



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. The value of $\tan^{-1}(\sqrt{3}) + \sec^{-1}(-2) - \sin^{-1}\left(-\frac{1}{2}\right)$ is

- (A) $\frac{\pi}{2}$
- (B) $\frac{7\pi}{6}$
- (C) $\frac{2\pi}{3}$
- (D) $\frac{5\pi}{6}$

2. If the statement $(p \wedge q) \rightarrow (r \vee \neg s)$ is False (F), then the truth values of p, q, r and s are respectively

- (A) T, T, F, T
- (B) T, F, T, F
- (C) F, F, T, T
- (D) T, T, T, F

3. In $\triangle ABC$, if $2a^2 = b^2 + c^2$, then the value of $\frac{\cos 3A}{\cos A} + 2$ is

- (A) 0
- (B) 1
- (C) 2
- (D) 3

4. In $\triangle ABC$, $(b - c)^2 \cos^2 \frac{A}{2} + (b + c)^2 \sin^2 \frac{A}{2} =$

- (A) a
- (B) a^2
- (C) $b^2 + c^2$
- (D) $2a^2$

5. If $\frac{dy}{dx} = y + 5$ and $y(0) = 4$, then $y(\log 2)$ is equal to

- (A) 13
- (B) 15
- (C) 18

(D) 9

6. The coordinates of the foot of the perpendicular from the origin to the plane $2x - 3y - 6z = 4$ are

(A) $\left(\frac{8}{49}, -\frac{12}{49}, -\frac{24}{49}\right)$

(B) $\left(\frac{2}{7}, -\frac{3}{7}, -\frac{6}{7}\right)$

(C) $\left(\frac{8}{7}, -\frac{12}{7}, -\frac{24}{7}\right)$

(D) $\left(\frac{4}{49}, -\frac{6}{49}, -\frac{12}{49}\right)$

7. The solution of the differential equation $\frac{dy}{dx} = \frac{x+y}{x-y}$ is

(A) $\tan^{-1}\left(\frac{y}{x}\right) = \log \sqrt{x^2 + y^2} + C$

(B) $\tan^{-1}\left(\frac{x}{y}\right) = \log(x + y) + C$

(C) $x^2 + y^2 = C(x + y)$

(D) $y = x \tan(\log x + C)$

Chemistry

8. The monomer used to prepare Orlon is

(A) Vinyl chloride

(B) Tetrafluoroethylene

(C) Acrylonitrile

(D) Styrene

9. Identify the product when a ketone reacts with hydrazine ($NH_2 - NH_2$)

- (A) Oxime
 - (B) Hydrazone
 - (C) Semicarbazone
 - (D) Phenylhydrazone
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10. Which of the following reagents is used to prepare alkyl isocyanides from alkyl halides (RX)?

- (A) KCN (alc.)
 - (B) $AgCN$ (alc.)
 - (C) $NaCN$ (aq.)
 - (D) HCN
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11. Which of the following aqueous solutions will show maximum vapour pressure at 300 K?

- (A) 0.1 M Glucose
 - (B) 0.1 M $NaCl$
 - (C) 0.1 M $CaCl_2$
 - (D) 0.1 M $AlCl_3$
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