# MHT CET 2026 Mathematics Answer Key PDF

## Mathematics

1. Option (c) $k \geq 2$
   Explanation: The derivative of the function is $f'(x) = \frac{k-2}{(\sin x + \cos x)^2}$. For the function to be increasing for all $x$, we require $f'(x) \geq 0$, which is satisfied when $k - 2 \geq 0 \implies k \geq 2$.

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

3. Option (a) $y = \frac{x^3}{4} + \frac{C}{x}$
   Explanation: This is a linear differential equation with the integrating factor I.F. $= e^{\int \frac{1}{x}\,dx} = x$. Solving the standard equation $y \cdot x = \int x^3\,dx + C$ yields $xy = \frac{x^4}{4} + C$, which simplifies to $y = \frac{x^3}{4} + \frac{C}{x}$.

4. Option (a) $\frac{1}{\sqrt{6}}$
   Explanation: Using the shortest distance formula $d = \frac{|(\vec{a}_2 - \vec{a}_1)\cdot(\vec{b}_1 \times \vec{b}_2)|}{|\vec{b}_1 \times \vec{b}_2|}$ with points $(1, 2, 3)$ and $(2, 4, 5)$, and direction vectors $(2, 3, 4)$ and $(3, 4, 5)$, we obtain the distance as $\frac{1}{\sqrt{6}}$.

5. Option (a) 1
   Explanation: Using the vector magnitude identity $|\vec{a} - \vec{b}|^2 = |\vec{a}|^2 + |\vec{b}|^2 - 2\vec{a} \cdot \vec{b}$, we substitute the unit vector magnitudes and $\cos 60°$ to get $1 + 1 - 2(1)(1)(0.5) = 1$, hence $|\vec{a} - \vec{b}| = 1$.

## Physics

6. Option (c) 12 cm/s$^2$
   Explanation: The magnitude of acceleration of a particle in simple harmonic motion is given by $a = \omega^2 x$. Substituting the given values $\omega = 2$ rad/s and $x = 3$ cm yields $a = 2^2 \times 3 = 12$ cm/s$^2$.

7. 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. Substituting $V = 100$ V yields $\lambda = \frac{12.27}{10} = 1.227$ Å.

8. Option (b) $\frac{5R}{6}$
   Explanation: For a cube made of 12 resistors each of resistance $R$, the equivalent resistance across the body diagonal (opposite corners) is calculated using Kirchhoff's laws and symmetry to be $\frac{5}{6}R$.

9. Option (a) 1 : 4
   Explanation: The speed of sound in a gas is given by $v = \sqrt{\frac{\gamma RT}{M}}$. Since both gases are diatomic and at the same temperature, the ratio of their speeds is $\sqrt{\frac{M_{H_2}}{M_{O_2}}} = \sqrt{\frac{2}{32}} = \frac{1}{4}$.

## Chemistry

10. Option (b) +5
Explanation: Let $x$ be the oxidation state of phosphorus in $H_3PO_4$. Setting the sum of the oxidation states equal to zero, we get $3(+1) + x + 4(-2) = 0$, which simplifies to $x = +5$.

11. Option (c) Buna-S
Explanation: Buna-S is classified as a copolymer because it is synthesized by the addition polymerization of two different monomer species: 1,3-butadiene and styrene, unlike homopolymers like polythene and PVC.

12. Option (c) 11
Explanation: For a 0.001 M strong base solution of NaOH, the hydroxide ion concentration is $[OH^-] = 10^{-3}$ M, giving pOH = 3. Using pH + pOH = 14 at 25°C yields a pH of 11.

13. Option (c) Mixture of concentrated $HNO_3$ and $H_2SO_4$
Explanation: The conversion of benzene to nitrobenzene is an electrophilic aromatic substitution reaction called nitration. It requires a nitrating mixture consisting of concentrated nitric acid and concentrated sulfuric acid.