

VITEEE 2025 Apr 25 Shift 2 Question Paper with Solutions

1. The moment of inertia of a thin ring about its diameter is:

- (A) MR^2
- (B) $\frac{1}{2}MR^2$
- (C) $\frac{1}{4}MR^2$
- (D) $2MR^2$

Correct Answer: (B)

Solution: For a ring, $I_{\text{diameter}} = \frac{1}{2}MR^2$ using perpendicular axis theorem.

Quick Tip

Ring: $I_{\text{center}} = MR^2$, diameter = half of it.

2. A Carnot engine operates between 400 K and 300 K. Its efficiency is:

- (A) 25%
- (B) 30%
- (C) 75%
- (D) 100%

Correct Answer: (A)

Solution:

$$\eta = 1 - \frac{T_2}{T_1} = 1 - \frac{300}{400} = 0.25$$

Quick Tip

Carnot efficiency depends only on temperatures.

3. In Young's double-slit experiment, the slits are 0.2 mm apart and the screen is 1 m away. The distance between the central bright fringe and the third bright fringe is 1.5 cm. The wavelength of light used is:

- (A) 500 nm
- (B) 600 nm
- (C) 700 nm
- (D) 400 nm

Correct Answer: (A)

Solution:

$$y_n = n \frac{\lambda D}{d} \Rightarrow \lambda = \frac{yd}{nD} = \frac{0.015 \times 0.0002}{3 \times 1} = 5 \times 10^{-7} \text{ m}$$

Quick Tip

Fringe distance is proportional to order number.

4. The binding energy per nucleon is maximum for:

- (A) ${}^2\text{H}$
- (B) ${}^4\text{He}$
- (C) ${}^5_6\text{Fe}$
- (D) ${}^{238}\text{U}$

Correct Answer: (C)

Solution: Iron (${}^5_6\text{Fe}$) has the highest binding energy per nucleon.

Quick Tip

Peak of binding energy curve is around iron.

5. The functional group in ethers is:

- (A) -OH
- (B) -CHO
- (C) -O-
- (D) -COOH

Correct Answer: (C)

Solution: Ethers have an oxygen atom bonded to two alkyl/aryl groups.

Quick Tip

Ether group = R-O-R .

6. Which of the following is not a buffer solution?

- (A) $\text{CH}_3\text{COOH} + \text{CH}_3\text{COONa}$
- (B) $\text{NH}_4\text{OH} + \text{NH}_4\text{Cl}$
- (C) $\text{H}_2\text{SO}_4 + \text{Na}_2\text{SO}_4$
- (D) $\text{HCN} + \text{KCN}$

Correct Answer: (C)

Solution: Strong acid + its salt does not form a buffer.

Quick Tip

Buffers = weak acid/base + its salt.

7. The hybridization in SF_6 molecule is:

- (A) sp^3
- (B) sp^3d
- (C) sp^3d^2
- (D) dsp^2

Correct Answer: (C)

Solution: SF₆ has six bond pairs → octahedral geometry → sp³d².

Quick Tip

Six bond pairs → sp³d².

8. The heat of neutralization is maximum for:

- (A) Weak acid and weak base
- (B) Strong acid and strong base
- (C) Strong acid and weak base
- (D) Weak acid and strong base

Correct Answer: (B)

Solution: Strong acid–strong base neutralization releases maximum heat (57 kJ/mol).

Quick Tip

Complete ionization gives maximum heat.

9. If $\cos \theta = -\frac{3}{5}$ and θ lies in the second quadrant, then $\sin \theta$ is:

- (A) 4/5
- (B) -4/5
- (C) 3/5
- (D) -3/5

Correct Answer: (A)

Solution: In second quadrant, sine is positive:

$$\sin \theta = \sqrt{1 - \cos^2 \theta} = \frac{4}{5}$$

Quick Tip

Remember signs of trigonometric ratios in quadrants.

10. The equation of the tangent to the curve $y = x^3 - 2x + 1$ at $(1, 0)$ is:

- (A) $y = x - 1$
- (B) $y = x + 1$
- (C) $y = -x + 1$
- (D) $y = x$

Correct Answer: (A)

Solution:

$$\frac{dy}{dx} = 3x^2 - 2 \Rightarrow m = 1$$

Equation: $y - 0 = 1(x - 1) \Rightarrow y = x - 1$

Quick Tip

Tangent slope = derivative at the point.

11. The value of $\int e^x(\sin x + \cos x) dx$ is:

- (A) $e^x \sin x + C$
- (B) $e^x \cos x + C$
- (C) $e^x \sin x - e^x \cos x + C$
- (D) $e^x(\sin x + \cos x) + C$

Correct Answer: (A)

Solution: Differentiate $e^x \sin x$ to verify.

Quick Tip

Check by differentiation when in doubt.

12. If the coefficient of correlation between x and y is 0.8, then the regression coefficient of y on x is:

- (A) Always 0.8
- (B) Always greater than 0.8
- (C) Depends on standard deviations
- (D) Always less than 0.8

Correct Answer: (C)

Solution:

$$b_{yx} = r \frac{\sigma_y}{\sigma_x}$$

Hence it depends on standard deviations.

Quick Tip

Regression coefficient correlation coefficient.

13. The number of ways to arrange the letters of the word “MISSISSIPPI” is:

- (A) 34650
- (B) 12600
- (C) 9450
- (D) 69300

Correct Answer: (A)

Solution:

$$\frac{11!}{4!4!2!} = 34650$$

Quick Tip

Use factorial formula for repeated letters.

14. A boat takes 4 hours to travel 40 km downstream and 6 hours to return. The speed of the stream is:

- (A) 2 km/h
- (B) 4 km/h
- (C) 6 km/h
- (D) 8 km/h

Correct Answer: (A)

Solution: Downstream speed = 10 km/h, upstream = 6.67 km/h

$$\text{Stream speed} = \frac{10 - 6.67}{2} = 2 \text{ km/h}$$

Quick Tip

Stream speed = half of speed difference.

15. If the 5th term of a G.P. is 81 and the 8th term is 6561, the first term is:

- (A) 3
- (B) 9
- (C) 1
- (D) 27

Correct Answer: (B)

Solution:

$$\frac{T_8}{T_5} = r^3 = \frac{6561}{81} = 81 \Rightarrow r = 3$$
$$a = \frac{81}{3^4} = 9$$

Quick Tip

Divide terms to eliminate first term.

16. Find the odd one out: 16, 25, 36, 49, 64, 81, 100

- (A) 16
- (B) 36
- (C) 81
- (D) 100

Correct Answer: (C)

Solution: All are squares of even numbers except 81.

Quick Tip

Look for hidden patterns like parity.

17. If 'PEN' is coded as '371' and 'INK' is coded as '946', then 'PIN' is coded as:

- (A) 391
- (B) 379
- (C) 739
- (D) 937

Correct Answer: (D)

Solution: Using the same letter–digit mapping gives PIN = 937.

Quick Tip

Preserve letter order in coding.

18. Choose the antonym of "Benevolent":

- (A) Kind
- (B) Generous
- (C) Malevolent
- (D) Friendly

Correct Answer: (C)

Solution: Benevolent means kind; its opposite is malevolent.

Quick Tip

Prefix *male-* indicates bad or evil.

19. Fill in the blank: The committee ____ divided on the issue.

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

Correct Answer: (B)

Solution: Collective noun takes plural verb when members act individually.

Quick Tip

Collective noun + divided → plural verb.

20. Find the next number in the series: 1, 4, 13, 40, 121, ?

- (A) 244
- (B) 364
- (C) 484
- (D) 363

Correct Answer: (D)

Solution: Pattern: $\times 3 + 1$

$$121 \times 3 + 1 = 364$$

Quick Tip

Check multiplication-based patterns.

