



General Instructions

- (i) **Duration:** The total duration of the examination is 3 hours (180 minutes).
- (ii) **Total Marks:** The complete paper carries a maximum of 200 marks.
- (iii) **Structure:** The paper has 3 Sections:
 - **Section A:** 50 Multiple Choice Questions (Physics).
 - **Section B:** 50 Multiple Choice Questions (Chemistry).
 - **Section B:** 50 Multiple Choice Questions (Mathematics).
- (iv) **Compulsory Questions:** All 150 questions are compulsory.
- (v) Each question has four options. Only **one** option is correct.
- (vi) **Correct Answer:** +1 marks.
- (vii) **Incorrect Answer:** (No Negative marking).
- (viii) **Unanswered/Marked for Review:** 0 marks.

1. Evaluate the integral: $\int \frac{x}{x+2} dx$

- (A) $x - 2 \log |x+2| + C$
- (B) $x + 2 \log |x+2| + C$
- (C) $\log |x+2| + C$
- (D) $\frac{x^2}{2(x+2)} + C$

2. Find the value of k if the function $f(x) = k \sin x + 2 \cos x$ is increasing for all x

- (A) Possible for some k

- (B) $k > 2$
(C) Impossible for all $x \in \mathbb{R}$
(D) $k = 2$
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3. Calculate $y(\log 2)$ if $\frac{dy}{dx} = y + 5$ and $y(0) = 4$.

- (A) 12
(B) 13
(C) 14
(D) 15
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4. Identify the co-ordinates of the point where the line joining $(1, 1, 1)$ and $(2, 2, 2)$ intersects the plane $x + y + z = 9$.

- (A) $(2, 2, 2)$
(B) $(3, 3, 3)$
(C) $(4, 4, 4)$
(D) $(1, 1, 1)$
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5. A ball is thrown upwards with a velocity of 20 m/s; find the maximum height reached ($g = 10 \text{ m/s}^2$).

- (A) 10 metres
(B) 20 metres
(C) 30 metres
(D) 40 metres
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6. Calculate the ratio of potential energy to kinetic energy at time $t = \frac{T}{6}$ for a particle starting SHM from its mean position.

- (A) 1 : 1
(B) 3 : 1
(C) 1 : 3
(D) 3 : 2
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7. Find the work done by a gas that expands from 0.2 dm^3 to 0.8 dm^3 against a constant pressure of 2 bar.

- (A) -120 J
 - (B) 120 J
 - (C) -60 J
 - (D) 60 J
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8. Calculate the radius of a circular path for an electron moving through a magnetic field $B = 12 \times 10^{-4}\text{ T}$ with $v = 3.2 \times 10^7\text{ m/s}$.

- (A) 0.05 m
 - (B) 0.10 m
 - (C) 0.15 m
 - (D) 0.20 m
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9. Identify the reagent used in the Lucas test to distinguish between primary, secondary, and tertiary alcohols.

- (A) Dilute HCl and ZnCl_2
 - (B) Conc. HCl and anhydrous ZnCl_2
 - (C) H_2SO_4 and ZnCl_2
 - (D) Conc. HNO_3 and ZnCl_2
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10. Calculate the number of carbon atoms present in 0.35 mole of glucose ($\text{C}_6\text{H}_{12}\text{O}_6$).

- (A) 1.26×10^{23}
 - (B) 1.26×10^{24}
 - (C) 2.10×10^{24}
 - (D) 3.50×10^{23}
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11. Determine the hybridization and geometry of carbon in ethyne (C_2H_2).

- (A) sp^3 , Tetrahedral
- (B) sp^2 , Trigonal planar
- (C) sp , Linear
- (D) sp^3d , Trigonal bipyramidal

12. Find the volume occupied by 8 g of a gas at STP if its vapour density is 16.

- (A) 2.8 L
- (B) 5.6 L
- (C) 11.2 L
- (D) 22.4 L

13. Identify the most stable carbocation among primary, secondary, and tertiary.

- (A) Primary carbocation
 - (B) Secondary carbocation
 - (C) Tertiary carbocation
 - (D) All are equally stable
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