



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.

Mathematics

1. Find the area of the region bounded by the curve $y^2 = 4x$ and the line $x = 3$.

- (A) $8\sqrt{3}$
- (B) $6\sqrt{3}$
- (C) $4\sqrt{3}$
- (D) $12\sqrt{3}$

2. If the vectors $2i - j + k$, $i + 2j - 3k$ and $3i + aj + 5k$ are coplanar, find the value of a .

- (A) -2
 - (B) -4
 - (C) 2
 - (D) 4
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3. Find the general solution of the differential equation $\frac{dy}{dx} + y \cot x = \csc x$.

- (A) $y \sin x = x + c$
 - (B) $y \cos x = x + c$
 - (C) $y \sin x = c - x$
 - (D) $y \cos x = c + x$
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4. The probability of a shooter hitting a target is $\frac{3}{4}$. Find the probability of hitting the target exactly 4 times in 5 shots.

- (A) $\frac{405}{1024}$
 - (B) $\frac{243}{1024}$
 - (C) $\frac{405}{512}$
 - (D) $\frac{81}{256}$
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5. Find the value of k if the function $f(x) = \frac{k \sin x}{x}$ for $x \neq 0$ and $f(0) = 3$ is continuous at $x = 0$.

- (A) 1
 - (B) 2
 - (C) 3
 - (D) 4
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Physics

6. A stone is dropped from a height of 20 m; calculate its velocity just before it hits the ground ($g = 10 \text{ m/s}^2$).

- (A) 10 m/s
 - (B) 15 m/s
 - (C) 20 m/s
 - (D) 25 m/s
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7. Calculate the de Broglie wavelength of an electron accelerated through a potential difference of 100 V.

- (A) $0.1227 \text{ \AA}$
 - (B) $1.227 \text{ \AA}$
 - (C) $12.27 \text{ \AA}$
 - (D) $2.27 \text{ \AA}$
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8. What is the ratio of the surface area of two soap bubbles if their radii are in the ratio 2 : 3?

- (A) 2 : 3
 - (B) 4 : 9
 - (C) 3 : 2
 - (D) 9 : 4
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9. If the current in a coil changes from 5 A to 2 A in 0.1 s and an average emf of 30 V is induced, find the self-inductance.

- (A) 0.5 H
 - (B) 1 H
 - (C) 2 H
 - (D) 3 H
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10. Find the energy stored in a capacitor of $10 \mu\text{F}$ charged to a potential of 50 V.

- (A) 0.0125 J
 - (B) 0.025 J
 - (C) 0.125 J
 - (D) 0.25 J
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Chemistry

11. Calculate the number of atoms per unit cell in a Face-Centered Cubic (FCC) crystal structure.

- (A) 2
- (B) 4
- (C) 6
- (D) 8

12. Identify the major product formed when Ethyl Bromide reacts with alcoholic KOH.

- (A) Ethanol
- (B) Ethene (Ethylene)
- (C) Diethyl ether
- (D) Acetaldehyde

13. What is the hybridization of the central atom in SF_6 molecule?

- (A) sp^3
- (B) sp^2
- (C) sp^3d
- (D) sp^3d^2

14. Find the osmotic pressure of a 0.1 M glucose solution at $27^\circ C$ ($R = 0.0821 \text{ L atm mol}^{-1} K^{-1}$).

- (A) 1.23 atm
- (B) 2.46 atm
- (C) 3.46 atm
- (D) 4.10 atm

15. Name the catalyst used in the manufacture of ammonia by Haber's process.

- (A) Nickel
- (B) Platinum

- (C) Finely divided Iron (Fe) with Molybdenum (Mo) as a promoter
- (D) Vanadium pentoxide
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