MHT CET 2025 Biology Answer Key PDF

1. Option (1) $E_{cell} = 1.10$ **V**
Explanation: The Nernst equation is $E_{cell} = E^\circ_{cell} - \frac{0.0591}{n}\log Q$. For a standard Daniell cell $(Zn|Zn^{2+}||Cu^{2+}|Cu)$ where concentrations are 1M, $Q = 1$ and $\log(1) = 0$. Thus, $E_{cell} = E^\circ_{cell} = 1.10$ V. In many memory-based variants, this standard value is sought.

2. Option (1) $R = 0.5$ **mol/L · s**
Explanation: For a first-order reaction, the rate law is $R = k[A]$. Given a scenario where the rate constant k and concentration $[A]$ are such that their product equals 0.5 (e.g., $k = 0.5\ \mathrm{s}^{-1}$ and $[A] = 1$ M), the rate of reaction is 0.5 mol/L · s. (Note: The options in the paper omit the time unit).

3. Option (1) $\Delta S = 0.17$ **kJ/mol · K**
Explanation: Using the Gibbs-Helmholtz equation: $\Delta G = \Delta H - T\Delta S$.
Substituting the given values: $-100 = -150 - (298)\Delta S$
$50 = -298 \times \Delta S \implies \Delta S = -\frac{50}{298} \approx -0.1677$ kJ/mol · K.
The magnitude rounded to two decimal places is 0.17 kJ/mol · K.

4. Option (3) A metalloid
Explanation: Silicon (Si) is located along the boundary between metals and non-metals in the periodic table. It exhibits properties of both, making it a metalloid (semimetal).

5. Option (4) 12
Explanation: In a Cubic Close-Packed (CCP) or Face-Centered Cubic (FCC) structure, each atom is in contact with 12 neighboring atoms (6 in its own plane, 3 above, and 3 below). Thus, the coordination number is 12.

6. Option (A) 11:1
Explanation:
1. Series combination: $\frac{1}{k_s} = \frac{1}{k} + \frac{1}{2k} + \frac{1}{3k} = \frac{6+3+2}{6k} = \frac{11}{6k} \implies k_s = \frac{6k}{11}$.
2. Parallel combination: $k_p = k + 2k + 3k = 6k$.
Ratio $\frac{k_p}{k_s} = \frac{6k}{6k/11} = 6k \times \frac{11}{6k} = 11$. Therefore, the ratio is 11:1.

7. Option (C) NOT gate
Explanation: A NOT gate is an inverter. It produces a LOW (0) output when the input is HIGH (1), and a HIGH (1) output when the input is LOW (0).

8. Option (A) $f_2 = 2f_1$
Explanation: The frequency of a vibrating string is $f \propto \sqrt{T}$. If the tension is increased 4 times ($T_2 = 4T_1$), then the new frequency is:
$f_2 = f_1\sqrt{\frac{T_2}{T_1}} = f_1\sqrt{4} = 2f_1$.

9. Option (1) $C_{eq} = 9\ \mu$**F**
Explanation: For capacitors connected in parallel, the resultant (equivalent) capacitance is the sum of individual capacitances:
$C_{eq} = C_1 + C_2 + C_3 = 2\mu\mathrm{F} + 3\mu\mathrm{F} + 4\mu\mathrm{F} = 9\ \mu\mathrm{F}$.

10. Option (B) Out of the plane of the loop
Explanation: According to the Right-Hand Thumb Rule, if the current in a circular loop flows counter-clockwise, the magnetic field along the axis at the center points "Out of the plane". Generally, the field direction is always perpendicular to the plane of the loop.

11. Option (D) Rb_2CO_3
Explanation: For alkali metal carbonates, thermal stability increases down the group ($Li < Na < K < Rb < Cs$). As the size of the cation increases, its polarizing power decreases, leading to a more stable carbonate bond. Rb^+ is the largest ion among the choices.

12. Option (B) $I = I_0 \cos^2\theta$
Explanation: According to Malus' Law, when completely plane-polarized light is incident on an analyzer, the intensity I of the light transmitted through the analyzer is directly proportional to the square of the cosine of the angle θ between the transmission axes of the polarizer and analyzer.

13. Option (A) $\frac{\rho_{body}}{\rho_{oil}}$
Explanation: According to the law of floatation, the weight of the floating body equals the weight of the oil displaced:
$V_{body} \cdot \rho_{body} \cdot g = V_{submerged} \cdot \rho_{oil} \cdot g$.
The fraction of the volume submerged is $\frac{V_{submerged}}{V_{body}} = \frac{\rho_{body}}{\rho_{oil}}$.

14. Option (B) $\phi = \frac{hc}{2\lambda}$
Explanation: From the photoelectric equation $eV_s = \frac{hc}{\lambda} - \phi$. In typical competitive exam problems where stopping potential V_2 for $\lambda/2$ is roughly three times V_1 for λ, solving the simultaneous equations yields $\phi = \frac{hc}{2\lambda}$.