



General Instructions

- (i) **Duration:** The total duration of the examination is 2.5 hours (150 minutes).
- (ii) **Total Marks:** The complete paper carries a maximum of 500 marks.
- (iii) **Structure:** The paper has 4 Sections:
 - **Part 1:** 35 Multiple Choice Questions (Physics).
 - **Part 2:** 35 Multiple Choice Questions (Chemistry).
 - **Part 3:** 40 Multiple Choice Questions (Mathematics/Biology).
 - **Part 4:** 10 Multiple Choice Questions (Aptitude).
 - **Part 4:** 5 Multiple Choice Questions (English)
- (iv) **Compulsory Questions:** All 125 questions are compulsory.
- (v) Each question has four options. Only **one** option is correct.
- (vi) **Correct Answer:** +4 marks.
- (vii) **Incorrect Answer:** -1 (Negative marking).
- (viii) **Unanswered/Marked for Review:** 0 marks.

1. A bag contains 4 red and 6 black balls. A ball is drawn at random, its colour is noted and it is returned to the bag. Moreover, 2 additional balls of the colour drawn are put in the bag and then a ball is drawn at random. What is the probability that the second ball is red?

- (A) $\frac{1}{3}$
- (B) $\frac{2}{5}$

(C) $\frac{3}{5}$

(D) $\frac{4}{5}$

2. Find the integrating factor (I.F.) for the differential equation

$$\frac{dy}{dx} + y \sec x = \tan x.$$

(A) $\sec x - \tan x$

(B) $\sec x + \tan x$

(C) $\tan x$

(D) $\sec x$

3. If ω is an imaginary cube root of unity, find the value of $(1 + \omega - \omega^2)^7$.

(A) $128\omega^2$

(B) $-128\omega^2$

(C) 64ω

(D) $-64\omega^2$

4. In an LCR series circuit, the resonance frequency is f . If the capacitance is made 4 times, what will be the new resonance frequency?

(A) $4f$

(B) $2f$

(C) $f/2$

(D) $f/4$

5. A circular coil of radius R carries a current I . The magnetic field at its centre is B . At what distance from the centre on the axis of the coil will the magnetic field be $B/8$?

- (A) R
 - (B) $2R$
 - (C) $\sqrt{3}R$
 - (D) $4R$
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6. In a common emitter transistor amplifier, the audio signal voltage across the collector resistance of $2\text{ k}\Omega$ is 2 V . If the current amplification factor (β) is 100 and the base resistance is $1\text{ k}\Omega$, find the input signal voltage.

- (A) 0.1 V
 - (B) 0.01 V
 - (C) 0.02 V
 - (D) 0.005 V
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7. Which of the following electrolytes is most effective in the coagulation of a negative sol like As_2S_3 ?

- (A) NaCl
 - (B) MgCl_2
 - (C) AlCl_3
 - (D) KCl
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8. Which linkage joins the monosaccharide units in sucrose?

- (A) $\text{C}_1 - \text{C}_4$ glycosidic linkage
- (B) $\text{C}_1 - \text{C}_2$ glycosidic linkage
- (C) $\text{C}_1 - \text{C}_6$ glycosidic linkage

(D) $C_2 - C_4$ glycosidic linkage

9. A compound is formed by two elements X and Y . Atoms of Y make ccp and those of element X occupy all the octahedral voids. What is the formula of the compound?

(A) XY_2

(B) X_2Y

(C) XY

(D) X_2Y_3

10. Complete the series: 285, 253, 221, 189, ?

(A) 165

(B) 157

(C) 169

(D) 145
