



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 390 marks.
- (iii) **Structure:** The paper has 4 Sections:
 - **Part 1:** 30 Multiple Choice Questions (Physics).
 - **Part 2:** 30 Multiple Choice Questions (Chemistry).
 - **Part 3:** 10 Multiple Choice Questions (English Proficiency),
20 Multiple Choice Questions (Logical Reasoning)
 - **Part 4:** 40 Multiple Choice Questions (Mathematics/Biology)
- (iv) **Compulsory Questions:** All 130 questions are compulsory, and +12 Questions (Optional Extra Questions)
- (v) Each question has four options. Only **one** option is correct.
- (vi) **Correct Answer:** +3 marks.
- (vii) **Incorrect Answer:** -1 (Negative marking).
- (viii) **Unanswered/Marked for Review:** 0 marks.

PHYSICS

1. A body of mass m is dropped from a height h . What is its kinetic energy just before it hits the ground?

- (A) mgh
 - (B) $\frac{1}{2}mgh$
 - (C) $2mgh$
 - (D) mgh^2
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2. Two charges q_1 and q_2 are placed at a distance r . If the distance between them is doubled, the electrostatic force between them becomes:

- (A) One-fourth of the original force
 - (B) Half of the original force
 - (C) Four times the original force
 - (D) Twice the original force
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3. A light ray enters a glass slab of refractive index $\mu = 1.5$ from air. What is the speed of light inside the glass slab? (Speed of light in air $c = 3 \times 10^8$ m/s)

- (A) 2×10^8 m/s
 - (B) 4.5×10^8 m/s
 - (C) 3×10^8 m/s
 - (D) 1.5×10^8 m/s
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4. A gas undergoes an adiabatic process. During this process:

- (A) No heat is exchanged with the surroundings
 - (B) The temperature of the gas remains constant
 - (C) The pressure of the gas remains constant
 - (D) The volume of the gas remains constant
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CHEMISTRY

5. Using the standard electrode potential, find out the pair between which redox reaction is not feasible. $E^\ominus$ values: $\text{Fe}^{3+}/\text{Fe}^{2+} = +0.77\text{V}$; $\text{I}_2/\text{I}^- = +0.54\text{V}$; $\text{Cu}^{2+}/\text{Cu} = +0.34\text{V}$; $\text{Ag}^+/\text{Ag} = +0.80\text{V}$.

- (A) Fe^{3+} and I^-
 - (B) Ag^+ and Cu
 - (C) Fe^{3+} and Cu
 - (D) Ag and Fe^{3+}
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6. The reaction $\text{A}(\text{g}) \rightarrow \text{P}(\text{g}) + \text{Q}(\text{g}) + \text{R}(\text{g})$ follows first-order kinetics with a half-life of 69.3 s at 500°C . Starting with pure A in a container at 500°C and a pressure of 0.4 atm, what will be the total pressure of the system after 230 s?

- (A) 1.15 atm
 - (B) 1.32 atm
 - (C) 1.22 atm
 - (D) 1.12 atm
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7. Electron affinity is positive, when:

- (A) $\text{O}^- \rightarrow \text{O}^-$
 - (B) $\text{O}^- \rightarrow \text{O}^{2-}$
 - (C) $\text{O} \rightarrow \text{O}^+$
 - (D) $\text{O} \rightarrow \text{O}^{2+}$
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8. The ionic radii in Å of N^{3-} , O^{2-} , and F^- are respectively:

- (A) 1.71, 1.40 and 1.36
 - (B) 1.71, 1.36 and 1.40
 - (C) 1.36, 1.40 and 1.71
 - (D) 1.36, 1.71 and 1.40
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9. Find the sum of the series $\left(x + \frac{1}{x}\right)^2 + \left(x^2 + \frac{1}{x^2}\right)^2 + \left(x^3 + \frac{1}{x^3}\right)^2 + \dots$ up to n terms.

- (A) $\frac{x^{2n}-1}{x^2-1} \times \frac{x^{2n+2}+1}{x^{2n}} + 2n$
(B) $\frac{x^{2n}+1}{x^2+1} \times \frac{x^{2n+2}-1}{x^{2n}} - 2n$
(C) $\frac{x^{2n}-1}{x^2-1} \times \frac{x^{2n}-1}{x^{2n}} - 2n$
(D) None of these
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10. A person invites 10 friends to dinner and places them such that 4 are at one round table and 6 are at another round table. The total number of ways in which he can arrange the guests is:

- (A) $10!/6!$
(B) $10!/24$
(C) $9!/24$
(D) None of these
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11. If $z_1, z_2, \dots, z_n$ are complex numbers such that $|z_1| = |z_2| = \dots = |z_n| = 1$, then $|z_1 + z_2 + \dots + z_n|$ is equal to:

- (A) $|z_1 z_2 z_3 \dots z_n|$
(B) $|z_1| + |z_2| + \dots + |z_n|$
(C) $\left| \frac{1}{z_1} + \frac{1}{z_2} + \dots + \frac{1}{z_n} \right|$
(D) n
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12. Evaluate the definite integral: $\int_0^{\pi/2} \sin^2(x) dx$.

- (A) $\frac{\pi}{4}$
(B) $\frac{\pi}{2}$
(C) 1
(D) 0
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