VITEEE 2026 May 2 Shift 2

Question Paper with Solutions

Conducted by VIT Vellore

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 5:** 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. Find the value of the integral $\int_0^{\pi/2} \frac{\sqrt{\sin x}}{\sqrt{\sin x}+\sqrt{\cos x}}\,dx$.

(A) π

(B) $\pi/2$

(C) $\pi/4$

(D) 0

Correct Answer: (C) $\pi/4$

Solution:

Concept:

A useful symmetry property of definite integrals is:

$$\int_0^a f(x)\,dx = \int_0^a f(a-x)\,dx$$

This property helps simplify integrals containing complementary trigonometric functions like $\sin x$ and $\cos x$, especially over intervals such as $[0, \pi/2]$.

Another useful trick is adding the integral with its transformed form to simplify the expression.

Step 1: Let the given integral be I.

$$I = \int_0^{\pi/2} \frac{\sqrt{\sin x}}{\sqrt{\sin x} + \sqrt{\cos x}}\,dx$$

Step 2: Using the property $\int_0^a f(x)dx = \int_0^a f(a-x)dx$.

Let $x \to \frac{\pi}{2} - x$.

Since

$$\sin\left(\frac{\pi}{2} - x\right) = \cos x$$

and

$$\cos\left(\frac{\pi}{2} - x\right) = \sin x$$

we get

$$I = \int_0^{\pi/2} \frac{\sqrt{\cos x}}{\sqrt{\cos x} + \sqrt{\sin x}}\,dx$$

Step 3: Adding the two expressions of I.

$$I = \int_0^{\pi/2} \frac{\sqrt{\sin x}}{\sqrt{\sin x} + \sqrt{\cos x}}dx$$

$$I = \int_0^{\pi/2} \frac{\sqrt{\cos x}}{\sqrt{\cos x} + \sqrt{\sin x}}dx$$

Adding,

$$2I = \int_0^{\pi/2} \left(\frac{\sqrt{\sin x}}{\sqrt{\sin x} + \sqrt{\cos x}} + \frac{\sqrt{\cos x}}{\sqrt{\cos x} + \sqrt{\sin x}} \right) dx$$

$$2I = \int_0^{\pi/2} 1 \, dx$$

$$2I = [x]_0^{\pi/2} = \frac{\pi}{2}$$

$$I = \frac{\pi}{4}$$

Quick Tip: For integrals involving $\sin x$ and $\cos x$ over $[0, \pi/2]$, try using the symmetry property $x \to \frac{\pi}{2} - x$. Adding the two forms of the integral often simplifies the expression dramatically.

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2. If A is a 3×3 matrix and $|A| = 5$, find the value of $|adj(A)|$.

(A) 5

(B) 25

(C) 125

(D) 15

Correct Answer: (B) 25

Solution:

Concept:

For any square matrix A of order n, an important determinant property related to the adjoint matrix is:

$$|adj(A)| = |A|^{n-1}$$

where $|A|$ = determinant of matrix A, $adj(A)$ = adjoint of matrix A, n = order of the square matrix.

This identity is frequently used in determinant and inverse-related problems.

Step 1: Identify the order of the matrix.

The matrix A is given as a 3×3 matrix.

$$n = 3$$

Step 2: Use the determinant property of adjoint.

$$|adj(A)| = |A|^{n-1}$$

Substitute the given values $|A| = 5$ and $n = 3$:

$$|adj(A)| = 5^{3-1}$$

$$|adj(A)| = 5^2$$

$$|adj(A)| = 25$$

Quick Tip: For an $n \times n$ matrix, always remember the identity $|adj(A)| = |A|^{n-1}$. For example, if the matrix is 3×3, then $|adj(A)| = |A|^2$.

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3. Calculate the de Broglie wavelength of an electron accelerated through a potential difference of $100\,V$.

(A) $1.227\,Å$

(B) $12.27\,Å$

(C) $0.1227\,Å$

(D) $122.7\,Å$

Correct Answer: (A) $1.227\,Å$

Solution:

Concept:

According to de Broglie's hypothesis, a moving particle exhibits wave nature. For an electron accelerated through a potential difference V, the wavelength is given by the shortcut formula:

$$\lambda = \frac{12.27}{\sqrt{V}}\,\text{Å}$$

where V is the accelerating potential in volts.

Step 1: Substitute the given potential difference.

$$V = 100$$

$$\lambda = \frac{12.27}{\sqrt{100}}$$

Step 2: Simplify the expression.

$$\lambda = \frac{12.27}{10}$$

$$\lambda = 1.227\,\text{Å}$$

Quick Tip: For electrons accelerated through a potential V, remember the shortcut formula $\lambda = \frac{12.27}{\sqrt{V}}$ Å. It is widely used in quick numerical problems related to matter waves.

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4. Calculate the work done in moving a charge of $2\mu C$ between two points with a potential difference of $5V$.

(A) $10\,J$

(B) $10^{-5}\,J$

(C) $2.5\,J$

(D) $0.4\,J$

Correct Answer: (B) $10^{-5}\,J$

Solution:

Concept:

The work done in moving a charge in an electric field is given by:

$$W = q \times \Delta V$$

where W = work done, q = charge, ΔV = potential difference.

Step 1: Substitute the given values.

$$q = 2\mu C = 2 \times 10^{-6} C$$

$$\Delta V = 5V$$

$$W = q \times \Delta V$$

Step 2: Calculate the work done.

$$W = (2 \times 10^{-6}) \times 5$$

$$W = 10 \times 10^{-6}$$

$$W = 10^{-5} J$$

Quick Tip: In electrostatics problems involving potential difference, always use $W = q\Delta V$. Convert microcoulombs (μC) into coulombs before substitution.

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5. Calculate the half-life of a first-order reaction if the rate constant is $0.693\,\text{min}^{-1}$.

(A) 10 min

(B) 1 min

(C) 0.5 min

(D) 6.93 min

Correct Answer: (B) 1 min

Solution:

Concept:

For a first-order reaction, the half-life is independent of the initial concentration and is given by the formula:

$$t_{1/2} = \frac{0.693}{k}$$

where $t_{1/2}$ = half-life of the reaction, k = rate constant of the reaction.

Step 1: Substitute the given value of the rate constant.

$$k = 0.693\,\text{min}^{-1}$$

$$t_{1/2} = \frac{0.693}{0.693}$$

Step 2: Simplify the expression.

$$t_{1/2} = 1\,\text{min}$$

Quick Tip: For first-order reactions, remember that the half-life formula is $t_{1/2} = \frac{0.693}{k}$. The half-life does not depend on the initial concentration of reactants.

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6. What is the major product formed when Propene reacts with HBr in the presence of peroxide?

(A) 2-Bromopropane

(B) 1-Bromopropane

(C) 1, 2-Dibromopropane

(D) Propane

Correct Answer: (B) 1-Bromopropane

Solution:

Concept:

In the presence of peroxide, the addition of HBr to an alkene follows the **Anti-Markovnikov rule**. According to this rule:

- The bromine atom attaches to the carbon having more hydrogen atoms.
- The hydrogen atom attaches to the more substituted carbon.

This reaction proceeds through a **free radical mechanism** and is commonly known as the **Peroxide Effect** or **Kharasch Effect**.

Step 1: Identify the structure of Propene.

$$CH_3 - CH = CH_2$$

Step 2: Apply the Anti-Markovnikov rule.

The bromine atom attaches to the terminal carbon (which has more hydrogen atoms), leading to the formation of:

$$CH_3 - CH_2 - CH_2Br$$

Step 3: Identify the product formed.

Product: 1-Bromopropane

Quick Tip: Remember: HBr in the presence of peroxide follows the Anti-Markovnikov rule (Peroxide Effect). This effect is observed only with HBr, not with HCl or HI.

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7. Complete the series: $3, 7, 15, 31, 63, \ldots$

(A) 95

(B) 111

(C) 127

(D) 128

Correct Answer: (C) 127

Solution:

Concept:

Many number series follow a recursive pattern where each term is obtained by performing an operation on the previous term. A common pattern is multiplying the previous term and then adding a constant.

Step 1: Observe the pattern between consecutive terms.

$$3 \rightarrow 7 \rightarrow 15 \rightarrow 31 \rightarrow 63$$

Check the relation:

$$3 \times 2 + 1 = 7$$

$$7 \times 2 + 1 = 15$$

$$15 \times 2 + 1 = 31$$

$$31 \times 2 + 1 = 63$$

Thus, the pattern is:

$$a_{n+1} = 2a_n + 1$$

Step 2: Apply the pattern to find the next term.

$$63 \times 2 + 1 = 126 + 1$$

$$= 127$$

Quick Tip: In number series problems, check simple operations such as multiplication, addition, subtraction, or powers between consecutive terms. Recognizing the pattern quickly helps determine the next number.