DPP
DAILY PRACTICE PROBLEMS

Class : XIIth
Date :

Solutions

Subject : PHYSICS
DPP No. : 4

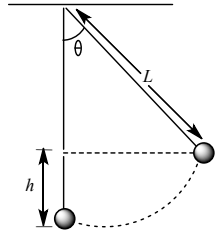
Topic :- Electro Magentic Induction

1 **(d)**

Cross ⊗ magnetic field passing from the closed loop is increasing. Therefore, from Lenz's law induced current will produce dot ⊙ magnetic field. Hence, induced current is anticlockwise.

2 **(a)**

$h = L - L\cos\theta$



$\Rightarrow \quad h = L(1-\cos\theta) \qquad$ ....(i)

$\therefore \quad v^2 = 2gh - 2gL(1-\cos\theta)$

$= 2gL\left(2\sin^2\frac{\theta}{2}\right)$

$\Rightarrow \quad v = 2\sqrt{gL}\sin\frac{\theta}{2}$

Thus, maximum potential difference

$V_{max} = BvL$

$= B \times 2\sqrt{gL}\sin\frac{\theta}{2}L$

$= 2BL\sin\frac{\theta}{2}(gL)^{1/2}$

4 **(b)**

Rate of work $= \frac{W}{t} = P = Fv$; also $F = Bil = B\left(\frac{Bvl}{R}\right)l$

$\Rightarrow P = \frac{B^2v^2l^2}{R} = \frac{(0.5)^2 \times (2)^2 \times (1)^2}{6} = \frac{1}{6}W$

5 **(c)**

The emf developed between the ends of the conductor

$$e = \frac{1}{2}B\lambda^2\omega$$

$$= \frac{1}{2} \times 0.2 \times 10^{-4} \times (1)^2 \times 5 = 50\mu V$$

6 **(d)**

$e = B.\frac{dA}{dt} = L\frac{di}{dt} \Rightarrow 1 \times \frac{5}{10^{-3}} = L \times \frac{(2-1)}{2 \times 10^{-3}} \Rightarrow L = 10H$

7 **(d)**

More rapid is the movement of bar magnet, more is the deflection observed in the galvanometer

8 **(c)**

In a generator e.m.f. is induced according as Lenz's rule

9 **(a)**

Since the current is increasing, so inward magnetic flux linked with the ring also increases (as viewed from left side). Hence induced current in the ring is anticlockwise, so end x will be positive

Induced emf $|e| = A\frac{dB}{dt} = A\frac{d}{dt}(B_0 + \alpha t) \Rightarrow |e| = A\alpha$

10 **(c)**

From Faraday's law of electromagnetic induction

$$e = -\frac{d\phi}{dt} = -BAN$$

Given, $B = 0.1$ T, $N = 20$, $A = \pi r^2 = \pi(0.1)^2$

$\therefore \quad e = -0.1 \times 20 \times \pi(0.1)^2 = 20\pi$ mV

11. **(d)**

Mutual inductance between two coil in the same plane with their centers coinciding is given by

$$M = \frac{\mu_0}{4\pi}\left(\frac{2\pi^2 R_2^2 N_1 N_2}{R_1}\right) henry$$

12 **(d)**

Using Fleming's right hand rule, the direction of magnetic induction $\vec{B}$ in the region P is downward into the paper.

13 **(b)**

Transformation ratio, $k = \frac{N_s}{N_p} = \frac{V_s}{V_p}$

For step-up transformer,

$N_s > N_p$, $\quad ie, V_s > V_p$, hence, $k > 1$.

14 **(b)**

$N_2\phi_2 = Mi_1 \Rightarrow 9 \times 10^{-5} = M \times 3 \Rightarrow M = 3 \times 10^{-5}\ H$

15 **(a)**

Faraday's laws involve conversion of mechanical energy into electrical energy. This is in accordance with the law of conservation of energy

16 **(d)**

KE of charged possible in a cyclotron,

$$E_k = \frac{q^2B^2r^2}{2m}$$

But frequency $f = \frac{qB}{2\pi m}$

$$\therefore E_k = \frac{(2\pi mf)^2r^2}{2m} = 2\pi^2mf^2r^2$$

Or $E_k = 2 \times (3.14)^2 \times 1.67 \times 10^{-27} \times (10 \times 10^6)^2 \times (0.5)^2$

$= 8.23 \times 10^{-13}$J

$$\therefore \quad E_k = \frac{8.23 \times 10^{-13}}{1.6 \times 10^{-19}} = 5.1 \times 10^6 \text{ eV} = 5.1 \text{ MeV}$$

17 **(b)**

Magnetic flux, $\phi = 5t^2 - 4t + 1\ Wb$

$$\therefore \frac{d\phi}{dt} = 10t - 4\ Wb\ s^{-1}$$

The induced emf is $\varepsilon = \frac{-d\phi}{dt} = -(10t - 4)$

At, $t = 0.2\ S$, $\varepsilon = -(10 \times 0.2 - 4) = 2V$

The induced current is $I = \frac{\varepsilon}{R} = \frac{2V}{10\Omega} = 0.2\ A$

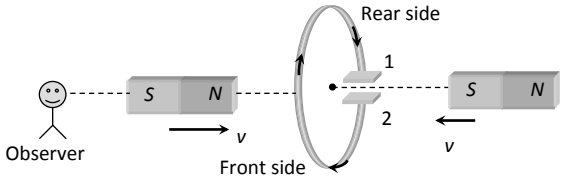
18 **(b)**

$$i = i_0\left(1 - e^{\frac{Rt}{L}}\right) \Rightarrow \frac{di}{dt} = -i_0\left(-\frac{R}{L}\right)e^{\frac{Rt}{L}} = \frac{i_0R}{L}.e^{\frac{Rt}{L}}$$

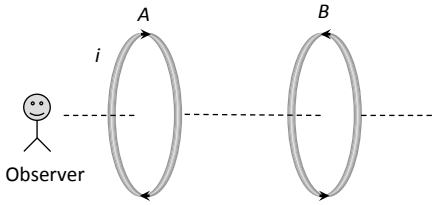
At $t = 0; \frac{di}{dt} = \frac{i_0R}{L} = \frac{E}{L} \Rightarrow 4 = \frac{E}{20} \Rightarrow E = 80\ V$

19 **(b)**

By the movement of both the magnets, current will be anticlockwise, as seen from left side, *i.e.*, plate 1 will be positive and 2 will be negative



20 **(d)**



If current through A increases, magnetic field ($\times$) linked with coil B increases. Hence anticlockwise current induces in coil B. As shown in figure both the currents produce repulsive effect

ANSWER-KEY										
Q.	1	2	3	4	5	6	7	8	9	10
A.	D	A	A	B	C	D	D	C	A	C
Q.	11	12	13	14	15	16	17	18	19	20
A.	D	D	B	B	A	D	B	B	B	D