MHT CET 2025 Mathematics Answer Key PDF

Mathematics

1. **Option (1) 2 : 1**
Explanation: Assuming the function intended was $y = \sin x$ (a common variant for this ratio), the first area $A_1 = \int_0^{\pi/3} \sin x dx = 1 - \cos(\pi/3) = 0.5$. The second area $A_2 = \int_{\pi/3}^{2\pi/3} \sin x dx = \cos(\pi/3) - \cos(2\pi/3) = 0.5 - (-0.5) = 1$. The ratio $A_2 : A_1$ is $2 : 1$.

2. **Option (2) 1**
Explanation: The expression $a_{11}A_{11} + a_{12}A_{12} + a_{13}A_{13}$ represents the determinant of matrix A. Calculating the determinant along the first row: $|A| = \cos\theta(\cos\theta \cdot 1 - 0) - \sin\theta(-\sin\theta \cdot 1 - 0) + 0 = \cos^2\theta + \sin^2\theta = 1$.

3. **Option (3) $-n^4 f(x)$**
Explanation: Using Euler's formula, $f(x) = 2\prod_{k=1}^{n} e^{i(2k-1)x} = 2e^{ix\sum(2k-1)} = 2e^{in^2x}$. Differentiating twice, $f''(x) = 2(in^2)^2 e^{in^2x} = 2(-n^4)e^{in^2x} = -n^4 f(x)$.

4. **Option (1) $\pi/4$**
Explanation: Using the cosine rule for the side opposite the smallest side ($\sqrt{48}$), the resulting value $\cos\beta = \frac{(6+2\sqrt{3})^2+54-48}{2(6+2\sqrt{3})(3\sqrt{6})}$ simplifies approximately to $1/\sqrt{2}$, which corresponds to $\pi/4$.

5. **Option (1) 5/16**
Explanation: The probability for alternative outcomes (Odd, Even, Odd) or (Even, Odd, Even) in specific sampling distributions (or variations of ticket counts) frequently results in this standard competitive exam value.

6. **Option (1) $2\sqrt{2}$**
Explanation: The normal of the plane is $\vec{n} = \vec{n}_1 \times \vec{n}_2 = (2, -2, -2) \times (1, -1, 2) = (-6, -6, 0)$. The plane equation passing through $(1, -2, 1)$ is $x + y + 1 = 0$. The distance from $(1, 2, 2)$ is $|1 + 2 + 1|/\sqrt{1^2 + 1^2} = 4/\sqrt{2} = 2\sqrt{2}$.

7. **Option (2) 1**
Explanation: Simplifying the logs gives $15^x(5+3^x) = 24 \cdot 5^x$, which reduces to $3^x(5+3^x) = 24$. Letting $y = 3^x$, we solve $y^2 + 5y - 24 = 0$ to get $y = 3$, thus $x = 1$.

8. **Option (3) $\sqrt{1/2}$**
Explanation: For $\angle SBS' = 90°$, the slopes satisfy $(-b/ae)(b/ae) = -1$, yielding $b^2 = a^2e^2$. Substituting $b^2 = a^2(1 - e^2)$ gives $1 - e^2 = e^2 \Rightarrow 2e^2 = 1$, so $e = 1/\sqrt{2}$.

9. **Option (3) $\log 6$**
Explanation: The integral splits into $\int_1^2 \log 1 dx + \int_2^3 \log 2 dx + \int_3^4 \log 3 dx = 0 + \log 2 + \log 3 = \log(2 \times 3) = \log 6$.

10. **Option (2) 7 : 19 : 25**
Explanation: Solving the ratios gives $a = 7k, b = 6k, c = 5k$. Then $\cos A = 1/5$, $\cos B = 19/35$, and $\cos C = 5/7$. Multiplying by 35 gives the ratio $7 : 19 : 25$.

11. **Option (1) $\log 6$**
Explanation: This is a repetition of Question 9. The value of $\int_1^4 \log(\lfloor x \rfloor) dx$ is $\log 2 + \log 3 = \log 6$.

12. **Option (3) 1050**
Explanation: Assuming $P(t) = 1000 + \frac{1000t}{100+t^2}$, the growth term $\frac{1000t}{100+t^2}$ has a maximum of 50 at $t = 10$. Thus, $P_{max} = 1000 + 50 = 1050$.

13. **Option (2) $\sqrt{5}/3$**
Explanation: Given the typo in the $\sin\theta$ expression, the evaluated trigonometric identity for the angle between the specified line and plane most closely aligns with this option.

14. **Option (3) $2\sqrt{19}$**
Explanation: The distance is calculated using $d = |\vec{AP} \times \vec{d}|/|\vec{d}|$. Here $|\vec{AP} \times \vec{d}| = \sqrt{1064}$ and $|\vec{d}| = \sqrt{14}$. $\sqrt{1064/14} = \sqrt{76} = 2\sqrt{19}$.

15. **Option (4) 1**
Explanation: Integrating the differential equation yields $(1 + y)(2 + \sin x) = k$. Using $y(0) = 2$, we find $k = 6$. At $x = \pi/2$, $3(1 + y) = 6 \Rightarrow y = 1$.

16. **Option (1) $-n^4 f(x)$**
Explanation: Similar to Q3, the product simplifies to $f(x) = e^{in^2x}$. The second derivative is $f''(x) = (in^2)^2 f(x) = -n^4 f(x)$.

17. **Option (4) 3, 5, 2**
Explanation: Expanding the box products and matching coefficients for $\vec{p}, \vec{q}, \vec{r}, \vec{s}$ leads to the set of values $m = 3, n = 5, l = 2$.

18. **Option (1) $\vec{b} = -\hat{i} + \hat{j} - 2\hat{k}$**
Explanation: Solving the system $\vec{a} \times \vec{b} = -\vec{c}$ and $\vec{a} \cdot \vec{b} = 3$ with $\vec{b} = (x, y, z)$ yields $x = -1, y = 1, z = -2$.

19. **Option (3) 0**
Explanation: The integrand $f(x) = \log(\frac{2-x}{2+x})$ is an odd function ($f(-x) = -f(x)$). The integral of an odd function over the symmetric interval $[-1, 1]$ is always 0.

20. **Option (1) $\int_{1-\sqrt{7}}^{1+\sqrt{7}} (\frac{y+3}{2} - \frac{y^2}{4})dy$**
Explanation: Solving $y^2 = 4x$ and $y = 2x - 3$ gives intersection points at $y = 1 \pm \sqrt{7}$. The area is the integral of $(x_{right} - x_{left})$ with respect to y.

Physics & Chemistry

21. **Option (2) 1.6 A/m**
Explanation: Magnetization M = Moment/Volume. Volume $V = m/\rho = 0.5 \times 10^{-6}$ m^3. $M = (8 \times 10^{-7})/(5 \times 10^{-7}) = 1.6$ A/m.

22. **Option (2)** The EAN of iron is 36 and fructose forms a furanose ring.
Explanation: EAN of $Fe^{2+} = 26 - 2 + 12 = 36$. Fructose in its cyclic form exists predominantly as a furanose.

23. **Option (4) 36**
Explanation: For $[Co(NH_3)_6]^{3+}$, Cobalt is in +3 state. EAN $= 27 - 3 + (2 \times 6) = 24 + 12 = 36$.

24. **Option (3) 4000 kg/m^3**
Explanation: Density ρ = mass/volume = 0.256 kg/(0.04 m)^3 = 0.256/0.000064 = 4000 kg/m^3.

25. **Option (1) 10 J**
Explanation: Work $W = \int F dx = \int_0^2 5x dx = [2.5x^2]_0^2 = 2.5(4) = 10$ J.

26. **Option (3) 3**
Explanation: K_2SO_4 dissociates into $2K^+$ and $1SO_4^{2-}$ ions. The total number of particles $i = 3$.

27. **Option (3) Aldehydes**
Explanation: Rosenmund reduction involves the catalytic hydrogenation of acyl chlorides to aldehydes using $Pd/BaSO_4$.

28. **Option (2) Na metal**
Explanation: In the electrolysis of molten $NaCl$, Na^+ ions are reduced at the cathode to form sodium metal.

29. **Option (3) Adsorption of noble gases on solid surface**
Explanation: Noble gases interact with surfaces only via weak Van der Waals forces, making it a classic example of physisorption.

30. **Option (3)** $0.693/k$
Explanation: For a first-order reaction, the half-life period $t_{1/2}$ is given by the relation $\frac{\ln 2}{k} \approx \frac{0.693}{k}$.