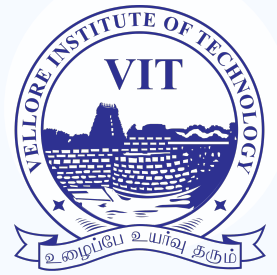


VITEEE 2026 April 28 Shift 2

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. Find the value of k if the lines

$$\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4}$$

and

$$\frac{x-4}{5} = \frac{y-1}{2} = \frac{z}{k}$$

are coplanar.

- (A) 0
- (B) 1
- (C) -1
- (D) 2

Correct Answer: (B) 1

Solution:

Concept:

Two lines in space are coplanar if the scalar triple product of the vector joining a point on each line and their direction vectors is zero.

If

$$\vec{d}_1, \vec{d}_2$$

are the direction vectors of the two lines and

$$P_1\vec{P}_2$$

is the vector joining points on the two lines, then the coplanarity condition is

$$\begin{vmatrix} x_2 - x_1 & y_2 - y_1 & z_2 - z_1 \\ d_{1x} & d_{1y} & d_{1z} \\ d_{2x} & d_{2y} & d_{2z} \end{vmatrix} = 0$$

This determinant represents the scalar triple product.

Step 1: Identify points and direction ratios.

From

$$\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4}$$

Point on line L_1 :

$$P_1(1, 2, 3)$$

Direction ratios:

$$\vec{d}_1 = (2, 3, 4)$$

From

$$\frac{x-4}{5} = \frac{y-1}{2} = \frac{z}{k}$$

Point on line L_2 :

$$P_2(4, 1, 0)$$

Direction ratios:

$$\vec{d}_2 = (5, 2, k)$$

Step 2: Find the vector joining the two points.

$$P_1\vec{P}_2 = (4-1, 1-2, 0-3)$$

$$P_1\vec{P}_2 = (3, -1, -3)$$

Step 3: Apply the coplanarity condition.

$$\begin{vmatrix} 3 & -1 & -3 \\ 2 & 3 & 4 \\ 5 & 2 & k \end{vmatrix} = 0$$

Expanding the determinant:

$$3(3k-8) - (-1)(2k-20) + (-3)(4-15) = 0$$

$$9k - 24 + 2k - 20 + 33 = 0$$

$$11k - 11 = 0$$

$$k = 1$$

Quick Tip: For two lines in 3D to be coplanar, use the scalar triple product condition:

$$[P_1\vec{P}_2, \vec{d}_1, \vec{d}_2] = 0$$

If the determinant formed by these three vectors equals zero, the lines lie in the same plane.

2. If A is a square matrix of order 3 such that $|adj A| = 64$, then find the value of $|A|$.

- (A) 4
- (B) ± 4
- (C) 8
- (D) ± 8

Correct Answer: (D) ± 8

Solution:

Concept:

For a square matrix A of order n , the determinant of the adjoint matrix satisfies the property

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

where n is the order of the matrix.

This identity is frequently used in determinant problems involving adjoint matrices.

Step 1: Use the determinant property of the adjoint matrix.

Since A is a square matrix of order 3,

$$|adj A| = |A|^{3-1}$$

$$|adj A| = |A|^2$$

Step 2: Substitute the given value.

$$|adj A| = 64$$

Therefore,

$$|A|^2 = 64$$

Step 3: Solve for the determinant of A.

$$|A| = \pm\sqrt{64}$$

$$|A| = \pm 8$$

Quick Tip: For a square matrix of order n , remember the identity

$$|\text{adj}A| = |A|^{n-1}.$$

In many exam problems, once the order of the matrix is known, this formula allows you to directly relate the determinant of the matrix and its adjoint.

3. Evaluate the integral

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

- (A) $\frac{\pi}{6}$
- (B) $\frac{\pi}{4}$
- (C) $\frac{\pi}{3}$
- (D) $\frac{\pi}{2}$

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

Solution:

Concept:

For definite integrals, an important property is

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

This symmetry property is often useful when the integrand contains both $\sin x$ and $\cos x$.

Step 1: Let the integral be I .

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

Using the property

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

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

Step 2: Add the two integrals.

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

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

$$2I = \frac{\pi}{2}$$

Step 3: Solve for I .

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

Quick Tip: When a definite integral contains $\sin x$ and $\cos x$ together, try the property

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

Adding the two integrals often simplifies the expression dramatically.

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

- (A) $4\sqrt{3}$ sq. units
- (B) $6\sqrt{3}$ sq. units
- (C) $8\sqrt{3}$ sq. units
- (D) $12\sqrt{3}$ sq. units

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

Solution:

Concept:

For curves given in the form $y^2 = f(x)$, the area enclosed between the curve and a vertical line is often found using symmetry:

$$\text{Area} = 2 \int_{x_1}^{x_2} y \, dx$$

because the curve is symmetric about the x -axis.

Step 1: Express y from the equation of the curve.

$$y^2 = 4x$$

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

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

Step 2: Set up the area integral.

The curve intersects the line $x = 3$, so the limits are $x = 0$ to $x = 3$.

$$\begin{aligned} \text{Area} &= 2 \int_0^3 2\sqrt{x} \, dx \\ &= 4 \int_0^3 x^{1/2} \, dx \end{aligned}$$

Step 3: Evaluate the integral.

$$\begin{aligned} & 4 \left[\frac{2}{3} x^{3/2} \right]_0^3 \\ &= \frac{8}{3} (3^{3/2}) \\ &= \frac{8}{3} (3\sqrt{3}) \\ &= 8\sqrt{3} \end{aligned}$$

Quick Tip: For curves of the form $y^2 = ax$, remember the graph is symmetric about the x -axis. So the total area between the curve and a vertical boundary can be computed using

$$\text{Area} = 2 \int y \, dx.$$

This avoids calculating upper and lower parts separately.

5. If the sum of the first n terms of an A.P is $S_n = 3n^2 + 5n$, find the 10^{th} term.

- (A) 60
- (B) 61
- (C) 62
- (D) 63

Correct Answer: (C) 62

Solution:

Concept:

If S_n denotes the sum of the first n terms of a sequence, then the n^{th} term is given by

$$T_n = S_n - S_{n-1}$$

This relation helps us find an individual term when the sum formula is given.

Step 1: Use the relation between T_n and S_n .

$$T_n = S_n - S_{n-1}$$

For $n = 10$,

$$T_{10} = S_{10} - S_9$$

Step 2: Compute S_{10} .

$$S_n = 3n^2 + 5n$$

$$S_{10} = 3(10)^2 + 5(10)$$

$$S_{10} = 300 + 50$$

$$S_{10} = 350$$

Step 3: Compute S_9 .

$$S_9 = 3(9)^2 + 5(9)$$

$$S_9 = 3(81) + 45$$

$$S_9 = 243 + 45$$

$$S_9 = 288$$

Step 4: Find the 10th term.

$$T_{10} = S_{10} - S_9$$

$$T_{10} = 350 - 288$$

$$T_{10} = 62$$

Quick Tip: Whenever the formula for S_n is given, use

$$T_n = S_n - S_{n-1}.$$

This is the fastest way to find a specific term without expanding the entire sequence.

6. Calculate the equivalent resistance between two diametrically opposite points of a circular wire of total resistance $12\ \Omega$.

- (A) $2\ \Omega$
- (B) $3\ \Omega$
- (C) $4\ \Omega$
- (D) $6\ \Omega$

Correct Answer: (B) $3\ \Omega$

Solution:

Concept:

When a circular wire is connected between two diametrically opposite points, the wire is divided into two equal semicircles. Since resistance is proportional to length, each semicircle will have half the total resistance.

These two semicircles act as two resistors connected in parallel.

Step 1: Determine the resistance of each semicircle.

Total resistance of the circular wire:

$$R = 12\ \Omega$$

Since the wire is divided into two equal halves,

$$R_1 = R_2 = \frac{12}{2} = 6\Omega$$

Step 2: Identify the circuit configuration.

The two semicircular resistances connect the same two points, so they are in parallel.

$$R_{eq} = \frac{R_1 R_2}{R_1 + R_2}$$

Step 3: Calculate the equivalent resistance.

$$R_{eq} = \frac{6 \times 6}{6 + 6}$$

$$R_{eq} = \frac{36}{12}$$

$$R_{eq} = 3\Omega$$

Quick Tip: For circular wire resistance problems, remember that resistance is proportional to the length of the wire. Connecting diametrically opposite points divides the circle into two equal semicircles which act as parallel resistors.

7. A capacitor of $10\mu F$ is charged to $50V$. Calculate the energy stored in the capacitor.

- (A) $0.00125J$
- (B) $0.0125J$
- (C) $0.125J$
- (D) $1.25J$

Correct Answer: (B) $0.0125J$

Solution:

Concept:

The energy stored in a capacitor is given by the formula

$$E = \frac{1}{2}CV^2$$

where C = capacitance, V = potential difference across the capacitor.

Step 1: Convert capacitance into SI units.

$$C = 10 \mu F$$

$$C = 10 \times 10^{-6} F$$

Step 2: Substitute the values into the energy formula.

$$E = \frac{1}{2}CV^2$$

$$E = \frac{1}{2}(10 \times 10^{-6})(50)^2$$

Step 3: Simplify the expression.

$$E = \frac{1}{2}(10 \times 10^{-6})(2500)$$

$$E = 0.5 \times 10^{-5} \times 2500$$

$$E = 0.0125 J$$

Quick Tip: Always convert microfarads to farads before calculation:

$$1 \mu F = 10^{-6} F.$$

Then apply the energy formula $E = \frac{1}{2}CV^2$.

8. If the speed of light in a medium is 2×10^8 m/s, what is the refractive index of the medium?

- (A) 1.2
- (B) 1.3
- (C) 1.5
- (D) 2

Correct Answer: (C) 1.5

Solution:

Concept:

The refractive index of a medium is defined as the ratio of the speed of light in vacuum to the speed of light in the medium.

$$n = \frac{c}{v}$$

where c = speed of light in vacuum = 3×10^8 m/s v = speed of light in the medium.

Step 1: Substitute the given values into the formula.

$$n = \frac{c}{v}$$

$$n = \frac{3 \times 10^8}{2 \times 10^8}$$

Step 2: Simplify the expression.

$$n = \frac{3}{2}$$

$$n = 1.5$$

Quick Tip: The refractive index indicates how much light slows down in a medium. Higher refractive index means the speed of light in that medium is lower.

9. A proton ($q = 1.6 \times 10^{-19} \text{ C}$) enters a magnetic field of 2 T with a velocity of $3 \times 10^6 \text{ m/s}$ perpendicular to the field. Find the magnetic force acting on the proton.

- (A) $9.6 \times 10^{-14} N$
- (B) $9.6 \times 10^{-13} N$
- (C) $9.6 \times 10^{-12} N$
- (D) $9.6 \times 10^{-11} N$

Correct Answer: (B) $9.6 \times 10^{-13} N$

Solution:

Concept:

The magnetic force acting on a moving charged particle in a magnetic field is given by

$$F = qvB \sin \theta$$

where q = charge of the particle, v = velocity of the particle, B = magnetic field strength, θ = angle between velocity and magnetic field.

Step 1: Identify the given values.

$$q = 1.6 \times 10^{-19} C$$

$$v = 3 \times 10^6 \text{ m/s}$$

$$B = 2 T$$

Since the particle enters perpendicular to the field,

$$\theta = 90^\circ$$

$$\sin 90^\circ = 1$$

Step 2: Substitute into the formula.

$$F = qvB \sin \theta$$

$$F = (1.6 \times 10^{-19})(3 \times 10^6)(2)$$

Step 3: Calculate the force.

$$F = 9.6 \times 10^{-13} \text{ N}$$

Quick Tip: When a charged particle moves perpendicular to a magnetic field, $\sin 90^\circ = 1$. So the force simplifies to $F = qvB$.

10. Determine the de Broglie wavelength of an electron accelerated through 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:

According to the de Broglie hypothesis, a moving particle exhibits wave-like properties. The wavelength associated with a charged particle accelerated through a potential difference V is given by

$$\lambda = \frac{h}{p}$$

For electrons accelerated through a potential V , this simplifies to

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

where V is in volts.

Step 1: Write the de Broglie wavelength formula for an electron.

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

Step 2: Substitute the given potential difference.

$$V = 100$$

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

Step 3: Evaluate the expression.

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

$$\lambda = 1.227 \text{ \AA}$$

Quick Tip: For electrons accelerated through a potential V , quickly use the shortcut

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

This formula is widely used in quantum mechanics and electron diffraction problems.

11. Which compound undergoes Cannizzaro reaction: Formaldehyde, Acetaldehyde, or Benzophenone?

- (A) Formaldehyde
- (B) Acetaldehyde
- (C) Benzophenone
- (D) Both (A) and (B)

Correct Answer: (A) Formaldehyde

Solution:

Concept:

The Cannizzaro reaction occurs in aldehydes that do not possess an α -hydrogen atom. In this reaction, two molecules of the aldehyde undergo disproportionation in the presence of a strong base to form an alcohol and a carboxylate salt.

Step 1: Identify the condition for Cannizzaro reaction.

Aldehydes lacking an α -hydrogen atom undergo the Cannizzaro reaction.

Step 2: Examine each compound.

Formaldehyde ($HCHO$) has no α -hydrogen because there is no carbon adjacent to the carbonyl carbon.

Acetaldehyde (CH_3CHO) contains α -hydrogen atoms.

Benzophenone is a ketone and does not undergo Cannizzaro reaction.

Step 3: Determine the correct compound.

Thus, only formaldehyde undergoes the Cannizzaro reaction.

Quick Tip: Cannizzaro reaction occurs only in aldehydes without α -hydrogen atoms. Examples include formaldehyde and benzaldehyde.

12. What is the coordination number of Fe in the complex $[Fe(C_2O_4)_3]^{3-}$?

- (A) 3
- (B) 4
- (C) 6
- (D) 9

Correct Answer: (C) 6

Solution:**Concept:**

The coordination number of a metal ion in a complex is the number of donor atoms directly bonded to the central metal atom.

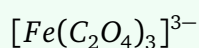
A ligand may be:

- Monodentate (one donor atom)
- Bidentate (two donor atoms)

Step 1: Identify the ligand type.

Oxalate ion ($C_2O_4^{2-}$) is a bidentate ligand.

Step 2: Count the ligands in the complex.



There are three oxalate ligands.

Step 3: Calculate the coordination number.

Each oxalate ligand provides two donor atoms.

$$3 \times 2 = 6$$

Thus, the coordination number of Fe is 6.

Quick Tip: Coordination number = number of donor atoms attached to the central metal atom. For bidentate ligands, multiply the number of ligands by 2.

13. Calculate the pH of a 0.01 M HCl solution.

- (A) 1
- (B) 2
- (C) 3
- (D) 4

Correct Answer: (B) 2

Solution:

Concept:

The pH of a solution is defined as

$$pH = -\log[H^+]$$

For strong acids like HCl , the acid completely dissociates in water.

Step 1: Determine the hydrogen ion concentration.

Since HCl is a strong acid,

$$[H^+] = 0.01 M$$

$$[H^+] = 10^{-2}$$

Step 2: Apply the pH formula.

$$pH = -\log[H^+]$$

$$pH = -\log(10^{-2})$$

Step 3: Evaluate the value.

$$pH = 2$$

Quick Tip: For strong acids, assume complete dissociation. Thus, the hydrogen ion concentration equals the molarity of the acid.

14. Identify the monomers for Nylon-6,6.

- (A) Adipic acid and Hexamethylenediamine
- (B) Ethylene glycol and Terephthalic acid
- (C) Styrene
- (D) Caprolactam

Correct Answer: (A) Adipic acid and Hexamethylenediamine

Solution:**Concept:**

Nylon-6,6 is a condensation polymer formed by the polymerization of a dicarboxylic acid and a diamine. During the reaction, molecules combine with the elimination of small molecules such as water.

Step 1: Identify the monomers involved in Nylon-6,6 formation.

Nylon-6,6 is produced by the reaction between:

- Adipic acid ($\text{HOOC} - (\text{CH}_2)_4 - \text{COOH}$)
- Hexamethylenediamine ($\text{H}_2\text{N} - (\text{CH}_2)_6 - \text{NH}_2$)

Step 2: Understand the naming of Nylon-6,6.

The numbers 6,6 indicate that both monomers contain six carbon atoms in their chains.

Step 3: Formation of the polymer.

These monomers undergo condensation polymerization forming amide linkages ($-\text{CONH}-$), producing Nylon-6,6.

Quick Tip: In Nylon-6,6, the first number represents the number of carbons in the diamine, and the second number represents the number of carbons in the dicarboxylic acid.

15. Which group contains the most electronegative elements in the periodic table?

- (A) Group 1
- (B) Group 2
- (C) Group 16
- (D) Group 17

Correct Answer: (D) Group 17

Solution:

Concept:

Electronegativity is the tendency of an atom to attract shared electrons in a chemical bond. Across a period, electronegativity increases from left to right, while down a group it generally decreases.

Step 1: Observe the trend across the periodic table.

Elements on the right side of the periodic table have higher electronegativity.

Step 2: Identify the group with the highest values.

Group 17 elements (halogens) such as fluorine, chlorine, bromine, and iodine have very high electronegativities.

Step 3: Note the most electronegative element.

Fluorine, which belongs to Group 17, is the most electronegative element in the periodic table.

Quick Tip: Electronegativity increases across a period and decreases down a group. Fluorine (Group 17) has the highest electronegativity among all elements.

16. If 'FRIEND' is coded as 'HUMJTK', how is 'CANDLE' coded?

- (A) EDRIRJ
- (B) EDRJRI
- (C) FESJRL
- (D) DCRHQP

Correct Answer: (A) EDRIRJ

Solution:**Concept:**

In coding-decoding problems, each letter is shifted forward or backward in the alphabet according to a pattern.

Here, the pattern increases sequentially by +2, +3, +4, +5, +6, +7.

Step 1: Observe the pattern from the given example.

$$F \rightarrow H \quad (+2)$$

$$R \rightarrow U \quad (+3)$$

$$I \rightarrow M \quad (+4)$$

$$E \rightarrow J \quad (+5)$$

$$N \rightarrow T \quad (+6)$$

$$D \rightarrow K \quad (+7)$$

Thus the pattern is +2, +3, +4, +5, +6, +7.

Step 2: Apply the same pattern to 'CANDLE'.

$$C + 2 = E$$

$$A + 3 = D$$

$$N + 4 = R$$

$$D + 5 = I$$

$$L + 6 = R$$

$$E + 7 = J$$

Step 3: Write the coded word.

CANDLE → EDRIRJ

Quick Tip: In alphabet coding problems, convert letters to their alphabetical positions if needed and identify the pattern of increase or decrease.

17. A man walks 5 km East, then turns right and walks 4 km, and then turns left and walks 5 km. In which direction is he finally moving?

- (A) North
- (B) South
- (C) East
- (D) West

Correct Answer: (C) East

Solution:

Concept:

In direction problems, visualize the movement step-by-step while keeping track of the current facing direction.

Step 1: Initial movement.

The man starts by walking 5 km towards the East.

Step 2: First turn.

Turning right from East means he now faces South. He walks 4 km towards South.

Step 3: Second turn.

Turning left from South means he now faces East again. He walks 5 km in the East direction.

Step 4: Final direction.

Therefore, the man is finally moving towards the East.

Quick Tip: A quick trick: Right turn moves clockwise, while left turn moves anticlockwise on the compass directions.

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

- (A) 38
- (B) 40
- (C) 42
- (D) 44

Correct Answer: (C) 42

Solution:

Concept:

Series problems often follow patterns in the differences between consecutive terms.

Step 1: Find the differences between consecutive numbers.

$$6 - 2 = 4$$

$$12 - 6 = 6$$

$$20 - 12 = 8$$

$$30 - 20 = 10$$

Step 2: Observe the pattern in the differences.

The differences increase by +2:

$$4, 6, 8, 10, 12$$

Step 3: Find the next term.

$$30 + 12 = 42$$

Thus, the missing number is 42.

Quick Tip: When numbers increase quickly in a series, checking the differences between consecutive terms often reveals the pattern.

19. Choose the synonym of the word 'ABANDON'.

- (A) Retain
- (B) Forsake
- (C) Protect
- (D) Defend

Correct Answer: (B) Forsake

Solution:

Concept:

A synonym is a word that has the same or nearly the same meaning as another word.

Step 1: Understand the meaning of the word 'Abandon'.

The word *abandon* means to leave something completely or give it up.

Step 2: Analyze the given options.

- Retain – to keep or continue to have
- Forsake – to leave or give up completely
- Protect – to keep safe
- Defend – to guard from attack

Step 3: Choose the closest meaning.

The word *forsake* has the same meaning as *abandon*.

Quick Tip: In synonym questions, first understand the meaning of the given word clearly, then eliminate options that have opposite or unrelated meanings.

20. Fill in the blank: Neither of the two candidates _____ qualified.

- (A) are
- (B) were
- (C) is
- (D) have

Correct Answer: (C) is

Solution:

Concept:

The word *neither* is treated as a singular pronoun when referring to two people or things. Therefore, it takes a singular verb.

Step 1: Identify the subject of the sentence.

The subject here is *neither of the two candidates*.

Step 2: Determine the verb agreement.

Since *neither* is singular, the verb must also be singular.

Step 3: Choose the correct verb form.

The singular verb that correctly completes the sentence is *is*.

Quick Tip: Words like *each*, *everyone*, *anyone*, *neither*, *either* are treated as singular subjects and therefore take singular verbs.