MHT CET 2025 20 April Shift 2 PCM Question Paper

Time Allowed :3 Hour	**Maximum Marks :**200	**Total Questions :**150

1. Which of the following gases is most soluble in water?

(A) Oxygen

(B) Nitrogen

(C) Carbon dioxide

(D) Hydrogen

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2. Which of the following elements does not have a completely filled outermost shell in its ground state?

(A) Neon

(B) Helium

(C) Oxygen

(D) Argon

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3. Which of the following is an example of a redox reaction?

(A) NaCl dissolving in water

(B) $2H_2O_2\ (aq) \rightarrow 2H_2O\ (l) + O_2\ (g)$

(C) NaOH dissolving in water

(D) $CaCO_3\ (s) \rightarrow CaO\ (s) + CO_2\ (g)$

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4. In the reaction $2H_2 + O_2 \rightarrow 2H_2O$, if 4 moles of hydrogen react completely with oxygen, how many moles of water will be produced?

(A) 2 mol

(B) 4 mol

(C) 8 mol

(D) 1 mol

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6. What is the volume of oxygen required for complete combustion of 0.25 mole of methane at S.T.P.?

(A) 22.4 L

(B) 5.6 L

(C) 11.2 L

(D) 7.46 L

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6. Evaluate the integral: $\int \sin^5 x \, dx$

(A) $-\frac{1}{5}\cos x(5 - 10\sin^2 x + \sin^4 x) + C$

(B) $-\cos x + \frac{\cos^3 x}{3} - \frac{\cos^5 x}{5} + C$

(C) $\frac{1}{5}\sin^5 x + C$

(D) $\int \sin^5 x \, dx = \int \sin^3 x \cdot \sin^2 x \, dx$

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7. Evaluate the determinant of the matrix:

$$\begin{vmatrix} 1 & \tan x \\ -\tan x & 1 \end{vmatrix}$$

(A) $1 - \tan^2 x$

(B) $1 + \tan^2 x$

(C) $\sec^2 x$

(D) 0

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8. Evaluate the expression:

$$f\left(f(f(x))\right) + \left(f(f(x))\right)^2 \quad \text{if} \quad x = 1$$

(A) $f(f(f(1))) + (f(f(1)))^2$

(B) $f(f(f(1))) + (f(1))^2$

(C) $f(1)^2 + f(1)$

(D) Cannot be determined

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9. A copper ball at $80°C$ is brought to $60°C$ in 5 minutes, with surrounding temperature at $20°C$. Find the temperature of the ball after 20 minutes.

(A) $35°C$

(B) $30°C$

(C) $25°C$

(D) $20°C$

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10. Given $f'(1) = 3$, $f(1) = 1$, and

$$y = f\left(f(f(x))\right) + \left(f(x)\right)^2,$$

then find $\frac{dy}{dx}$ at $x = 1$.

(A) 9

(B) 12

(C) 15

(D) 18

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11. If $y = x^x + x^x$, then find $\frac{dy}{dx}$:

(A) $x^x(\ln x + 1)$

(B) $2x^x(\ln x + 1)$

(C) $x^x(\ln x - 1)$

(D) $2x^x \ln x$

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12. Evaluate the definite integral: $\int_{-2}^{2} |x^2 - x - 2|\, dx$

(A) $\frac{40}{3}$

(B) $\frac{28}{3}$

(C) $\frac{36}{5}$

(D) $\frac{44}{3}$

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13. Find the value of the integral: $\int \frac{2x+3}{(xy)(x^2+1)}\, dx$

(A) $\frac{1}{y}\ln(x^2+1)+C$

(B) $\frac{2}{y}\ln|x|+\frac{3}{y}\tan^{-1}(x)+C$

(C) $\frac{2}{y}\ln|x|+\frac{3}{y}\ln(x^2+1)+C$

(D) $\frac{1}{y}\ln|x(x^2+1)|+C$

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14. If $\int \frac{2x+3}{(x-1)(x^2+1)}\,dx = \log_x\{(x-1)^{\frac{5}{2}}(x^2+1)^a\} - \frac{1}{2}\tan^{-1}x + C$, then the value of a is:

(A) $\frac{5}{4}$

(B) $-\frac{5}{3}$

(C) $-\frac{5}{6}$

(D) $-\frac{5}{4}$
