MHT CET 2026 Mathematics Answer Key PDF

Mathematics

1. Option (b) -4
   Explanation: For three vectors to be coplanar, their scalar triple product (the determinant of their components) must be zero. Solving the determinant equation yields $7a + 28 = 0 \implies a = -4$.

2. Option (b) $\frac{32}{3}$ sq. units
   Explanation: The required area is bounded symmetrically by the parabola $y^2 = 8x$ and $x = 2$. Integrating from 0 to 2 yields the area $2\int_0^2 \sqrt{8x}\,dx = 4\sqrt{2}\left[\frac{2}{3}x^{3/2}\right]_0^2 = \frac{32}{3}$ sq. units.

3. Option (b) $\tan^{-1} y = \tan^{-1} x + \frac{\pi}{4}$
   Explanation: Separating variables gives $\frac{dy}{1+y^2} = \frac{dx}{1+x^2}$, which integrates to $\tan^{-1} y = \tan^{-1} x + C$. Substituting the initial condition $y(0) = 1$ gives $C = \tan^{-1}(1) = \frac{\pi}{4}$.

4. Option (b) 2.4
   Explanation: For a binomial distribution, the variance is calculated using the formula $\text{Var}(X) = npq$. Substituting $n = 10$, $p = 0.4$, and $q = 1 - p = 0.6$ yields a variance of $10 \times 0.4 \times 0.6 = 2.4$.

5. Option (b) $\pm\frac{1}{\sqrt{3}}, \pm\frac{1}{\sqrt{3}}, \pm\frac{1}{\sqrt{3}}$
   Explanation: Since the line makes equal angles with the axes, we have $\alpha = \beta = \gamma$, so $\cos^2\alpha + \cos^2\beta + \cos^2\gamma = 1 \implies 3\cos^2\alpha = 1$, giving the direction cosines as $\pm\frac{1}{\sqrt{3}}$.

Physics

6. Option (a) 1.227 Å
   Explanation: The de Broglie wavelength of an electron accelerated through a potential difference V is given by $\lambda = \frac{12.27}{\sqrt{V}}$ Å. For $V = 100$ V, this simplifies to $\lambda = \frac{12.27}{10} = 1.227$ Å.

7. Option (c) 50%
   Explanation: The efficiency of a Carnot engine is calculated using the formula $\eta = 1 - \frac{T_C}{T_H}$. Substituting the given temperatures $T_C = 300$ K and $T_H = 600$ K yields $\eta = 1 - 0.5 = 50\%$.

8. Option (b) 0.0125 J
   Explanation: The energy stored in a charged capacitor is given by $U = \frac{1}{2}CV^2$. Substituting the capacitance $C = 10 \times 10^{-6}$ F and potential $V = 50$ V yields $U = 0.0125$ J.

9. Option (b) $2MR^2$
   Explanation: The moment of inertia of a ring about a central perpendicular axis is MR^2. By the parallel axis theorem, the moment of inertia about a tangent perpendicular to its plane is $MR^2 + MR^2 = 2MR^2$.

Chemistry

10. Option (b) Pent-2-ene
    Explanation: Reacting 2-bromopentane with alcoholic KOH undergoes a dehydrohalogenation elimination reaction. According to Saytzeff's rule, the more substituted and stable alkene, Pent-2-ene, is formed as the major product.

11. Option (b) 2
Explanation: In a body-centered cubic (BCC) lattice, the total number of atoms per unit cell is calculated as $8 \times \frac{1}{8}$ (from the corner positions) $+1 \times 1$ (from the body-centered position), which equals 2.

12. Option (a) $ZnCl_2 + HCl$
Explanation: The Lucas test uses a reagent consisting of a mixture of anhydrous zinc chloride ($ZnCl_2$) and concentrated hydrochloric acid (HCl) to distinguish primary, secondary, and tertiary alcohols.

13. Option (b) 2.46 atm
Explanation: The osmotic pressure is determined using the relation $\pi = CRT$. Substituting the molarity $C = 0.1$ M, gas constant $R = 0.0821$ L atm $mol^{-1}K^{-1}$, and temperature $T = 300$ K yields $\pi = 2.46$ atm.

14. Option (c) sp^3d^2
Explanation: The sulfur atom in sulfur hexafluoride (SF_6) forms six single covalent bonds with fluorine atoms and has zero lone pairs. This steric number of 6 corresponds to sp^3d^2 hybridization.