



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. Evaluate the integral:

$$\int \frac{2x}{x^2 - 5x + 4} dx$$

- (A) $\frac{8}{3} \ln|x - 4| - \frac{2}{3} \ln|x - 1| + C$
- (B) $\frac{2}{3} \ln|x - 1| - \frac{8}{3} \ln|x - 4| + C$
- (C) $2 \ln|x - 1| + \ln|x - 4| + C$

(D) $\ln|x^2 - 5x + 4| + C$

2. For the curve $y = 3x^3 - 3x^2 + 1$ at $x = 1$, find the equation of the tangent.

(A) $y = 3x - 2$

(B) $y = 3x - 3$

(C) $y = 3x - 1$

(D) $y = x + 1$

3. Find the general solution for x if $\cos 4x = \cos 3x$.

(A) $x = 2n\pi$

(B) $x = \frac{2n\pi}{7}$

(C) $x = \frac{2n\pi}{7}, 2n\pi$

(D) $x = \frac{n\pi}{7}$

4. Evaluate the integral:

$$\int \frac{x}{x+2} dx$$

(A) $x - 2\ln|x+2| + C$

(B) $x + 2\ln|x+2| + C$

(C) $x - \ln|x+2| + C$

(D) $\ln|x+2| + C$

5. If A, B, C are vertices of a triangle with position vectors $\vec{a}, \vec{b}, \vec{c}$, find the position vector of the point D where the angle bisector from vertex A meets BC .

(A) $\frac{\vec{b} + \vec{c}}{2}$

- (B) $\frac{|\vec{AC}| \vec{b} + |\vec{AB}| \vec{c}}{|\vec{AB}| + |\vec{AC}|}$
- (C) $\frac{|\vec{AB}| \vec{b} + |\vec{AC}| \vec{c}}{|\vec{AB}| + |\vec{AC}|}$
- (D) $\frac{\vec{a} + \vec{b} + \vec{c}}{3}$
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Physics

6. A particle starts oscillating simple harmonically from its mean position with time period T ; find the ratio of potential energy to kinetic energy at time $t = \frac{T}{6}$.

- (A) $\frac{1}{3}$
- (B) 3
- (C) $\frac{1}{2}$
- (D) 1
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7. Calculate the percentage increase in apparent frequency for an observer moving towards a stationary sound source with $\frac{1}{5}$ th the velocity of sound.

- (A) 10%
- (B) 20%
- (C) 25%
- (D) 30%
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8. Find the ratio of fundamental frequencies f_1/f_2 for a pipe open at both ends when $\frac{1}{3}$ of its length is later submerged in water.

- (A) $\frac{3}{2}$
- (B) 2
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(C) $\frac{4}{3}$

(D) $\frac{3}{4}$

9. A car starts from rest and accelerates uniformly at 3 m/s^2 ; determine its velocity after 5 seconds.

(A) 10 m/s

(B) 15 m/s

(C) 20 m/s

(D) 25 m/s

10. Find the acceleration of a 2 kg block acted upon by a net force of 10 N .

(A) 2 m/s^2

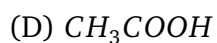
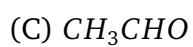
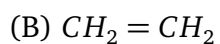
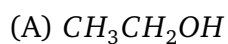
(B) 5 m/s^2

(C) 10 m/s^2

(D) 20 m/s^2

Chemistry

11. Identify the product formed when $\text{CH}_3\text{--CH}_2\text{--Br}$ reacts with alcoholic KOH .



12. What is the oxidation state of oxygen in peroxides?

- (A) -2
 - (B) -1
 - (C) 0
 - (D) $+1$
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13. Identify the specific reagent used in the Swarts reaction (e.g., AgF or SbF_3).

- (A) $AgCl$
 - (B) SbF_3
 - (C) $FeCl_3$
 - (D) HCl
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14. Which of the following is a disproportionation reaction: Clemmensen, Wolff–Kishner, or Cannizzaro?

- (A) Clemmensen reaction
 - (B) Wolff–Kishner reaction
 - (C) Cannizzaro reaction
 - (D) None of these
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15. Predict the product when an alcohol reacts with sodium metal.

- (A) Alkane
 - (B) Sodium alkoxide + Hydrogen gas
 - (C) Ether
 - (D) Aldehyde
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