VITEEE 2026 May 1 Shift 1

Question Paper with Solutions

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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. Evaluate $\displaystyle\int_0^{\pi/2} \frac{\sqrt{\sin x}}{\sqrt{\sin x}+\sqrt{\cos x}}\,dx$.

(A) $\frac{\pi}{2}$

(B) $\frac{\pi}{6}$

(C) $\frac{\pi}{4}$

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

Correct Answer: (C) $\frac{\pi}{4}$

Solution:

Concept:

For definite integrals over symmetric limits, an important property is:

$$\int_a^b f(x)\,dx = \int_a^b f(a+b-x)\,dx$$

This property is particularly useful when the function contains expressions like $\sin x$ and $\cos x$, since under the transformation $x \to \frac{\pi}{2} - x$:

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

Using this symmetry often simplifies integrals significantly.

Step 1: Let the given integral be

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

Step 2: Use the property $\int_a^b f(x)dx = \int_a^b f(a+b-x)dx$.

Here $a = 0$ and $b = \frac{\pi}{2}$. Replace x with $\frac{\pi}{2} - x$:

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

Using trigonometric identities:

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

Thus,

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

Step 3: Add the two expressions for I.

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

Since the denominators are the same:

$$\frac{\sqrt{\sin x}}{\sqrt{\sin x}+\sqrt{\cos x}}+\frac{\sqrt{\cos x}}{\sqrt{\cos x}+\sqrt{\sin x}}=1$$

Therefore,

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

Step 4: Evaluate the remaining integral.

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

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

Quick Tip: For definite integrals of the form $\int_0^a f(x)\,dx$, always check the symmetry property $f(x)+f(a-x)$.
If their sum simplifies to a constant, the integral becomes very easy to evaluate.

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

(A) 5

(B) 10

(C) 25

(D) 125

Correct Answer: (C) 25

Solution:

Concept:

For a square matrix A of order n, an important determinant property involving the adjoint matrix is:

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

where $|A|$ is the determinant of matrix A, and n is the order of the matrix.
This property directly helps compute the determinant of the adjoint without explicitly finding the adjoint matrix.

Step 1: Identify the order of the matrix.
The matrix A is given as a 3×3 matrix.
Thus,

$$n = 3$$

Step 2: Apply the determinant property of the adjoint matrix.

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

Substituting the given values:

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

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

Step 3: Compute the value.

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

Quick Tip: For any $n \times n$ matrix A,

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

This formula avoids the lengthy process of actually computing the adjoint matrix.

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3. Find the area of the region bounded by the curve $y^2 = 4x$ and the line $x = 3$.

(A) $4\sqrt{3}$

(B) $6\sqrt{3}$

(C) $8\sqrt{3}$

(D) $12\sqrt{3}$

Correct Answer: (C) $8\sqrt{3}$

Solution:

Concept:

The curve $y^2 = 4x$ represents a parabola opening to the right. Since the equation contains y^2, the curve is symmetric about the x-axis.

To find the area bounded between the parabola and a vertical line, we integrate with respect to x. Because of symmetry, we compute the area above the x-axis and multiply by 2.

Step 1: Express y in terms of x.

From

$$y^2 = 4x$$

$$y = \pm\sqrt{4x}$$

Thus,

$$y = \pm 2\sqrt{x}$$

Step 2: Find the limits of integration.

The region is bounded by the vertical line

$$x = 3$$

and the parabola starts at the vertex

$$x = 0$$

Thus the limits are:

$$0 \leq x \leq 3$$

Step 3: Set up the area integral.

Area of the region:

$$A = 2\int_0^3 y\,dx$$

Substitute $y = 2\sqrt{x}$:

$$A = 2\int_0^3 2\sqrt{x}\,dx$$

$$A = 4\int_0^3 x^{1/2}\,dx$$

Step 4: Evaluate the integral.

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

Thus,

$$A = 4\left[\frac{x^{3/2}}{3/2}\right]_0^3$$

$$A = 4\left[\frac{2}{3}x^{3/2}\right]_0^3$$

$$A = \frac{8}{3}(3^{3/2})$$

$$3^{3/2} = 3\sqrt{3}$$

$$A = \frac{8}{3}(3\sqrt{3})$$

$$A = 8\sqrt{3}$$

Quick Tip: If a curve contains y^2 (like $y^2 = 4x$), it is symmetric about the x-axis. When finding the enclosed area, integrate for the positive branch and multiply the result by 2.

4. If the current in a coil changes from $2\,\text{A}$ to $4\,\text{A}$ in $0.1\,\text{s}$, inducing an EMF of $20\,\text{V}$, find the self-inductance.

(A) $0.5\,\text{H}$

(B) $1\,\text{H}$

(C) $2\,\text{H}$

(D) $4\,\text{H}$

Correct Answer: (B) $1\,\text{H}$

Solution:

Concept:
Self-inductance is defined using the relation between induced EMF and the rate of change of current:

$$e = L\frac{di}{dt}$$

where e = induced EMF, L = self-inductance of the coil, $\frac{di}{dt}$ = rate of change of current.

Step 1: Compute the rate of change of current.
The current changes from $2\,\text{A}$ to $4\,\text{A}$.

$$\frac{di}{dt} = \frac{4-2}{0.1}$$

$$\frac{di}{dt} = \frac{2}{0.1} = 20$$

Step 2: Substitute into the self-inductance formula.

$$e = L\frac{di}{dt}$$

$$20 = L(20)$$

Step 3: Solve for L.

$$L = 1\,\text{H}$$

Quick Tip: Self-inductance problems usually use the formula $e = L\frac{di}{dt}$. Always compute the rate of change of current first before solving for L.

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5. In a common emitter transistor, $\beta = 100$, $R_c = 2\,\text{k}\Omega$, and the output voltage is $2\,\text{V}$. If $R_b = 1\,\text{k}\Omega$, find the input voltage.

(A) $0.02\,\text{V}$

(B) $0.01\,\text{V}$

(C) $0.1\,\text{V}$

(D) $0.2\,\text{V}$

Correct Answer: (B) $0.01\,\text{V}$

Solution:

Concept:

The voltage gain of a common emitter transistor amplifier is given by:

$$A_v = \beta \frac{R_c}{R_b}$$

Also,

$$A_v = \frac{V_{out}}{V_{in}}$$

These relations allow us to determine the input voltage when the output voltage and gain are known.

Step 1: Calculate the voltage gain.

$$A_v = \beta \frac{R_c}{R_b}$$

$$A_v = 100 \times \frac{2}{1}$$

$$A_v = 200$$

Step 2: Use the gain relation.

$$A_v = \frac{V_{out}}{V_{in}}$$

$$200 = \frac{2}{V_{in}}$$

Step 3: Solve for the input voltage.

$$V_{in} = \frac{2}{200}$$

$$V_{in} = 0.01\,\text{V}$$

Quick Tip: For common emitter amplifiers, remember the gain formula $A_v = \beta \frac{R_c}{R_b}$. Then use $A_v = \frac{V_{out}}{V_{in}}$ to find the required voltage.

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6. Two point charges q_1 and q_2 are r cm apart in a vacuum with force F. What is the force if they are placed in a medium with dielectric constant $K = 5$ at distance $r/5$?

(A) F

(B) $2F$

(C) $5F$

(D) $25F$

Correct Answer: (C) $5F$

Solution:

Concept:

According to Coulomb's law, the force between two charges in vacuum is:

$$F = \frac{1}{4\pi\epsilon_0}\frac{q_1q_2}{r^2}$$

When the charges are placed in a medium with dielectric constant K, the force becomes:

$$F = \frac{1}{4\pi\epsilon_0 K}\frac{q_1q_2}{r^2}$$

Thus, the force is inversely proportional to the dielectric constant and inversely proportional to the square of the distance.

Step 1: Write the expression for the new force.

If the distance becomes $r/5$ and the medium has dielectric constant $K = 5$:

$$F_{\text{new}} = \frac{1}{4\pi\epsilon_0 K}\frac{q_1q_2}{(r/5)^2}$$

Step 2: Simplify the expression.

$$(r/5)^2 = \frac{r^2}{25}$$

$$F_{\text{new}} = \frac{1}{K} \times 25\left(\frac{1}{4\pi\epsilon_0}\frac{q_1q_2}{r^2}\right)$$

Step 3: Express in terms of the original force F.

$$F_{\text{new}} = \frac{25}{5}F$$

$$F_{\text{new}} = 5F$$

Quick Tip: From Coulomb's law, $F \propto \frac{1}{Kr^2}$. If distance decreases by a factor of 5, force increases by 25. Then divide by the dielectric constant K.

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7. A compound is formed by elements X and Y. Y atoms make CCP and X atoms occupy all octahedral voids. What is the formula?

(A) X_2Y

(B) XY

(C) XY_2

(D) X_2Y_3

Correct Answer: (B) XY

Solution:

Concept:

In a Close Packed Crystal (CCP) structure:

- If the number of atoms forming the close packing is N,
- The number of **octahedral voids** present is also N.

If another atom occupies all octahedral voids, the ratio between the two types of atoms becomes directly comparable with the number of voids.

Step 1: Determine the number of atoms forming CCP.

Let the number of Y atoms forming the CCP structure be:

$$N$$

Step 2: Determine the number of octahedral voids.

In CCP:

$$\text{Number of octahedral voids} = N$$

Step 3: Determine the number of X atoms.

Since X atoms occupy **all octahedral voids**:

$$X = N$$

Thus,

$$X : Y = N : N$$

$$X : Y = 1 : 1$$

Step 4: Write the chemical formula.

$$\boxed{XY}$$

Quick Tip: In CCP or FCC structures: **Octahedral voids = Number of atoms in the lattice**.
If all octahedral voids are filled, the ratio of void atoms to lattice atoms becomes 1 : 1.

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8. Which linkage joins the monosaccharide units in sucrose?

(A) $C_1 - C_4$ glycosidic linkage

(B) $C_1 - C_2$ glycosidic linkage

(C) $C_1 - C_6$ glycosidic linkage

(D) $C_2 - C_4$ glycosidic linkage

Correct Answer: (B) $C_1 - C_2$ glycosidic linkage

Solution:

Concept:

Sucrose is a **disaccharide** composed of two monosaccharides:

- α-D-glucose
- β-D-fructose

These two units are connected through a **glycosidic bond**. The bond is formed between specific carbon atoms of the two sugars.

Step 1: Identify the carbon atoms involved in bonding.

The glycosidic bond in sucrose is formed between:

$$C_1 \text{ of glucose}$$

and

$$C_2 \text{ of fructose}$$

Step 2: Write the linkage type.

Thus the linkage is:

$$C_1 - C_2$$

glycosidic linkage.

Step 3: State the final answer.

Therefore, sucrose contains a

$$C_1 - C_2$$

glycosidic bond.

Quick Tip: Remember common carbohydrate linkages:

- Maltose $\rightarrow C_1 - C_4$ linkage
- Lactose $\rightarrow C_1 - C_4$ linkage
- **Sucrose** $\rightarrow C_1 - C_2$ **linkage**

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9. Which electrolyte is most effective in the coagulation of a negative sol like As_2S_3?

(A) $NaCl$

(B) $MgCl_2$

(C) $AlCl_3$

(D) KCl

Correct Answer: (C) $AlCl_3$

Solution:

Concept:

According to the **Hardy–Schulze rule**:

> The greater the valency of the ion responsible for neutralizing the charge of a colloidal particle, the greater its coagulating power.

For a **negatively charged sol**, the coagulating ions are **positive ions (cations)**.

Step 1: Identify the nature of the sol.

The sol As_2S_3 is a **negative sol**.

Thus, **cations** will cause coagulation.

Step 2: Compare the valencies of the cations.

$$NaCl \rightarrow Na^+ \quad \text{(valency 1)}$$

$$MgCl_2 \rightarrow Mg^{2+} \quad \text{(valency 2)}$$

$$AlCl_3 \rightarrow Al^{3+} \quad \text{(valency 3)}$$

$$KCl \rightarrow K^+ \quad \text{(valency 1)}$$

Step 3: Apply Hardy–Schulze rule.

Since the coagulating power increases with valency:

$$Al^{3+} > Mg^{2+} > Na^+ = K^+$$

Step 4: Identify the most effective electrolyte.

Thus the most effective coagulating electrolyte is:

$$AlCl_3$$

Quick Tip: Hardy–Schulze rule: **Higher valency of the counter-ion → greater coagulation power.** For negative sols, **cations** are responsible for coagulation.

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

(A) 165

(B) 157

(C) 149

(D) 161

Correct Answer: (B) 157

Solution:

Concept:

In number series problems, we often check the **difference between consecutive terms**. If the difference remains constant, the sequence forms an **Arithmetic Progression (A.P.)**.

Step 1: Find the difference between consecutive terms.

$$253 - 285 = -32$$

$$221 - 253 = -32$$

$$189 - 221 = -32$$

Thus, the sequence follows an arithmetic pattern with common difference

$$d = -32$$

Step 2: Find the next term.

$$189 - 32 = 157$$

Step 3: Write the next number in the series.

$$\boxed{157}$$

Quick Tip: In many number series questions, first check if the sequence follows an **arithmetic pattern**. If the difference between terms is constant, simply add or subtract that value to get the next term.

11. If 'PLAYER' is written as '543976' and 'DARE' is '8367', what is the code for 'YELP'?

(A) 9745

(B) 9457

(C) 9743

(D) 9547

Correct Answer: (A) 9745

Solution:

Concept:
In coding–decoding problems, each letter is assigned a specific numerical value. We determine the mapping of letters to numbers using the given coded words.

Step 1: Use the coding of 'PLAYER'.

$$PLAYER \rightarrow 543976$$

Thus,

$$P = 5, \quad L = 4, \quad A = 3, \quad Y = 9, \quad E = 7, \quad R = 6$$

Step 2: Verify using 'DARE'.

$$DARE \rightarrow 8367$$

From this,

$$D = 8, \quad A = 3, \quad R = 6, \quad E = 7$$

This confirms the previous letter-number assignments.

Step 3: Write the code for 'YELP'.
Using the mapping:

$$Y = 9, \quad E = 7, \quad L = 4, \quad P = 5$$

Thus,

$$YELP = 9745$$

Step 4: Final coded number.

$$\boxed{9745}$$

Quick Tip: In coding–decoding questions, first determine the **letter-to-number mapping** using the given examples. Then apply the same mapping to the required word.
