

VITEEE 2025 Apr 26 Shift 1 Question Paper with Solutions

1. A resistor of $10\ \Omega$ and an inductor of $0.1\ \text{H}$ are connected in series to a $100\ \text{V}$, $50\ \text{Hz}$ AC source. The impedance of the circuit is:

- (A) $10\ \Omega$
- (B) $\sqrt{100 + 100\pi^2}\ \Omega$
- (C) $\sqrt{100 + 10000\pi^2}\ \Omega$
- (D) $100\ \Omega$

Correct Answer: (B)

Solution:

$$X_L = 2\pi fL = 2\pi(50)(0.1) = 10\pi$$
$$Z = \sqrt{R^2 + X_L^2} = \sqrt{10^2 + (10\pi)^2} = \sqrt{100 + 100\pi^2}$$

Quick Tip

Impedance in RL circuit: $Z = \sqrt{R^2 + X_L^2}$.

2. The escape velocity from the surface of Earth is $11.2\ \text{km/s}$. If the radius of Earth is doubled and mass remains the same, the new escape velocity will be:

- (A) $11.2\ \text{km/s}$
- (B) $7.92\ \text{km/s}$
- (C) $15.84\ \text{km/s}$
- (D) $22.4\ \text{km/s}$

Correct Answer: (B)

Solution:

$$v_e \propto \frac{1}{\sqrt{R}}$$

$$v' = \frac{11.2}{\sqrt{2}} = 7.92 \text{ km/s}$$

Quick Tip

Escape velocity varies inversely with square root of radius.

3. A convex lens of focal length 20 cm forms a real image at 30 cm from the lens. The object distance is:

- (A) 60 cm
- (B) 12 cm
- (C) 15 cm
- (D) 10 cm

Correct Answer: (A)

Solution:

$$\frac{1}{f} = \frac{1}{v} + \frac{1}{u} \Rightarrow \frac{1}{20} = \frac{1}{30} + \frac{1}{u}$$
$$\frac{1}{u} = \frac{1}{60} \Rightarrow u = 60 \text{ cm}$$

Quick Tip

Use lens formula carefully with sign convention.

4. The half-life of a radioactive element is 8 days. The fraction remaining after 32 days is:

- (A) 1/2
- (B) 1/4
- (C) 1/8
- (D) 1/16

Correct Answer: (D)

Solution:

$$32 \text{ days} = 4 \text{ half-lives} \Rightarrow \left(\frac{1}{2}\right)^4 = \frac{1}{16}$$

Quick Tip

Remaining fraction = $(1/2)^n$.

5. The oxidation number of Cr in $K_2Cr_2O_7$ is:

- (A) +3
- (B) +6
- (C) +7
- (D) +12

Correct Answer: (B)

Solution: Oxidation state of Cr in dichromate ion is +6.

Quick Tip

Chromium shows +6 oxidation state in dichromates.

6. Which of the following is a secondary alcohol?

- (A) CH_3CH_2OH
- (B) $(CH_3)_2CHOH$
- (C) $CH_3CH_2CH_2OH$
- (D) $(CH_3)_3COH$

Correct Answer: (B)

Solution: In $(CH_3)_2CHOH$, the carbon bearing $-OH$ is attached to two other carbons.

Quick Tip

Secondary alcohol: $-OH$ on a carbon attached to two carbons.

7. The pH of 0.01 M NaOH solution is:

- (A) 2
- (B) 12
- (C) 11
- (D) 13

Correct Answer: (B)

Solution:

$$\text{pOH} = -\log(0.01) = 2 \Rightarrow \text{pH} = 14 - 2 = 12$$

Quick Tip

Strong bases completely dissociate.

8. The monomer of natural rubber is:

- (A) Isoprene
- (B) Chloroprene
- (C) Neoprene
- (D) Styrene

Correct Answer: (A)

Solution: Natural rubber is cis-1,4-polyisoprene.

Quick Tip

Isoprene is the building block of natural rubber.

9. If $\sin \theta + \cos \theta = \sqrt{2}$, then $\tan \theta + \cot \theta$ is:

- (A) 1
- (B) 2

(C) $\sqrt{2}$

(D) 0

Correct Answer: (B)

Solution:

$$\sin \theta = \cos \theta = \frac{1}{\sqrt{2}} \Rightarrow \theta = 45^\circ$$

$$\tan \theta + \cot \theta = 1 + 1 = 2$$

Quick Tip

Equality of sine and cosine implies 45° .

10. The number of terms in the expansion of $(a + b + c)^5$ is:

(A) 15

(B) 21

(C) 56

(D) 126

Correct Answer: (B)

Solution:

$$\text{Number of terms} = \frac{(n+1)(n+2)}{2} = \frac{6 \times 7}{2} = 21$$

Quick Tip

Applies to multinomial expansions.

11. The differential equation $\frac{dy}{dx} = \frac{y}{x}$ represents:

(A) Straight lines through origin

(B) Parabola

(C) Circle

(D) Ellipse

Correct Answer: (A)

Solution:

$$\frac{dy}{y} = \frac{dx}{x} \Rightarrow y = Cx$$

Quick Tip

Solution of first-order DE gives family of curves.

12. If the vectors $2\hat{i} + 3\hat{j} + \hat{k}$ and $4\hat{i} - \hat{j} + 2\hat{k}$ are perpendicular, the value of λ in $\lambda\hat{i} + 2\hat{j} + 3\hat{k}$ is:

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

Correct Answer: (A)

Solution: For perpendicular vectors,

$$(\lambda, 2, 3) \cdot (4, -1, 2) = 0 \Rightarrow 4\lambda - 2 + 6 = 0 \Rightarrow \lambda = -1$$

Quick Tip

Perpendicular vectors have zero dot product.

13. Find the missing number: 2, 6, 12, 20, 30, ?

- (A) 42
- (B) 40
- (C) 45
- (D) 50

Correct Answer: (A)

Solution: Sequence follows $n(n + 1)$: $1 \cdot 2, 2 \cdot 3, \dots, 6 \cdot 7 = 42$.

Quick Tip

Look for quadratic patterns.

14. If 'APPLE' is coded as 'CRRNG', then 'ORANGE' is coded as:

- (A) QSURGJ
- (B) QSUPIJ
- (C) RTVSHK
- (D) QSURIG

Correct Answer: (A)

Solution: Each letter is shifted forward by two positions in the alphabet.

Quick Tip

Alphabet coding often uses fixed shifts.

15. Choose the word that is most nearly opposite in meaning to "Obscure":

- (A) Hidden
- (B) Clear
- (C) Vague
- (D) Mysterious

Correct Answer: (B)

Solution: Obscure means unclear or hidden; its opposite is clear.

Quick Tip

Antonyms convey opposite meanings.
