UNIT TEST-03

Subject : Physics
Class : XII

Q.1 (2)	**Q.2** (2)	**Q.3** (3)	**Q.4** (2)	**Q.5** (4)	**Q.6** (1)	**Q.7** (3)	**Q.8** (1)	**Q.9** (3)	**Q.10** (4)
Q.11 (3)	**Q.12** (3)	**Q.13** (2)	**Q.14** (2)	**Q.15** (2)	**Q.16** (3)	**Q.17** (1)	**Q.18** (1)	**Q.19** (2)	**Q.20** (3)
Q.21 (3)	**Q.22** (3)	**Q.23** (2)	**Q.24** (4)	**Q.25** (3)	**Q.26** (2)	**Q.27** (1)	**Q.28** (4)	**Q.29** (2)	**Q.30** (2)
Q.31 (4)	**Q.32** (3)	**Q.33** (4)	**Q.34** (3)	**Q.35** (4)	**Q.36** (1)	**Q.37** (3)	**Q.38** (4)	**Q.39** (2)	**Q.40** (2)
Q.41 (4)	**Q.42** (3)	**Q.43** (4)	**Q.44** (4)	**Q.45** (4)	**Q.46** (2)	**Q.47** (2)	**Q.48** (1)	**Q.49** (4)	**Q.50** (2)

Q.1 (2)

From $T = 2\pi\sqrt{\frac{I}{MB}}, 4 = 2\pi\sqrt{\frac{I}{MB}}$

When it is cut into two equal parts in length, mass of each part becomes $\frac{1}{2}$, I = mass $\frac{(\text{length})^2}{12}$ becomes $\frac{1}{8}$th and M becomes $\frac{1}{2}$

$$T' = 2\pi\sqrt{\frac{\frac{I}{8}}{\left(\frac{M}{2}\right)B}}$$

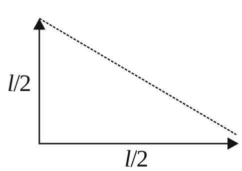
$$\therefore T' = \frac{1}{2}\left(2\pi\sqrt{\frac{I}{MB}}\right)$$

$$T' = \frac{1}{2}T = 2s$$

Q.2 (2)

Magnetic moment of each part is = M/2

So, the net magnetic moment is



$$= \sqrt{\left(\frac{M}{2}\right)^2 + \left(\frac{M}{2}\right)^2} = \frac{M}{\sqrt{2}}$$

Q.3 (3)

$$\phi = \vec{B}.\vec{A} = \mu_m \vec{H}.\vec{A} = \mu_o \mu_r HA$$

$$\Rightarrow \mu_r(\mu_o HA) = 0{\cdot}91 \Rightarrow \mu_r = \frac{0{\cdot}91}{0{\cdot}65} = 1{\cdot}4$$

Q.4 (2)

Formula based

Q.5 (4)

For paramagnetic

Magnetic suscaptibility, $\chi \propto \frac{1}{T}$

$\Rightarrow$ inversely proportional to absolute temperature

Q.6 (1)

Q.7 (3)

$\phi = 3t^2 + 4t + 9$

$$|v| = \left|-\frac{d\phi}{dt}\right| = 6t + 4$$

$= 6 \times 2 + 4 = 12 + 4 = 16$ volt

Q.8 (1)

f = 0.02 cos 100 πt

N = 50

$$v = \left|-\frac{d\phi}{dt}\right| = 0.02 \times 50 \times 100\,\pi \times \sin 100\pi t$$

$= 1 \times 100 \times \pi = 100 \times 3.14 = 314$ volt

Q.9 (3)

$$e = -L\frac{di}{dt}$$

e = –L (slope of i-t graph)

applying the concept we can find graph between e and t

Q.10 (4)

F = BId = ma

$a = \frac{BId}{m} \Rightarrow \quad v = a \times t$

Q.11 (3)

Q.12 (3)

Induced emf, e = Bvl

v = velocity of train

$= 72 \times \frac{5}{18} = 20 ms^{-1}$

$= 2 \times 10^{-5} \times 20 \times 1$

$= 2 \times 10^{-5} \times 20$

$= 40 \times 10^{-5}$ V

$= 40 \times 10^{-2}$ mV

$= 0.4$ mV

Q.13 (2)

$$e = -\frac{LdI}{dt} \Rightarrow L = -\frac{e}{(dI/dt)}$$

$$L = -\frac{8}{(2/0.05)} = -0.2 H$$

= 0.2 H (only positive value)

Q.14 (2)

Q.15 (2)

$N_A = 300$ $N_B = 600$

$I_A = 3A$, $I_B = ?$

$\phi_A = 1.2 \times 10^{-4}$ wb $\phi_B = 9.0 \times 10^{-5}$ wb

$\because = \mu \times I_A = \phi_B$

$$M = \frac{\varphi_B}{I_A}$$

$$= \frac{9.0 \times 10^{-5}}{3}$$

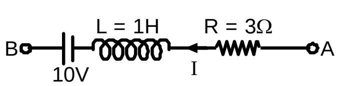
$= 3 \times 10^{-5}$ H

Q.16 (3)

$$E = \frac{1}{2}Li^2 \quad \frac{dE}{dt} = \frac{1}{2}.2.Li\frac{di}{dt} = Li\frac{di}{dt}$$

$= 2 \times 2 \times 4 = 16$ J/sec.

Q.17 (1)



$$V_A - 3(10t + 5) - 1\frac{d(10t + 5)}{dt} + 10 - V_B = 0$$

at t = 0

$V_A - 3 \times 5 - 10 + 10 - V_B = 0$

$V_A - V_B = 15$ V

Q.18 (1)

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

$$\frac{1}{2} \times 4 \times 10^{-6} \times C^2 = \frac{1}{2} \times 2 \times (2)^2$$

$\Rightarrow C^2 = 2 \times 10^6 \Rightarrow C = \sqrt{2} \times 10^3 V$

Order is 10^3 V

Q.19 (2)

At t = 0

$$I = 4 \times \frac{1}{2} = 2A$$

Q.20 (3)

Q.21 (3)

$$\cos\phi = \frac{R}{Z} = 0.8$$

Q.22 (3)

$$\cos\phi = \frac{R}{Z} = \frac{10}{20} = \frac{1}{2} \Rightarrow \phi = 60^o$$

Q.23 (2)

Q.24 (4)

L–R circuit

$$I = \frac{V}{Z} = \frac{V}{\sqrt{R^2 + \omega^2 L^2}}$$

Q.25 (3)

Q.26 (2)

Q.27 (1)

Q.28 (4)

$$\frac{V_2}{V_1} = \frac{N_2}{N_1} = \frac{8}{1}$$

$V_2 = 8 \times 120 = 960$ volt

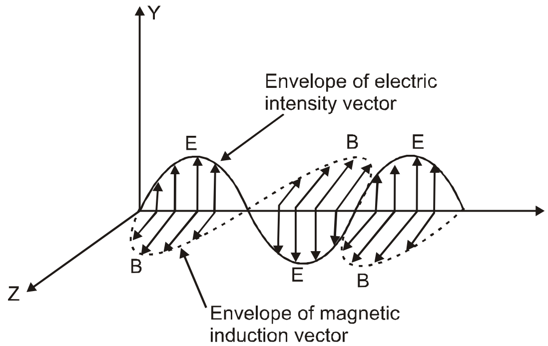
$$I = \frac{960}{10^4} = 96 mA.$$

Q.29 (2)

Q.30 (2)

Q.31 (4)

The amplitudes of the electric and magnetic fields in free space are related by $\frac{E_0}{B_0} = c$



In figure, electric field vector $(\vec{E})$ and magnetic field vector $(\vec{B})$ are vibrating along Y and Z directions and propagation of electromagnetic wave is shown in X-direction.
Hence, electric and magnetic fields are in phase and perpendicular to each other.

Q.32 (3)

Q.33 (4)

Q.34 (3)
β rays are not electromagnetic waves.

Q.35 (4)

Q.36 (1)
Work done in changing the orientation of a dipole of moment M in a magnetic field B from position θ_1 to θ_2 is given by
$W = MB(\cos\theta_1 - \cos\theta_2)$
Here, $\theta_1 = 0^o$ and $\theta_2 = 180^o$
So, $W = 2MB = 2 \times 2.5 \times 0.5 = 1J$

Q.37 (3)

Susceptibility $(X) \dfrac{\text{intensity of magnetisation(I)}}{\text{magnetic field (B)}}$

Or $I = \chi B$
$\therefore I = 3 \times 10^{-4} \times 4 \times 10^{-4}$
Or $I = 12 \times 10^{-8}\ Am^{-1}$

Q.38 (4)

Q.39 (2)

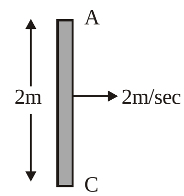
$$i = \frac{e}{R} = \frac{N}{R}\left[\frac{d\phi}{dt}\right] = \frac{N}{R}\left[\frac{\phi - (\phi)}{dt}\right]$$

$$= \frac{2N\phi}{R(dt)} = \frac{2N(BA)}{R(dt)}$$

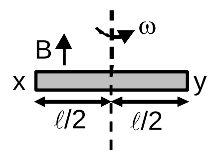
$$= \frac{2(1200)(4\times10^{-4})(500\times10^{-4})}{20(10^{-1})}$$

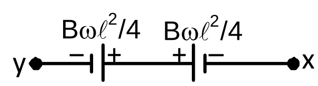
$= 24 \times 10^{-3}\ A = 24\ mA$

Q.40 (2)
Effective length AC = (2 sin 30) × 2 = 2m
emf induced = $BV\ell = 1 \times 2 \times 2$
= 4 volt



Q.41 (4)





$$v_x + \frac{B\omega\ell^2}{4} - \frac{B\omega\ell^2}{4} - v_y = 0$$

$\Rightarrow v_x - v_y = 0$

Q.42 (3)

$$\varepsilon_2 = -M\frac{di,}{dt}$$

$$= -4\frac{(0-5)}{10^{-3}} = 2 \times 10^4\ V.$$

Q.43 (4)

$W = \dfrac{1}{2} LI^2$ (Lesa Energy stored)

$$= \frac{1}{2} \times 5 \times (10)^2 = 250\ J$$

Q.44 (4)

Q.45 (4)

$I_{RMS} = 10A; V_{RMS} = 25V$

so, Power = $I_{RMS} V_{RMS} \cos\phi$

$\Rightarrow$ Power = $10 + 25 \times \cos\phi$

$\Rightarrow$ Power = $250 \cos\phi$

$\Rightarrow$ Power = $250 \cos\phi$

as $\cos\phi \le 1$

$\Rightarrow$ Power ≤ 250 W

Q.46 (2)

$X_L = 2\pi f L$

$= 2 \times 3.14 \times 50 \times 25.48 \times 10^{-3} = 8\,\Omega$

$$X_C = \frac{1}{2\pi f\,C} = \frac{1}{2 \times 3.14 \times 50 \times 796 \times 10^{-6}} = 4\Omega$$

$\therefore$ Impedance of the circuit is

$$Z = \sqrt{R^2 + (X_L - X_C)^2} = \sqrt{(3)^2 + (8-4)^2} = 5\Omega$$

Q.47 (2)

$$\frac{N_1}{N_2} = \frac{V_1}{V_2} = \frac{200}{5} = \frac{40}{1}$$

Q.48 (1)

$$\sqrt{\mu_r \varepsilon_r} = 2$$

$$v = \frac{c}{n} = \frac{3 \times 10^8}{2} = 15 \times 10^7 \text{ m/s}$$

x = 15

Q.49 (4)

Factual

Q.50 (2)

As $\lambda = \dfrac{hc}{E}$

where the symbols have their usual meanings.

Here, E = 15 keV = 15×10^3 V

and hc = 1240 eV nm

$$\therefore\ \lambda = \frac{1240\,\text{eV nm}}{15 \times 10^3\,\text{eV}} = 0.083 \text{ mm}$$

As the wavelength range of X-rays is from 1 nm to 10^{-3} nm, so this wavelength belongs to X-rays.