?

1. The process of egg cell formation in females.
2. The process of sperm cell development in males.
3. The fusion of sperm and egg during fertilization.
4. The maturation of gametes within the plant reproductive system.

Correct Answer: 2. The process of sperm cell development in males.

Solution:

Spermatogenesis is the biological process through which spermatozoa are produced from male primordial germ cells in the testes. This process involves mitotic and meiotic divisions, ultimately resulting in the formation of mature sperm cells capable of fertilizing an ovum.

 Quick Tip

Spermatogenesis occurs continuously after puberty and is essential for male fertility.

12. Which of the following statements correctly define euploidy and aneuploidy?

1. Euploidy refers to the presence of an abnormal number of chromosomes, while aneuploidy refers to a complete set of chromosomes.
2. Euploidy refers to the maintenance of the complete set of chromosomes, while aneuploidy refers to the presence of an abnormal number of chromosomes.
3. Both euploidy and aneuploidy refer to variations in chromosome number without any abnormalities.

4. Euploidy is related to the structure of chromosomes, whereas aneuploidy is related to their number.

Correct Answer: 2. Euploidy refers to the maintenance of the complete set of chromosomes, while aneuploidy refers to the presence of an abnormal number of chromosomes.

Solution:

Euploidy is the condition of having a complete set of chromosomes, which is essential for normal development and functioning. Aneuploidy, on the other hand, involves the presence of an abnormal number of chromosomes, which can lead to various genetic disorders and developmental issues.

 Quick Tip

Euploidy ensures the stability of an organism's genome, whereas aneuploidy often results in genetic imbalances and associated health problems.

13. Match the following chromosomal abnormalities with their correct definitions:

Chromosomal Abnormality	Definition
1. Monosomy	A. Presence of three copies of a particular chromosome.
2. Nullisomy	B. Absence of both homologous chromosomes.
3. Trisomy	C. Presence of four copies of a particular chromosome.
4. Tetrasomy	D. Presence of only one copy of a particular chromosome.

Correct Answer:

- Monosomy - D. Presence of only one copy of a particular chromosome.
- Nullisomy - B. Absence of both homologous chromosomes.
- Trisomy - A. Presence of three copies of a particular chromosome.
- Tetrasomy - C. Presence of four copies of a particular chromosome.

Solution:

Monosomy refers to the presence of only one copy of a particular chromosome instead of the usual pair. Nullisomy is the complete absence of both homologous chromosomes. Trisomy denotes having three copies of a specific chromosome, and tetrasomy indicates four copies of a particular chromosome.

 Quick Tip

Understanding chromosomal abnormalities is essential for diagnosing genetic disorders and assessing their impact on an organism's development.

14. Which of the following is a dominant autosomal disorder?

1. Cystic Fibrosis
2. Huntington's Disease
3. Sickle Cell Anemia
4. Hemophilia

Correct Answer: 2. Huntington's Disease

Solution: Huntington's Disease is a dominant autosomal disorder, meaning only one copy of the mutated gene is sufficient to cause the disease. In contrast, disorders like Cystic Fibrosis and Sickle Cell Anemia are recessive, requiring two copies of the mutated gene. Hemophilia is typically an X-linked recessive disorder.

 Quick Tip

Dominant autosomal disorders require only one copy of the altered gene to be inherited for the disorder to be expressed in an individual.

15. Which of the following is a restriction endonuclease?

1. DNA polymerase
2. RNA polymerase
3. EcoRI
4. Ligase

Correct Answer: 3. EcoRI

Solution: EcoRI is a well-known restriction endonuclease that recognizes specific DNA sequences and cleaves the DNA at or near these sites. DNA polymerase and RNA polymerase are involved in DNA and RNA synthesis, respectively, while ligase is an enzyme that joins DNA fragments together.

 Quick Tip

Restriction endonucleases like EcoRI are essential tools in molecular biology for cutting DNA at specific sequences, facilitating genetic cloning and analysis.

16. Which component was not found in the early Earth's atmosphere?

1. Oxygen
2. Carbon dioxide
3. Nitrogen
4. Ammonia

Correct Answer: 1. Oxygen

Solution: The early Earth's atmosphere was primarily composed of gases like carbon dioxide, nitrogen, and ammonia. Oxygen was not a significant component and only became abundant later due to the photosynthetic activity of organisms.

 Quick Tip

The lack of oxygen in the early atmosphere was crucial for the formation of anoxic conditions, which influenced the development of early life forms.

17. Which of the following are natural inhibitors produced by plants?

1. Alkaloids
2. Terpenoids
3. Glycosides
4. All of the above

Correct Answer: 4. All of the above

Solution: Plants produce a variety of natural inhibitors as defense mechanisms against herbivores and pathogens. Alkaloids, terpenoids, and glycosides are all classes of compounds that serve as natural inhibitors in plants.

 Quick Tip

Natural inhibitors play a vital role in plant survival by deterring pests and inhibiting the growth of competing organisms.