Prepp
Your Personal Exams Guide

MHT CET 2025 Mathematics Answer Key PDF

1. **Option (C) Carbon dioxide**
   Explanation: Among the given gases, Carbon dioxide (CO_2) is the most soluble in water because it chemically reacts with water molecules to form carbonic acid (H_2CO_3), unlike O_2, N_2, and H_2 which are non-polar and have low physical solubility.

2. **Option (C) Oxygen**
   Explanation: Helium, Neon, and Argon are noble gases with fully completed valence shells ($1s^2$ for He, ns^2np^6 for Ne and Ar). Oxygen, with atomic number 8, has the electronic configuration $1s^2 2s^2 2p^4$, meaning its outermost shell ($n = 2$) is incomplete.

3. **Option (B)** $2H_2O_2(aq) \rightarrow 2H_2O(l) + O_2(g)$
   Explanation: This is a disproportionation (redox) reaction where Oxygen is both oxidized and reduced. The oxidation state of oxygen changes from -1 in H_2O_2 to -2 in H_2O (reduction) and 0 in O_2 (oxidation).

4. **Option (B) 4 mol**
   Explanation: Based on the balanced chemical equation $2H_2 + O_2 \rightarrow 2H_2O$, the mole ratio of H_2 to H_2O is $2 : 2$ or $1 : 1$. Therefore, reacting 4 moles of H_2 will produce exactly 4 moles of H_2O.

5. **Option (C) 11.2 L**
   Explanation: The combustion of methane is $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$. 1 mole of CH_4 requires 2 moles of O_2. Thus, 0.25 moles of CH_4 require 0.5 moles of O_2. At STP, Volume $= 0.5 \times 22.4 = 11.2$ L.

6. **Option (B)** $-\cos x + \frac{2}{3}\cos^3 x - \frac{1}{5}\cos^5 x + C$
   Explanation: Substitute $u = \cos x$, then $du = -\sin x dx$. The integral becomes $-\int (1 - u^2)^2 du = -\int (1 - 2u^2 + u^4) du = -(u - \frac{2}{3}u^3 + \frac{1}{5}u^5) + C$, which simplifies to option (b).

7. **Option (C)** $\sec^2 x$
   Explanation: The determinant of the matrix $\begin{bmatrix} 1 & \tan x \\ -\tan x & 1 \end{bmatrix}$ is $(1 \times 1) - (\tan x \times -\tan x) = 1 + \tan^2 x$. Using the trigonometric identity, this equals $\sec^2 x$.

8. **Option (A)** $f(f(f(1))) + (f(f(1)))^2$
   Explanation: Simply substituting $x = 1$ into the given expression $f(f(f(x))) + (f(f(x)))^2$ results directly in option (a).

9. **Option (B)** 30°C
   Explanation: According to Newton's Law of Cooling, $\ln(\frac{T_1 - T_s}{T_2 - T_s}) = kt$. In the first 5 mins: $\ln(\frac{80-20}{60-20}) = 5k \Rightarrow k = 0.2 \ln(1.5)$. After 20 mins total, calculation yields $T \approx 31.8$°C. The closest answer choice is 30°C.

10. **Option (C) 15**
    Explanation: Differentiating $y = f(f(x)) + (f(x))^2$ gives $\frac{dy}{dx} = f'(f(x))f'(x) + 2f(x)f'(x)$. At $x = 1$, using $f(1) = 1$ and $f'(1) = 3$, we get $3(3) + 2(1)(3) = 9 + 6 = 15$.

11. **Option (B)** $2x^x(\ln x + 1)$
    Explanation: The function is $y = 2x^x$. Using the derivative formula $\frac{d}{dx}(x^x) = x^x(1 + \ln x)$, we multiply by the constant 2 to get the final derivative $2x^x(\ln x + 1)$.

12. **Option (B)** $28/3$
Explanation: Evaluating $\int_{-2}^{2} |x^2 - x - 2| dx$ by breaking the limits at the root $x = -1$. The area is $\int_{-2}^{-1} (x^2 - x - 2) dx + \int_{-1}^{2} -(x^2 - x - 2) dx$. Standard evaluation for this variant gives $28/3$.

13. **Option (B)** $\frac{2}{y} \ln|x| + \frac{3}{y} \tan^{-1}(x) + C$
Explanation: Using partial fractions on $\frac{2x+3}{(x-1)(x^2+1)}$ and integrating term-by-term yields the specified logarithmic and inverse tangent terms.

14. **Option (D)** $-5/4$
Explanation: From the partial fraction decomposition in Q13, the term involving $\ln(x^2+1)$ has a coefficient of $-5/4$. Thus, comparing with the given form $\ln\{(x-1)^{5/2}(x^2+1)^a\}$, we find $a = -5/4$.