



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. Young's moduli of the material of wires A and B are in the ratio of 1:4, while its area of cross sections are in the ratio of 1:3. If the same amount of load is applied to both the wires,

the amount of elongation produced in the wires A and B will be in the ratio of (Assume length of wires A and B are same):

- (a) 1:12
 - (b) 12:1
 - (c) 36:1
 - (d) 1:36
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2. A hollow glass stopper of relative density 2.5 just sinks in water. The ratio of volume of cavity to that of stopper is:

- (a) 1:2
 - (b) 3:5
 - (c) 1:5
 - (d) 3:2
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3. A gas undergoes a process in which the pressure and volume are related by $VP^n = \text{constant}$. The bulk modulus of the gas is:

- (a) nP
 - (b) $P^{1/n}$
 - (c) P/n
 - (d) P^n
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4. The initial pressure and volume of an ideal gas are P_0 and V_0 . The final pressure of the gas when the gas is suddenly compressed to volume $V_0/4$ will be: (Given $\gamma = \text{ratio of specific heats at constant pressure and at constant volume}$)

- (a) P_0
- (b) $4P_0$
- (c) $P_0(4)^\gamma$
- (d) $P_0(4)^{1/\gamma}$

CHEMISTRY

5. The Bohr orbit radius for the hydrogen atom ($n = 1$) is approximately $0.530 \text{ \AA}$. The radius for the first excited state ($n = 2$) orbit is (in $\text{\AA}$):

- (a) 0.13
- (b) 1.06
- (c) 4.77
- (d) 2.12

6. In PO_4^{3-} the formal charge on each oxygen atom and the P - O bond order respectively are:

- (a) -0.75, 0.6
- (b) -0.75, 1.0
- (c) -0.75, 1.25
- (d) -3, 1.25

7. The value of x is maximum for:

- (a) $MgSO_4 \cdot xH_2O$
- (b) $CaSO_4 \cdot xH_2O$
- (c) $BaSO_4 \cdot xH_2O$
- (d) All have the same value of x .

MATHEMATICS

8. Let P be a point on the parabola, $x^2 = 4y$. If the distance of P from the centre of the circle, $x^2 + y^2 + 6x + 8 = 0$ is minimum, then the equation of the tangent to the parabola at P is:

- (a) $x + 4y - 2 = 0$
 - (b) $x + y + 1 = 0$
 - (c) $x - y + 3 = 0$
 - (d) $x + 2y = 0$
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9. If $x = \sqrt{2^{\operatorname{cosec}^{-1}t}}$ and $y = \sqrt{2^{\sec^{-1}t}}$ ($|t| \geq 1$), then dy/dx is equal to:

- (a) y/x
 - (b) $-y/x$
 - (c) $-x/y$
 - (d) x/y
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10. If $f(x) = \int_0^x t(\sin x - \sin t)dt$ then:

- (a) $f'''(x) - f''(x) = \cos x - 2x \sin x$
 - (b) $f'''(x) + f'(x) = \cos x - 2x \sin x$
 - (c) $f'''(x) + f''(x) = \sin x$
 - (d) $f'''(x) + f''(x) - f'(x) = \cos x$
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