

JEE EXPERT

ANSWER KEY & SOLUTIONS

Module Test - [MT - 01]

JEE ADV. Paper - 02

Batch : 12th (Zenith- 1820 - X01 & X02)

Date :[04.08.2019]

PHYSICS

- | | | | |
|--|--|----------------|-------------|
| 1 (A, B, C) | 2 (B, D) | 3 (A, B, C, D) | 4 (A, B, D) |
| 5 (A, B, D) | 6 (B, D) | 7 (A, C) | 8 (A, D) |
| 9 (3) | 10 (9) | 11 (5) | 12 (4) |
| 13 (5) | 14 (4) | | |
| 15 $A \rightarrow s; B \rightarrow q; C \rightarrow q; D \rightarrow q$ | 16 $A \rightarrow s; B \rightarrow q; C \rightarrow r; D \rightarrow p, s$ | | |
| 17 $A \rightarrow p, r, s, t; B \rightarrow p, r; C \rightarrow p, r, s, t; D \rightarrow q$ | 18 $A \rightarrow p, s; B \rightarrow q, r, s; C \rightarrow q, r, s; D \rightarrow p$ | | |

CHEMISTRY

- | | | | |
|---|---|-----------------|--------------|
| 19 (A, B, C, D) | 20 (B, D) | 21 (A, B, C, D) | 22 (A, C) |
| 23 (B, C, D) | 24 (A, D) | 25 (A, B, C, D) | 26 (A, B, D) |
| 27 (5) | 28 (8) | 29 (3) | 30 (4) |
| 31 (6) | 32 (GRACE) | | |
| 33 $A \rightarrow p, t; B \rightarrow q, r; C \rightarrow p, t; D \rightarrow q, r$ | 34 $(A) \rightarrow p, s; (B) \rightarrow p, r; (C) \rightarrow p, q; (D) \rightarrow t;$ | | |
| 35 $A \rightarrow p, q, s, t; B \rightarrow p, r, s; C \rightarrow q, s, t; D \rightarrow q, s, t;$ | | | |
| 36 $A \rightarrow q, s; B \rightarrow t; C \rightarrow p; D \rightarrow r;$ | | | |

MATHEMATICS

- | | | | |
|---|--|-----------|--------------|
| 37 (A, B, C, D) | 38 (A, D) | 39 (A, D) | 40 (A, B, C) |
| 41 (A, C) | 42 (A, B) | 43 (A, B) | 44 (A, C) |
| 45 (1) | 46 (4) | 47 (4) | 48 (2) |
| 49 (4) | 50 (2) | | |
| 51 $A \rightarrow r; B \rightarrow q; C \rightarrow s; D \rightarrow p$ | 52 $A \rightarrow r; B \rightarrow q; C \rightarrow p; D \rightarrow s;$ | | |
| 53 $A \rightarrow q; B \rightarrow s; C \rightarrow p; D \rightarrow r, s;$ | 54 $A \rightarrow p; B \rightarrow r; C \rightarrow s; D \rightarrow q;$ | | |

JEE EXPERT

SOLUTIONS

Module Test - [MT - 01]

JEE ADV. Paper - 02

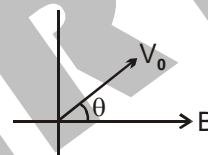
Batch : 12th (Zenith- 1820 - X01 & X02)

PHYSICS

SECTION-1

1. **Sol. (A, B, C)**

$$\text{Pitch} = \frac{2\pi m}{qB} V_0 \cos \theta$$



2. **Sol. (B, D)**

Resistance absorbs energy at the rate of 2W.

Potential difference across AB $\Rightarrow V_{AB} \cdot I = 50 \text{ W}$

$$V_{AB} = 50 \text{ V}$$

Drop across resistor is 2V, therefore EMF of E is 48 V.

As AB is absorbing energy at the rate of 50 W, 48 W is being absorbed by E. Thus, E is charging. i.e., current is entering from + ve terminal of E.

3. **Sol. (A,B,C,D)**

The total charge on inner surface of conductor will be zero & charge on outer surface is Q (uniform).

4. **Sol. (A,B,D)**

$$\frac{-\sigma}{2\epsilon_0} = \frac{x}{2\epsilon_0} - \frac{3\sigma}{2\epsilon_0} \Rightarrow x = 2\sigma$$

At $x = -2$

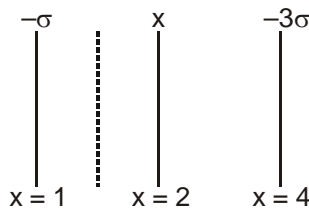
$$E = \frac{2\sigma}{2\epsilon_0} \hat{i} = \frac{\sigma}{\epsilon_0} \hat{i}$$

At $x = 3$

$$E = \frac{-\sigma}{2\epsilon_0} + \frac{2\sigma}{2\epsilon_0} + \frac{3\sigma}{2\epsilon_0} = \frac{4\sigma}{2\epsilon_0} = \frac{2\sigma}{\epsilon_0} \hat{i}$$

At $x = 6$

$$E = \frac{-\sigma}{\epsilon_0} \hat{i}$$



5. **Sol. (A,B,D)** Potential gradient on the wire = $\frac{2V}{L}$. S_1 closed \rightarrow only R is there in lower circuit. PD

across it is $\frac{V}{3}$.

When only S_2 closed, PD across $(R + 2R)$ is V.

6. **(B, D)**

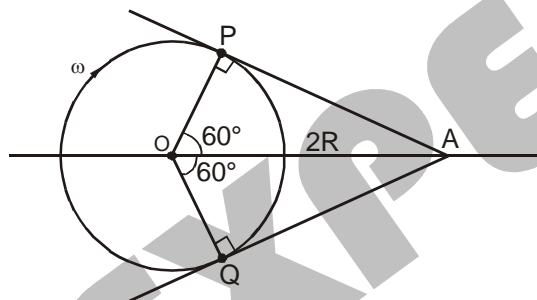
7. **(A, C)**

8. **(A, D)**

SECTION - 2

9. **Sol. (3)**

Point A shall record zero magnetic field (due to α -particle) when the α -particle is at position P and Q as shown in figure. The time taken by α -particle to go from P to Q is



$$t = \frac{1}{3} \frac{2\pi}{\omega} \quad \text{or} \quad \omega = \frac{2\pi}{3t} \Rightarrow \omega = 3 \text{ rad/sec}$$

10. **Sol. (9)**

$$dV = -E dx = -\vec{E} \cdot d\vec{r} = -(y^2 \hat{i} + 2yx \hat{j}) \cdot (dx \hat{i} + dy \hat{j}) = -(y^2 dx + 2yxdy) = -d(xy^2) = -[-9 - (0)] = 9 \text{ volt.}$$

11. **Sol. (5)**

For ammeter

$$99 I_g = (I - I_g) 1$$

$$\text{or } I = 100 I_g$$

I_g is the full scale deflection current of the galvanometer and I is the range of ammeter

For the circuit in the adjacent figure,

$$\frac{12 \text{ V}}{2 + r + \frac{99 \times I}{99 + 1}} = 3 \text{ A}$$

$$\Rightarrow r = 1.01 \, \Omega$$

For voltmeter, range

$$V = I_g(99 + 101) = 200 I_g$$

Also resistance of the voltmeter = $99 + 101 = 200 \, \Omega$

...(1)

In the adjacent figure, resistance across the terminals of the battery

$$R_1 = r + \frac{200 \times 2}{202} = 2.99 \, \Omega$$

$$\therefore \text{Current drawn from the battery, } I_1 = \frac{12}{2.99} = 4.01 \, \text{A}$$

\therefore Voltmeter reading

$$\frac{4}{5} V = 12 - I_1 r = 12 - 4.01 \times 1.01$$

$$V = 7.96 \times \frac{5}{4} = 9.95 \, \text{V}$$

$$\text{Using eq. (2), } I_g = \frac{9.95}{200} = 0.05 \, \text{A}$$

Using eq. (1), range of the ammeter

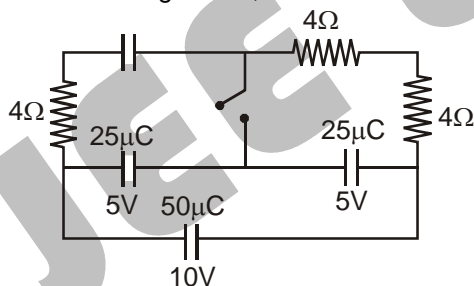
$$I = 100 I_g = 5 \, \text{A}$$

12. **Sol. (4)**

$$\text{Field} = \frac{\mu_0 i}{4\pi a} \times 2 + \frac{\mu_0 i}{2a} \left(\frac{\pi}{2 \times 2\pi} \right) = \frac{\mu_0 i}{2\pi a} + \frac{\mu_0 i}{8\pi a} \pi = \frac{\mu_0 i}{8\pi a} (4 + \pi)$$

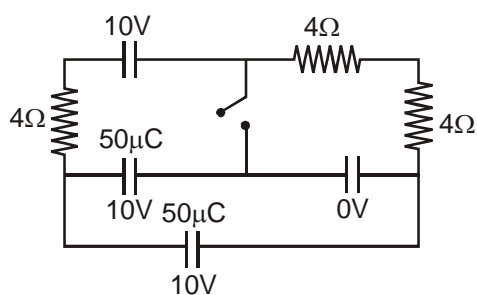
13. **Sol. (5)**

Before closing switch,



$$\text{Initial energy } U = \left(\frac{1}{2} \times 5 \times 5^2 \right) \times 2 + \left(\frac{1}{2} \times 5 \times 10^2 \right) = 125 + 250 = 375 \, \mu\text{J}$$

After closing switch,



$$U_f = \frac{1}{2} \times 5 \times 10^2 + \frac{1}{2} \times 5 \times 10^2 = 500 \mu\text{J}$$

$$\text{Heat} = W_b - \Delta U = (25)(10) - (500 - 375) = 125 \mu\text{J}$$

14. Ans. 4

SECTION - 3

15. Ans. (A \rightarrow s), (B \rightarrow q), (C \rightarrow q), (D \rightarrow q)

16. Ans. A \rightarrow s; B \rightarrow q; C \rightarrow r; D \rightarrow p, s

17. Ans. A \rightarrow p, r, s, t; B \rightarrow p, r; C \rightarrow p, r, s, t; D \rightarrow q

18. Ans. A \rightarrow p, s; B \rightarrow q, r, s; C \rightarrow q, r, s; D \rightarrow p