



### 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 particle moves along a straight line such that its position is given by  $x(t) = 3t^2 - t^3$ . What is its velocity at  $t = 2$  seconds?

- (A) 0 m/s
  - (B) 4 m/s
  - (C)  $-4$  m/s
  - (D) 12 m/s
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2. A force of 20 N is applied to a 5 kg object at an angle of  $60^\circ$  to the horizontal. What is the horizontal acceleration of the object, ignoring friction?

- (A)  $2 \text{ m/s}^2$
  - (B)  $4 \text{ m/s}^2$
  - (C)  $1.73 \text{ m/s}^2$
  - (D)  $2.5 \text{ m/s}^2$
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3. A ball is projected horizontally from the top of a tower with a velocity of 10 m/s. If it hits the ground 2 seconds later, what is the height of the tower? (Take  $g = 10 \text{ m/s}^2$ )

- (A) 20 m
  - (B) 10 m
  - (C) 40 m
  - (D) 25 m
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4. An ideal gas is compressed isothermally. During this process:

- (A) Internal energy remains constant
  - (B) Temperature increases
  - (C) No work is done on the gas
  - (D) Pressure remains constant
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## CHEMISTRY

5. Which of the following compounds exhibits the highest boiling point due to hydrogen bonding?

- (A)  $\text{H}_2\text{O}$
- (B)  $\text{H}_2\text{S}$

- (C)  $\text{CH}_4$   
(D)  $\text{HCl}$
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6. For a first-order reaction  $A \rightarrow B$ , the rate constant is  $0.1 \text{ s}^{-1}$ . What is the time required for 50% completion?

- (A) 6.93 s  
(B) 5 s  
(C) 10 s  
(D) 0.693 s
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7. In a galvanic cell, oxidation always occurs at:

- (A) The anode  
(B) The cathode  
(C) The salt bridge  
(D) The electrolyte
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8. Which of the following is an example of an intensive property?

- (A) Temperature  
(B) Mass  
(C) Volume  
(D) Total energy
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## MATHEMATICS

9. If

$$f(x) = \ln\left(\frac{\sin x}{1 + \cos x}\right),$$

then  $f'(x)$  is equal to:

- (A)  $\csc x$   
(B)  $\cot x$   
(C)  $\tan x$

(D)  $\sec x$

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**10. The sum of the first 20 terms of an arithmetic progression is 640, and the difference between the 15<sup>th</sup> and 5<sup>th</sup> terms is 30. Find the first term of the A.P**

(A) 12

(B) 14

(C) 17

(D) 19

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**11. If a real matrix  $A$  satisfies**

$$A^T = A \quad \text{and} \quad A^2 = I,$$

**then the eigenvalues of  $A$  must be:**

(A) Only 1

(B) Only  $-1$

(C) Either 1 or  $-1$

(D) Zero only

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**12. Evaluate:**

$$\int_0^1 x^3 \ln(1+x) dx$$

(A)  $\frac{7}{48}$

(B)  $\frac{25}{48}$

(C)  $\frac{1}{8}$

(D)  $\frac{5}{24}$

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