

MHT CET 2025 April 15 Shift 2 Question Paper

Time Allowed :3 Hours	Maximum Marks :200	Total Questions :200
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General Instructions

Read the following instructions very carefully and strictly follow them:

1. The test is of 3 hours duration.
2. The question paper consists of 200 questions. The maximum marks are 200.
3. There are three parts in the question paper consisting of Physics, Chemistry and Biology (Botany and Zoology) having 50 questions in each part of equal weightage.

Q1. A sound wave travels through air with a frequency of 500 Hz and a wavelength of 0.68 m. Calculate the speed of sound in air.

- (1) 340 m/s
- (2) 500 m/s
- (3) 200 m/s
- (4) 680 m/s

Q2. In a silicon semiconductor at room temperature, the intrinsic carrier concentration is $1.5 \times 10^{16} \text{ m}^{-3}$. Calculate the energy band gap E_g if

$$n_i = \sqrt{N_c N_v} e^{-E_g/(2kT)}$$

Given: $N_c = 2.8 \times 10^{25} \text{ m}^{-3}$, $N_v = 1.04 \times 10^{25} \text{ m}^{-3}$, $k = 1.38 \times 10^{-23} \text{ J/K}$, $T = 300 \text{ K}$.

- (1) 1.1 eV
- (2) 0.9 eV
- (3) 2.0 eV
- (4) 0.7 eV

Q3. An ideal gas undergoes an isothermal expansion from 2 L to 8 L at $T = 300 \text{ K}$. The initial pressure is $2 \times 10^5 \text{ Pa}$. Calculate the work done by the gas. (Use $R = 8.31 \text{ J/mol} \cdot \text{K}$).

- (1) 7200 J
- (2) 3600 J
- (3) 1800 J

(4) 14400 J

Q4. A concave mirror has focal length 20 cm. An object is placed 60 cm in front of the mirror. Find the image distance.

- (1) 30 cm
 - (2) 40 cm
 - (3) 60 cm
 - (4) 80 cm
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Q5. A projectile is fired with an initial speed of 20 m/s at an angle of 30° above the horizontal. Find the maximum height reached by the projectile.

- (1) 10 m
 - (2) 20 m
 - (3) 5 m
 - (4) 15 m
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Q6. The gravitational potential energy of an object of mass 5 kg at a height of 10 m above the surface of the Earth is:

- (1) 490 J
 - (2) 500 J
 - (3) 450 J
 - (4) 550 J
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Q7. A car of mass 1000 kg is moving in a circular path of radius 50 m with a speed of 20 m/s. Calculate the centripetal force acting on the car.

- (1) 4000 N
 - (2) 2000 N
 - (3) 5000 N
 - (4) 10000 N
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Q8. Two charges $q_1 = +3 \mu\text{C}$ and $q_2 = -4 \mu\text{C}$ are placed 20 cm apart. Calculate the force between them. (Use $k = 9 \times 10^9 \text{ N} \cdot \text{m}^2/\text{C}^2$).

- (1) 1.35 N
- (2) 2.45 N
- (3) 3.5 N
- (4) 4.2 N

Q9. A fluid of density 800 kg/m^3 flows through a pipe. Velocity at A is 2 m/s with area 1 m^2 ; velocity at B is 4 m/s . Find area at B.

- (1) 0.5 m^2
- (2) 1.5 m^2
- (3) 2.0 m^2
- (4) 4.0 m^2

Q10. For reaction $2A + B \rightarrow 3C$ with rate law $\text{Rate} = k[A]^2[B]$: If $[A]$ is doubled and $[B]$ is halved, how does the rate change?

- (1) It remains the same.
- (2) It doubles.
- (3) It increases by a factor of 4.
- (4) It decreases by a factor of 2.

Q11. The enthalpy of formation of HCl is -92.3 kJ/mol . If 2 moles of HCl form from H_2 and Cl_2 , calculate total heat released.

- (1) -184.6 kJ
- (2) -92.3 kJ
- (3) 92.3 kJ
- (4) 184.6 kJ

Q12. For $\text{N}_2 + 3\text{H}_2 \rightleftharpoons 2\text{NH}_3$ with $K_c = 4.0$, given $[\text{N}_2] = 0.2 \text{ M}$, $[\text{H}_2] = 0.6 \text{ M}$, $[\text{NH}_3] = 0.4 \text{ M}$, calculate Q_c and state if system is at equilibrium.

- (1) $Q_c = 1.2$, reaction will shift to the left.
- (2) $Q_c = 4.0$, reaction is at equilibrium.
- (3) $Q_c = 2.0$, reaction will shift to the right.
- (4) $Q_c = 0.5$, reaction will shift to the left.

Q13. Freezing point depression: $K_f = 1.86\text{ }^{\circ}\text{C} \cdot \text{kg/mol}$. If 0.5 mol of non-volatile solute is dissolved in 1 kg water, calculate ΔT_f .

- (1) $0.93\text{ }^{\circ}\text{C}$
- (2) $1.86\text{ }^{\circ}\text{C}$
- (3) $3.72\text{ }^{\circ}\text{C}$
- (4) $2.79\text{ }^{\circ}\text{C}$

Q14. The energy of the n th orbit of hydrogen is $E_n = -\frac{13.6}{n^2}\text{ eV}$. What is the energy for $n = 2$?

- (1) -3.4 eV
- (2) -13.6 eV
- (3) -6.8 eV
- (4) -1.36 eV

Q15. In the reaction $\text{Zn(s)} + \text{CuSO}_4\text{(aq)} \rightarrow \text{ZnSO}_4\text{(aq)} + \text{Cu(s)}$, which is the correct oxidation half-reaction?

- (1) $\text{Zn} \rightarrow \text{Zn}^{2+} + 2\text{e}^{-}$
- (2) $\text{Cu}^{2+} + 2\text{e}^{-} \rightarrow \text{Cu}$
- (3) $\text{Zn}^{2+} + 2\text{e}^{-} \rightarrow \text{Zn}$
- (4) $\text{Cu} \rightarrow \text{Cu}^{2+} + 2\text{e}^{-}$

Q16. Which of the following is the primary function of the human respiratory system?

- (1) To transport oxygen to tissues and carbon dioxide to the lungs.
- (2) To remove waste products from the body.
- (3) To facilitate digestion and absorption of nutrients.
- (4) To maintain homeostasis by regulating blood pH.

Q17. In a monohybrid cross between two heterozygous pea plants ($\text{Pp} \times \text{Pp}$), what is the expected phenotypic ratio?

- (1) 3:1
- (2) 1:2:1
- (3) 1:1
- (4) 4:0

Q18. Which of the following is an example of a primary consumer in an ecosystem?

- (1) Grasshopper
- (2) Snake
- (3) Fox
- (4) Deer

Q19. Which part of the human brain primarily regulates basic life functions (heart rate, breathing)?

- (1) Cerebrum
- (2) Cerebellum
- (3) Medulla Oblongata
- (4) Hypothalamus

Q20. Which equation correctly represents photosynthesis?

- (1) $6\text{CO}_2 + 6\text{H}_2\text{O} + \text{light} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$
- (2) $\text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 \rightarrow 6\text{CO}_2 + 6\text{H}_2\text{O} + \text{energy}$
- (3) $6\text{CO}_2 + 6\text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 + \text{light}$
- (4) $\text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 \rightarrow 6\text{CO}_2 + 6\text{H}_2\text{O} + \text{light}$

Q21. Which organelle is primarily responsible for producing ATP in a cell?

- (1) Nucleus
- (2) Mitochondria
- (3) Endoplasmic Reticulum
- (4) Golgi Apparatus

Q22. In a DNA molecule, which of the following base-pairings is correct?

- (1) Adenine pairs with Cytosine.
 - (2) Thymine pairs with Guanine.
 - (3) Adenine pairs with Thymine.
 - (4) Cytosine pairs with Uracil.
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Q23. Which of the following processes occurs during the second meiotic division (Meiosis II)?

- (1) Homologous chromosomes are separated.
 - (2) Sister chromatids are separated.
 - (3) DNA replication occurs.
 - (4) Crossing over occurs.
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Q24. Which of the following factors does NOT affect the rate of an enzyme-catalyzed reaction?

- (1) Temperature
 - (2) pH
 - (3) Substrate concentration
 - (4) Color of the enzyme
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