

MHT CET 2025 April 17 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. In a semiconductor, the intrinsic carrier concentration is $1.5 \times 10^{10} \text{ cm}^{-3}$ at room temperature. If the energy band gap of the semiconductor is $E_g = 1.1 \text{ eV}$, calculate the intrinsic carrier concentration at a temperature of $T = 500 \text{ K}$. The intrinsic carrier concentration at room temperature ($T_0 = 300 \text{ K}$) varies with temperature according to:

$$n_i(T) = n_{i0} \left(\frac{T}{T_0} \right)^{3/2} \exp \left[-\frac{E_g}{2k} \left(\frac{1}{T} - \frac{1}{T_0} \right) \right]$$

Given: $n_{i0} = 1.5 \times 10^{10} \text{ cm}^{-3}$, $T_0 = 300 \text{ K}$, $E_g = 1.1 \text{ eV}$, $k = 8.617 \times 10^{-5} \text{ eV/K}$, $T = 500 \text{ K}$.

- (1) $3.0 \times 10^{12} \text{ cm}^{-3}$
- (2) $6.2 \times 10^{12} \text{ cm}^{-3}$
- (3) $8.5 \times 10^{13} \text{ cm}^{-3}$
- (4) $1.2 \times 10^{14} \text{ cm}^{-3}$

Q2. A 1.0 kg sample of water at 80°C is placed in thermal contact with a 2.0 kg sample of water at 20°C . If the system is insulated, what is the final equilibrium temperature? Assume no heat loss and specific heat $c = 4.18 \text{ J/g}^\circ\text{C}$.

- (1) 40°C
- (2) 45°C
- (3) 50°C
- (4) 60°C

Q3. In an electromagnetic wave traveling in vacuum the electric field amplitude is $E_0 = 3.0 \times 10^3 \text{ V/m}$. What is the magnetic field amplitude B_0 ? Use $c = 3.0 \times 10^8 \text{ m/s}$.

- (1) $1.0 \times 10^{-5} \text{ T}$
 - (2) $1.0 \times 10^{-3} \text{ T}$
 - (3) $1.0 \times 10^{-6} \text{ T}$
 - (4) $1.0 \times 10^{-4} \text{ T}$
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Q4. A capacitor of capacitance $C = 10 \mu\text{F}$ is charged to $V = 100 \text{ V}$. What is the energy stored in the capacitor?

- (1) 0.5 J
 - (2) 5.0 J
 - (3) 50.0 J
 - (4) 0.05 J
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Q5. A photon has energy 5.0 eV. What is its wavelength? (Planck's constant $h = 6.626 \times 10^{-34} \text{ J}\cdot\text{s}$, $c = 3.0 \times 10^8 \text{ m/s}$)

- (1) 400 nm
 - (2) 500 nm
 - (3) 600 nm
 - (4) 700 nm
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Q6. What is the entropy change when 1.0 kg of water at 100°C is converted to steam at the same temperature? Latent heat $L_v = 2.25 \times 10^6 \text{ J/kg}$.

- (1) $2.25 \times 10^3 \text{ J/K}$
 - (2) $2.25 \times 10^6 \text{ J/K}$
 - (3) $2.25 \times 10^9 \text{ J/K}$
 - (4) $2.25 \times 10^7 \text{ J/K}$
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Q7. A current of 2.0 A is passed through a conductor for 10 minutes. How much charge passes through the conductor?

- (1) $1.2 \times 10^3 \text{ C}$
 - (2) $1.0 \times 10^3 \text{ C}$
 - (3) $2.0 \times 10^3 \text{ C}$
 - (4) $3.0 \times 10^3 \text{ C}$
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Q8. What is the wavelength of a sound wave with frequency 500 Hz traveling at speed 343 m/s?

- (1) 0.5 m
 - (2) 1.0 m
 - (3) 2.0 m
 - (4) 3.0 m
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Q9. A radioactive substance has half-life 10 hours. If the initial amount is 200 g, how much remains after 30 hours?

- (1) 25 g
 - (2) 50 g
 - (3) 100 g
 - (4) 12.5 g
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Q10. What is the pH of a solution with $[H^+] = 3.0 \times 10^{-4}$ mol/L?

- (1) 3.52
 - (2) 3.00
 - (3) 4.52
 - (4) 2.52
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Q11. What is the molarity of a solution prepared by dissolving 5.0 g NaCl in 250 mL water? (Molar mass NaCl = 58.5 g/mol)

- (1) 0.34 M
 - (2) 0.50 M
 - (3) 1.0 M
 - (4) 2.0 M
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Q12. What is the volume of 1.0 mol of an ideal gas at STP (0°C and 1.0 atm)? (R = 0.0821 L·atm/mol·K)

- (1) 22.4 L
- (2) 24.0 L
- (3) 20.0 L

(4) 25.0 L

Q13. What is the molar mass of a gas if 2.5 g occupies 1.0 L at 300 K and 1.0 atm?
($R = 0.0821 \text{ L}\cdot\text{atm}/\text{mol}\cdot\text{K}$)

- (1) 32 g/mol
 - (2) 28 g/mol
 - (3) 36 g/mol
 - (4) 44 g/mol
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Q14. What is the pH of a 0.01 M HCl solution?

- (1) 1.0
 - (2) 2.0
 - (3) 0.5
 - (4) 3.0
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Q15. What is the concentration of NaOH if 25.0 mL of 0.100 M HCl is neutralized by 50.0 mL of NaOH?

- (1) 0.05 M
 - (2) 0.10 M
 - (3) 0.20 M
 - (4) 0.25 M
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Q16. What is the molarity of a solution made by dissolving 2.5 g KCl in 500 mL water? (Molar mass KCl = 74.5 g/mol)

- (1) 0.10 M
 - (2) 0.25 M
 - (3) 0.50 M
 - (4) 1.00 M
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Q17. In rabbits, brown (B) is dominant to white (b). A heterozygous brown (Bb) is crossed with homozygous white (bb). What is the probability the offspring have

brown fur?

- (1) 50%
- (2) 25%
- (3) 75%
- (4) 100%

Q18. What is the role of mitochondria in the cell, and how does their structure relate to their function?

- (1) Mitochondria are the site of photosynthesis and have a large surface area for light absorption.
- (2) Mitochondria are the site of cellular respiration and have a double membrane structure for ATP production.
- (3) Mitochondria are involved in protein synthesis and have a single membrane.
- (4) Mitochondria are the storage site for genetic material and have a large central vacuole.

Q19. In a plant cell, which organelle is primarily responsible for photosynthesis?

- (1) Mitochondrion
- (2) Nucleus
- (3) Chloroplast
- (4) Ribosome

Q20. What is the role of ribosomes in the cell?

- (1) They store genetic information.
- (2) They synthesize proteins.
- (3) They regulate cellular respiration.
- (4) They control movement of substances in and out of the cell.

Q21. What is the function of the Golgi apparatus in the cell?

- (1) Synthesizes proteins and lipids.
- (2) Packages and modifies proteins for secretion.
- (3) Contains digestive enzymes to break down waste.
- (4) Regulates cell division and growth.

