



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 C:** 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) **Right Answer:** +1 marks for Physics and Chemistry Questions. +2 marks for Mathematics Questions
- (vii) **Incorrect Answer:** (No Negative marking).
- (viii) **Unanswered/Marked for Review:** 0 marks.

1. In a certain culture of bacteria, the rate of increase is proportional to the number of bacteria present at that instant. It is found that there are 10,000 bacteria at the end of 3 hours and 40,000 bacteria at the end of 5 hours, then the number of bacteria present in the beginning are:

- (A) 1250
- (B) 1200
- (C) 1350
- (D) 1300

2. The value of

$$\int \frac{x^2 - 1}{x^3 \sqrt{2x^4 - 2x^2 + 1}} dx$$

is:

- (A) $\sqrt{2 - \frac{2}{x^2} + \frac{1}{x^4}} + C$
 - (B) $2\sqrt{2 - \frac{2}{x^2} + \frac{1}{x^4}} + C$
 - (C) $\frac{1}{2}\sqrt{2 - \frac{2}{x^2} + \frac{1}{x^4}} + C$
 - (D) $\frac{1}{4}\sqrt{2 - \frac{2}{x^2} - \frac{1}{x^4}} + C$
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3. The area bounded by the X-axis and the curve

$$y = x(x - 2)(x + 1)$$

is:

- (A) $\frac{37}{12}$ sq. units
 - (B) $\frac{12}{27}$ sq. units
 - (C) $\frac{37}{4}$ sq. units
 - (D) $\frac{27}{13}$ sq. units
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4.

$$\int \frac{1}{x^{1/2} + x^{1/3}} dx$$

is equal to:

- (A) $\sqrt{x} - \sqrt[3]{x} + \sqrt[6]{x} - \log|x^{1/6} + 1| + C$
 - (B) $2\sqrt{x} - 3\sqrt[3]{x} + 6\sqrt[6]{x} - 6\log|x^{1/6} + 1| + C$
 - (C) $2\sqrt{x} + 3\sqrt[3]{x} + 6\sqrt[6]{x} + 6\log|x^{1/6} + 1| + C$
 - (D) $\sqrt{x} + \sqrt[3]{x} + \sqrt[6]{x} + \log|x^{1/6} + 1| + C$
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5. A wire 64 m long is bent into the shape of a rectangle. What should be its dimensions so that the enclosed area is maximum?

- (A) 16 m, 16 m
- (B) 18 m, 18 m

- (C) 24 m, 24 m
(D) 36 m, 36 m
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6. $\lim_{x \rightarrow 2} \left(\frac{1}{x-2} - \frac{2}{x^3 - 3x^2 + 2x} \right) =$
(A) $\frac{2}{3}$
(B) $-\frac{2}{3}$
(C) $\frac{3}{2}$
(D) $-\frac{3}{2}$

7. If slope of two lines represented by $\frac{x^2}{a} + \frac{2xy}{h} + \frac{y^2}{b} = 0$ is twice the other, then $ab : h^2 = ?$
(A) 1 : 2
(B) 2 : 1
(C) 8 : 9
(D) 9 : 8
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8. If A is a 3×3 matrix satisfying $2A = 3A^2 + kI$, and $\det(A) = 1$, then the value of k is:
(A) -1
(B) 1
(C) $-\frac{1}{3}$
(D) $\frac{1}{3}$
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9. If the area enclosed between the circle $x^2 + y^2 = 25$ and the parabola $y^2 = 16x$ is A , then $A = ?$
(A) $25\pi - 96$
(B) $50\pi - 96$
(C) $25\pi - 48$
(D) $50\pi - 48$
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10. If $\vec{a} = 2\hat{i} - \hat{j} + 3\hat{k}$ and $\vec{b} = \hat{i} + 2\hat{j} - \hat{k}$, then the vector perpendicular to both $\vec{a}$ and $\vec{b}$ is:

(A) $-5\hat{i} + 5\hat{j} + 5\hat{k}$

(B) $-5\hat{i} + 5\hat{j} - 5\hat{k}$

(C) $5\hat{i} + 5\hat{j} + 5\hat{k}$

(D) $-5\hat{i} - 5\hat{j} + 5\hat{k}$
