Marking Scheme – Half Yearly Exam

Class – XII

Subject – Physics

(2023 – 2024)

Q.1 D) 4

Q.2 A) more on the smaller sphere

Q.3 A) $T_1 > T_2$

Q.4 D) 23 A

Q.5 D) 9V

Q.6 B) 1:1

Q.7 A) V & B are ⊥

Q.8 A) less than g

Q.9 A) 1

Q.10 A) $\frac{1}{\sqrt{\mu\epsilon}}$

Q.11 B) 0.25 A

Q.12 B) $E_0 = cB_0$

Q.13 i) Both A & R are true, R is the correct expl of A

Q.14 i) Both A & R are true, R is the correct expl of A

Q.15 iii) A is true, but R is false.

Q.16 iv) Both are false.

Q.17 Definition — 1 mark

SI unit – $m^2/V/s$ — 1 mark

Q.17 Definition (1) mark each

10R)

Q.18 Expression + Explanation — (1) mark each

Q.19 $I_3 = I_1 + I_2$ — (1/2) — (1/2)

For Loop ABDC : $4I_1 - 3I_2 = -1$ — (1/2)

For Loop CDFE : $-3I_2 - 2I_3 = -3$ — (1/2)

On Solving: $I_1 = \frac{2}{13} A$; $I_2 = \frac{7}{13} A$ — (1/2)

$I_3 = \frac{9}{13} A$ — (1/2)

Q.20 $r = \frac{mv}{qB}$; $r = \frac{\sqrt{2mE}}{qB}$ $\because E = \frac{1}{2}mv^2$ — (1/2)

or $r_p = \frac{\sqrt{2m_p E}}{q_p B}$ and $r_\alpha = \frac{\sqrt{2m_\alpha E}}{q_\alpha B}$ — (1/2)

$\frac{r_p}{r_\alpha} = \sqrt{\frac{m_p}{4m_p}} \times \frac{q q_p}{q q_p} \Rightarrow \frac{r_p}{r_\alpha} = 1$ — (1/2) + (1/2) marks

Q.21 Derivation — 2 marks

Q.22 $|\vec{B}_1| = \frac{\mu_0 I R^2}{2(R^2+x^2)^{3/2}}$; $|\vec{B}_2| = \frac{\mu_0 I R^2}{2(R^2+x^2)^{3/2}}$ — (1)

Both $\vec{B}_1$ & $\vec{B}_2$ are $\perp$ so

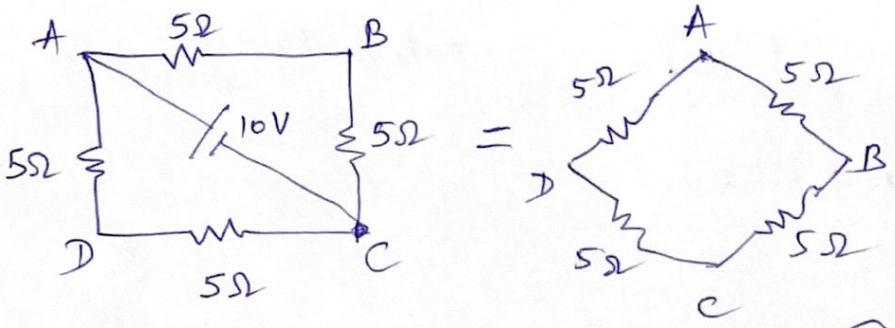
B at O $= \sqrt{B_1^2 + B_2^2} = \sqrt{2}\, B_1$ (as $B_1 = B_2$) — (1/2)

$\therefore B = \frac{\sqrt{2}\, \mu_0 I R^2}{2(R^2+x^2)^{3/2}}$ — (1/2)

$\tan\theta = \frac{B_2}{B_1} \Rightarrow \tan\theta = 1$ (as $B_1 = B_2$) — (1)

$\therefore \theta = 45^\circ$ w.r.t $\vec{B}_1$ or $\vec{B}_2$

Q.23



Eq resistance = 5Ω ——— (1/2)

Total $I = \frac{10}{5} = 2A$ ——— (1/2)

Current in each branch is 1A ——— (1/2)

So, p.d b/w A & B across 5Ω = $V = 1 \times 5 = 5V$ ——— (1/2)

Q.24 Statement ——— (1)

Derivation ——— (2)

Q.25 Meaning ——— (1)

Eg of material – Semiconductor / Insulator — (1)

Explanation ——— (1)

(OR)

Q.25 Derivation with relevant steps — (3)

Q.26 Order: ~~RW~~ < MW < X-rays < γ-rays ——— (1)

1 Application of each ——— (1/2) mark each

Q.27 i) On ↓ C, Z ↑ — (1/2)

$\because Z = \sqrt{R^2 + \frac{1}{\omega^2 C^2}}$

$\therefore I \downarrow$ — (1/2)

Brightness will decrease — (1/2)

ii) On ↓ f ; ω ↓ — (1/2)

$\because Z = \sqrt{R^2 + \frac{1}{(2\pi f)^2 C^2}}$

$Z \uparrow \therefore I \downarrow$ — (1/2)

Brightness will decrease — (1/2)

Q.28: i) } Meaning each case — (1) mark each

ii) } Current sensitivity will be ↑ed by ↑N, A↑, B↑, k↓

— (1)

Q.29. i) B) ~~AC generator~~ 1-clockwise, 2-anticlockwise — (1)

ii) a) NBAω — (1)

iii) (d) 16V — (1)

iv) d) 157 kV — (1)

(OR)

(iv) d) $\frac{1}{120}$ s.

Sol^n 30 i) d) $2^{1/3} : 1$ — (1)

ii) a) 0° — (1)

iii) a) $-\frac{E}{2}$ — (1)

iv) b) Electric susceptibility — (1)

(OR)

iv) d) 1.8×10^{-25} Nm

Sol^n 31 a) Proof $\langle P_{av} \rangle_{inductor} = 0$ — (2)

(OR)

b) i) $X_L = 2\pi f L \Rightarrow L = \frac{X_L}{2\pi f} = 32\,mH$ — (1)

ii) P dissipation is max when — (1)

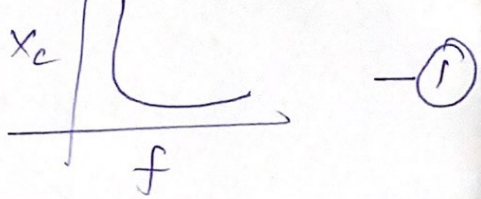
$X_L = X_C$

$2\pi f L = \frac{1}{2\pi f C} \Rightarrow C = 8.8\,\mu f$ — (1)

Sol^n 31 a) X → capacitor — (1) Justification — (1)

b) $Z = X_C$ (in case)

$X_C = \frac{1}{2\pi f C}$



— (1)

c) $V = V_0 \sin\omega t$

$Q = CV_0 \sin\omega t \Rightarrow I = \frac{dQ}{dt} = I_0 \sin(\omega t + \pi/2)$ — (2)

Q.32 A) i) Diamagnetic — (1)

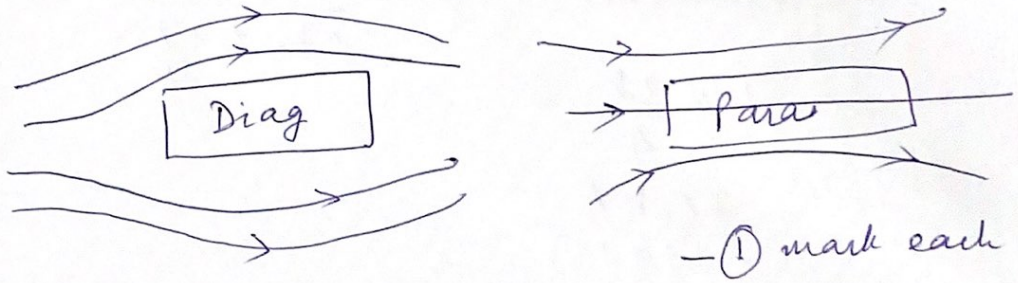
ii) Paramagnetic — (1)

$\mu_r = 1 + \chi$

B) For diamag $0 \leq \mu_r < 1$ — (1/2)

For paramag $1 < \mu_r < 1 + \epsilon$ — (1/2)

C)



— (1) mark each

Q.32 (OR) (i) Diagram with relevant directions — (1/2)

Derivation — (2)

(ii) Pattern of field lines — (1/2)

(iii) (a) ⊥ to page, inwards — (1)

(b) Max torque ⇒ $M \perp B$ — (1/2)

(c) Min torque ⇒ $M \parallel B$ — (1/2)