# VITEEE 2026 April 28 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. A wire of resistance $R$ is stretched to double its original length. What is its new resistance?**

(A) $2R$

(B) $4R$

(C) $\frac{R}{2}$

(D) $R$

**Correct Answer:** (B) $4R$

**Solution:**

**Concept:**

The resistance of a wire is given by the relation

$$R = \rho \frac{L}{A}$$

where

- $\rho$ = resistivity of the material (constant for a given material),
- $L$ = length of the wire,
- $A$ = cross-sectional area.

When a wire is stretched, its **volume remains constant** (assuming uniform stretching).

Since

$$\text{Volume} = A \times L$$

if the length increases, the cross-sectional area must decrease proportionally.

**Step 1:** Apply the constant volume condition.

Let the original length be $L$ and the original area be $A$.

If the wire is stretched to **double its length**, then

$$L' = 2L$$

Since the volume remains constant,

$$AL = A'L'$$

$$AL = A'(2L)$$

$$A' = \frac{A}{2}$$

Thus, the new cross-sectional area becomes half.

**Step 2:** Substitute into the resistance formula.

The new resistance is

$$R' = \rho \frac{L'}{A'}$$

Substituting $L' = 2L$ and $A' = \frac{A}{2}$:

$$R' = \rho \frac{2L}{A/2}$$

$$R' = \rho \times \frac{2L \times 2}{A}$$

$$R' = 4\rho \frac{L}{A}$$

$$R' = 4R$$

Thus, the new resistance becomes

$$\boxed{4R}$$

**Quick Tip:** If a wire is stretched to $n$ times its original length while volume remains constant, the new resistance becomes $n^2R$.

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**2. What is the de Broglie wavelength of an electron accelerated through a potential difference of 100 V?**

(A) 0.1227 Å

(B) 1.227 Å

(C) 12.27 Å

(D) 0.01227 Å

**Correct Answer:** (B) 1.227 Å

**Solution:**

**Concept:**

The de Broglie wavelength of an electron accelerated through a potential difference $V$ is given by

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

where $V$ is in volts.

**Step 1:** Substitute the given potential difference.

$$V = 100$$

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

**Step 2:** Simplify the expression.

$$\sqrt{100} = 10$$

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

$$\lambda = 1.227 \text{ Å}$$

$$\boxed{\lambda = 1.227 \text{ Å}}$$

**Quick Tip:** For electrons accelerated through a potential $V$, quickly use

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

This shortcut is widely used in quantum mechanics problems.

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**3. In a Young's Double Slit Experiment, if the distance between the slits is halved and the distance to the screen is doubled, what happens to the fringe width?**

(A) Doubled

(B) Halved

 

(C) Quadrupled

(D) Unchanged

**Correct Answer:** (C) Quadrupled

**Solution:**

**Concept:**

The fringe width in Young's Double Slit Experiment is given by

$$\beta = \frac{\lambda D}{d}$$

where

- $\lambda =$ wavelength of light
- $D =$ distance between slit and screen
- $d =$ distance between the slits

**Step 1:** Write the original fringe width.

$$\beta = \frac{\lambda D}{d}$$

**Step 2:** Apply the new conditions.

Distance to screen is doubled:

$$D' = 2D$$

Distance between slits is halved:

$$d' = \frac{d}{2}$$

**Step 3:** Substitute into the fringe width formula.

$$\beta' = \frac{\lambda D'}{d'}$$

$$\beta' = \frac{\lambda (2D)}{d/2}$$

$$\beta' = \frac{2\lambda D}{d/2}$$

$$\beta' = 4\frac{\lambda D}{d}$$

$$\beta' = 4\beta$$

Thus, the fringe width becomes four times the original value.

$$\boxed{\beta' = 4\beta}$$

**Quick Tip:** In Young's Double Slit Experiment, fringe width follows

$$\beta \propto \frac{D}{d}$$

Increasing screen distance increases fringe width, while increasing slit separation decreases it.

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**4. What is the coordination number of Cobalt in $[Co(en)_3]^{3+}$?**

(A) 3

(B) 4

(C) 6

(D) 2

**Correct Answer:** (C) 6

**Solution:**

**Concept:**

The coordination number of a complex is the total number of coordinate bonds formed between the central metal atom and the ligands.

Ethylenediamine ($en$) is a **bidentate ligand**, meaning each ligand forms two coordinate bonds with the central metal atom.

**Step 1:** Identify number of ligands and their denticity.

Number of ligands = 3, and each ligand forms 2 bonds.

**Step 2:** Calculate coordination number.

$$\text{Coordination number} = 3 \times 2 = 6$$

$$\boxed{6}$$

**Quick Tip:** Bidentate ligands like *en* contribute two bonds each. Multiply number of ligands by their denticity to find coordination number.

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**5. Which gas is evolved when Sodium metal reacts with Ethanol?**

(A) Oxygen

(B) Hydrogen

(C) Nitrogen

(D) Carbon dioxide

**Correct Answer:** (B) Hydrogen ($H_2$)

**Solution:**

**Concept:**

Sodium reacts with ethanol by displacing the acidic hydrogen of the hydroxyl group, forming sodium ethoxide and hydrogen gas.

**Step 1:** Write the balanced chemical reaction.

$$2C_2H_5OH + 2Na \rightarrow 2C_2H_5ONa + H_2$$

**Step 2:** Identify the gas evolved.

From the reaction, hydrogen gas ($H_2$) is released.

$$\boxed{H_2}$$

**Quick Tip:** Active metals like sodium react with alcohols to release hydrogen gas by replacing the acidic hydrogen of the $-OH$ group.

 

**6. What is the order of a reaction if the rate constant unit is $L \cdot mol^{-1} \cdot s^{-1}$?**

(A) Zero order

(B) First order

(C) Second order

(D) Third order

**Correct Answer:** (C) Second Order

**Solution:**

**Concept:**

The unit of rate constant $k$ for an $n^{th}$ order reaction is given by

$$k = (mol/L)^{1-n} \cdot s^{-1}$$

**Step 1:** Compare given unit with general formula.

Given:

$$k = L \cdot mol^{-1} \cdot s^{-1} = (mol/L)^{-1} \cdot s^{-1}$$

**Step 2:** Equate powers.

$$1 - n = -1$$

$$n = 2$$

Second Order

**Quick Tip:** For reaction order $n$:

$$k \propto (mol/L)^{1-n}$$

Match the exponent to quickly determine the order.

**7. If $\tan^{-1} x + \tan^{-1} y = \frac{\pi}{4}$, then what is the value of $x + y + xy$?**

(A) 0

(B) 1

(C) 2

(D) $-1$

**Correct Answer:** (B) 1

**Solution:**

**Concept:**

For inverse tangent addition,

$$\tan^{-1} a + \tan^{-1} b = \tan^{-1}\left(\frac{a+b}{1-ab}\right)$$

provided the angles lie in the principal range.

**Step 1:** Apply the identity.

$$\tan^{-1} x + \tan^{-1} y = \tan^{-1}\left(\frac{x+y}{1-xy}\right)$$

Given

$$\tan^{-1} x + \tan^{-1} y = \frac{\pi}{4}$$

so

$$\tan^{-1}\left(\frac{x+y}{1-xy}\right) = \frac{\pi}{4}$$

**Step 2:** Take tangent on both sides.

$$\frac{x+y}{1-xy} = \tan\left(\frac{\pi}{4}\right) = 1$$

**Step 3:** Solve the equation.

$$x + y = 1 - xy$$

$$x + y + xy = 1$$

$$\boxed{1}$$

**Quick Tip:** For problems involving $\tan^{-1} x + \tan^{-1} y$, convert them using

$$\tan^{-1} x + \tan^{-1} y = \tan^{-1}\left(\frac{x+y}{1-xy}\right).$$

This often simplifies the expression immediately.

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**8. Find the value of** $\displaystyle\int_0^{\pi/2} \frac{\sin x}{\sin x + \cos x}\, dx$.

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

(B) $\frac{\pi}{8}$

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

(D) 1

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

**Solution:**

**Concept:**

For definite integrals,

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

This symmetry property helps simplify many trigonometric integrals.

**Step 1:** Let

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

Using $x \to \frac{\pi}{2} - x$,

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

**Step 2:** Add the two expressions.

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

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

**Step 3:** Evaluate the integral.

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

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

$$\boxed{\frac{\pi}{4}}$$

**Quick Tip:** For integrals of the form $\int_0^{\pi/2} \frac{f(\sin x, \cos x)}{g(\sin x, \cos x)} dx$, try the substitution $x \to \frac{\pi}{2} - x$ and add both expressions.

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**9. What is the distance of the point $(1, 2, 3)$ from the $yz$-plane?**

(A) 3

(B) 2

(C) 1

(D) $\sqrt{3}$

**Correct Answer:** (C) 1

**Solution:**

**Concept:**

The equation of the $yz$-plane is

 

$$x = 0$$

The perpendicular distance of a point $(x, y, z)$ from the $yz$-plane is the absolute value of its $x$-coordinate.

**Step 1:** Identify the coordinate.
Given point:

$$(1, 2, 3)$$

**Step 2:** Apply the distance formula.

$$\text{Distance} = |x|$$

$$= |1|$$

$$= 1$$

$$\boxed{1}$$

**Quick Tip:** Distance from coordinate planes:

$$\text{Distance from } yz\text{-plane} = |x|, \quad \text{from } xz\text{-plane} = |y|, \quad \text{from } xy\text{-plane} = |z|.$$

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**10. Pointing to a man, a woman said, "His mother is the only daughter of my mother." How is the woman related to the man?**

(A) Sister

(B) Mother

(C) Aunt

(D) Grandmother

**Correct Answer:** (B) Mother

**Solution:**

**Concept:**

Family relation problems often involve interpreting statements carefully to identify relationships between individuals.

**Step 1:** Analyze the statement.

The woman says:

"His mother is the only daughter of my mother."

**Step 2:** Interpret the phrase.

The phrase "**only daughter of my mother**" means the woman herself, since she is the only daughter of her mother.

**Step 3:** Substitute the meaning.

Thus, the statement becomes:

"His mother is me."

Therefore, the woman is the **mother** of the man.

Mother

**Quick Tip:** In blood relation questions, replace phrases like "only son/daughter of my father/mother" with the person themselves to simplify the statement.

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**11. Find the missing number in the series:** 2, 6, 12, 20, 30, ?

(A) 36

(B) 40

(C) 42

(D) 44

**Correct Answer:** (C) 42

**Solution:**

**Concept:**

Number series problems are often solved by examining the pattern in the differences between consecutive terms.

**Step 1:** Find the differences between terms.

$$6 - 2 = 4$$

$$12 - 6 = 6$$

$$20 - 12 = 8$$

$$30 - 20 = 10$$

**Step 2:** Identify the pattern.

The differences increase sequentially:

$$4, 6, 8, 10$$

Next difference:

$$12$$

**Step 3:** Find the next term.

$$30 + 12 = 42$$

$$\boxed{42}$$

**Quick Tip:** When solving number series, first check the differences between consecutive terms. Increasing differences often indicate an arithmetic pattern.

**12. If "WATER" is coded as "YCVGT", what is the code for "FIRE"?**

(A) HKTG

(B) HKUF

(C) HJTG

(D) HKTE

**Correct Answer:** (A) HKTG

**Solution:**

**Concept:**

In coding-decoding questions, each letter may shift a fixed number of positions in the alphabet.

**Step 1:** Analyze the pattern in the given code.

"WATER" becomes "YCVGT".

Each letter is shifted **+2 positions** forward in the alphabet.

$$W \rightarrow Y$$

$$A \rightarrow C$$

$$T \rightarrow V$$

$$E \rightarrow G$$

$$R \rightarrow T$$

**Step 2:** Apply the same rule to "FIRE".

$$F \rightarrow H$$

$$I \rightarrow K$$

$$R \to T$$

$$E \to G$$

**Step 3:** Write the coded word.

$$\boxed{\text{HKTG}}$$

**Quick Tip:** In alphabet coding problems, check if letters are shifted forward or backward by a fixed number of positions.

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**13. Identify the error: "Neither the players nor the coach were present at the meeting."**

(A) Neither

(B) players

(C) were

(D) meeting

**Correct Answer:** (C) Replace "were" with "was"

**Solution:**

**Concept:**

In sentences using **neither...nor**, the verb agrees with the subject that is closest to it.

**Step 1:** Identify the subjects.

The subjects are:

players (plural) and coach (singular)

**Step 2:** Check the subject closest to the verb.

The word closest to the verb is **coach**, which is singular.

**Step 3:** Apply subject–verb agreement.

Since the closest subject is singular, the verb must also be singular.

Correct sentence: "Neither the players nor the coach was present at the meeting."

Replace "were" with "was"

**Quick Tip:** In **either/or** and **neither/nor** constructions, the verb agrees with the subject closest to it.

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**14. Choose the correct preposition: "The property was divided ___ the four brothers."**

(A) Between

(B) Among

(C) With

(D) For

**Correct Answer:** (B) Among

**Solution:**

**Concept:**

The prepositions **between** and **among** are used depending on the number of people involved.

- **Between** is used for two people or groups.
- **Among** is used for more than two people or groups.

**Step 1:** Identify the number of people involved.

The sentence mentions **four brothers**.

**Step 2:** Apply the rule.

Since the number of people is more than two, the correct preposition is **among**.

Correct sentence: "The property was divided among the four brothers."

Among

**Quick Tip:** Use **between** for two people and **among** for more than two people.

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**15. What is the antonym of "Vague"?**

(A) Uncertain

(B) Doubtful

(C) Precise

(D) Ambiguous

**Correct Answer:** (C) Precise (or Clear)

**Solution:**

**Concept:**

An antonym is a word that has the opposite meaning of another word.

**Step 1:** Understand the meaning of "Vague".

"Vague" means something that is unclear, indefinite, or not precise.

**Step 2:** Find the opposite meaning.

The opposite of vague is something that is clear, exact, and well-defined.

Precise

Precise (or Clear)

**Quick Tip:** When finding antonyms, first understand the exact meaning of the word and then choose the word with the opposite meaning.

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