Physicsaholics

DPP – 1 (EMI)

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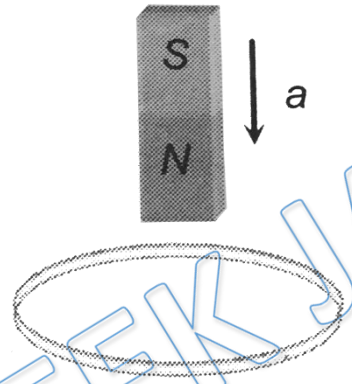
Q 1. A metallic ring is attached with the wall of a room. When the north pole of a magnet is brought near to it, the induced current in the ring will be



(a) No current induced
(b) In clockwise direction
(c) In anticlockwise direction
(d) Depends on magnitude of current

Q 2. A bar magnet falls with its north pole pointing down through the axis of a copper ring. When viewed from above, the current in the ring will be
(a) Clockwise while the magnet is above the plane of the ring and counter clockwise while below the plane of the ring.
(b) Counter clockwise throughout
(c) Counter clockwise while the magnet is above the plane of the ring and clockwise while below the plane of the ring.
(d) Clockwise throughout

Q 3. The horizontal component of earth's magnetic field is $3 \times 10^{-5}\ Wb/m^2$. The magnetic flux linked with a coil of area $1\ m^2$ and having 5 turns, whose plane is normal to the magnetic field, will be
(a) $3 \times 10^{-5}\ Wb$ (b) $5 \times 10^{-5}\ Wb$
(c) $15 \times 10^{-5}\ Wb$ (d) Zero

Q 4. A square coil of 600 turns, each side 20cm, is placed with its plane inclined at 30^0 to a uniform magnetic field of $4.5 \times 10^{-4}\ Wb/m^2$, Find the flux through the coil
(a) $35 \times 10^{-5}\ Wb$ (b) $54 \times 10^{-4}\ Wb$
(c) $51 \times 10^{-5}\ Wb$ (d) Zero

Q 5. A coil having an area A_o is placed in a magnetic field (plane of coil is perpendicular to magnetic field) which changes from B_o to $4B_o$ in time interval t. The e.m.f. induced in the coil will be

(a) $\frac{3A_oB_o}{t}$ (b) $\frac{4A_oB_o}{t}$

(c) $\frac{3B_o}{A_ot}$ (d) $\frac{4A_o}{B_ot}$

Q 6. A coil of area 10 cm^2 and 10 turns is in magnetic field directed perpendicular to the plane and changing at a rate of 10^8 gauss/s. The resistance of coil is 20Ω. The current in the coil will be

(a) 0.5 A (b) 5×10^{-3}A

(c) 0.05 A (d) 5 A

Q 7. A coil having an area $2m^2$ is placed in a magnetic field which changes from 1 Wb/m^2 to 4 Wb/m^2 in an interval of 2 second. The average e.m.f. induced in the coil will be

(a) 4V (b) 3V

(c) 1.5V (d) 2V

Q 8. A magnetic field of flux density 1.0 Wb m^{-2} acts normal to a 80 turns coil of 0.01 m^2 area. Find the e.m.f. induced in it, if this coil is removed from the field in 0.1 second

(a) 2V (b) 4V

(c) 0.8V (d) 8V

Q 9. The magnetic flux linked with coil, in weber is given by the equation $\phi = 5t^2 + 3t + 16$. The average induced emf in the coil in the fourth second is

(a) 38 V (b) 30 V

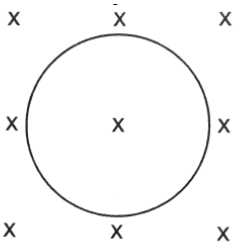
(c) 45 V (d) 90 V

Q 10. The magnetic flux linked with a coil is given by an equation ϕ(in webers) = $8t^2 + 3t + 5$. The magnitude of induced e.m.f. in the coil at t = 4 second will be

(a) 16V (b) 39V

(c) 67V (d) 145V

Q 11. A circular loop is placed in magnetic field B = 2t. Find the direction of induced current produced in the loop

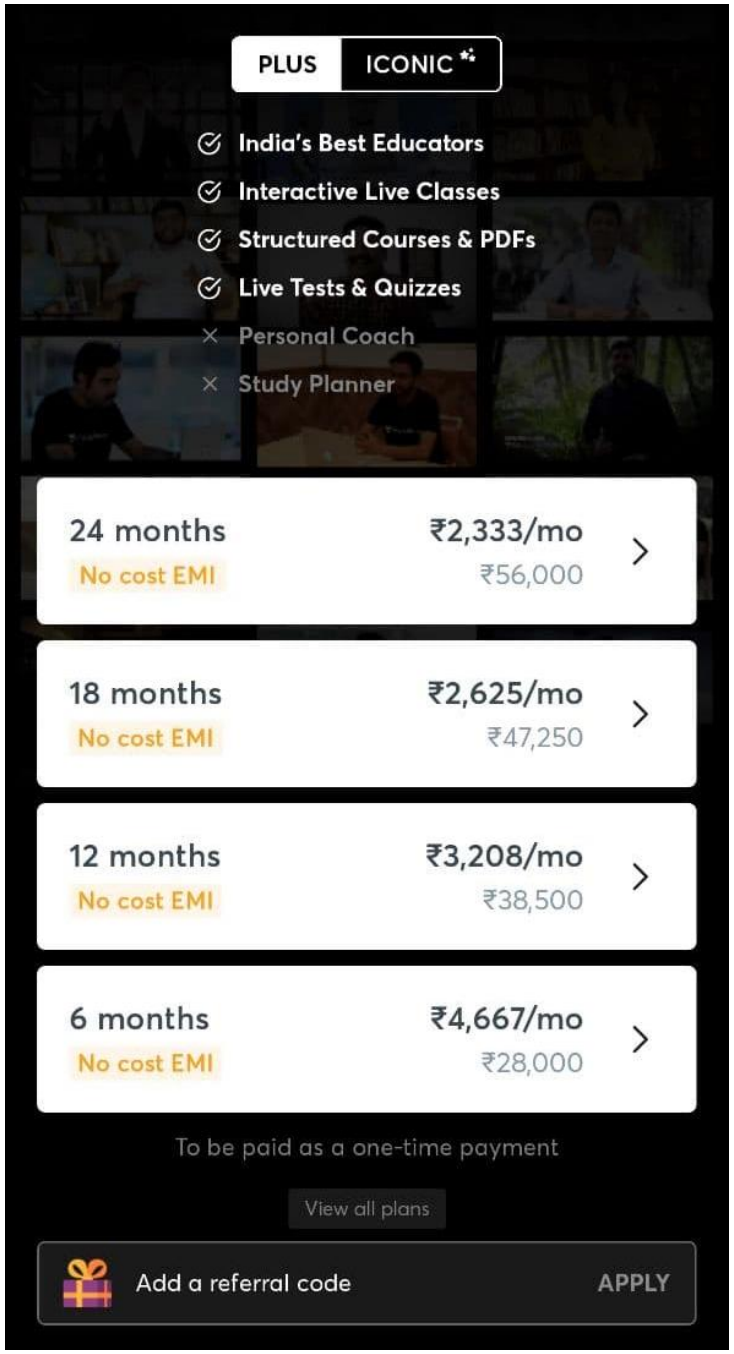


(a) Clock wise (b) Anti-clock wise

(c) Can't determine (d) none of these

Answer Key

Q.1 c	**Q.2 c**	**Q.3 c**	**Q.4 b**	**Q.5 a**
Q.6 d	**Q.7 b**	**Q.8 d**	**Q.9 a**	**Q.10 c**
Q.11 b				



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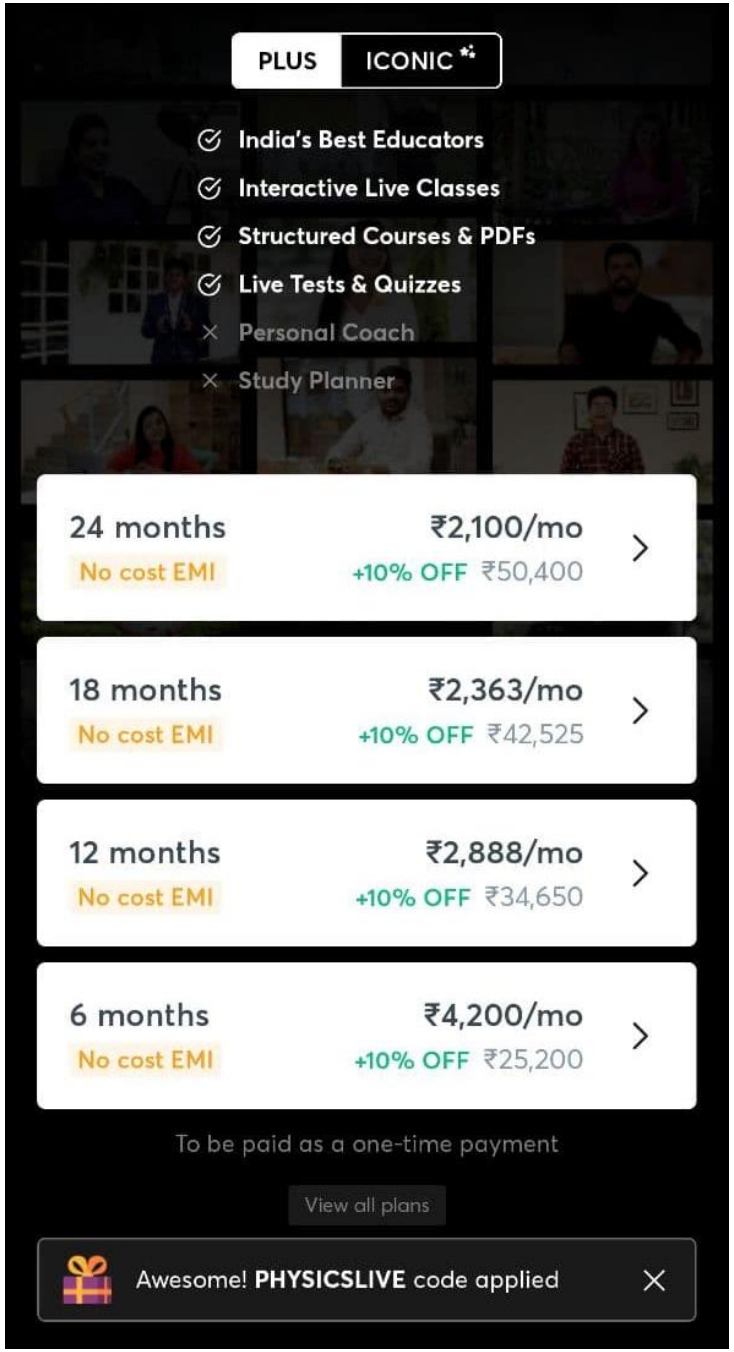
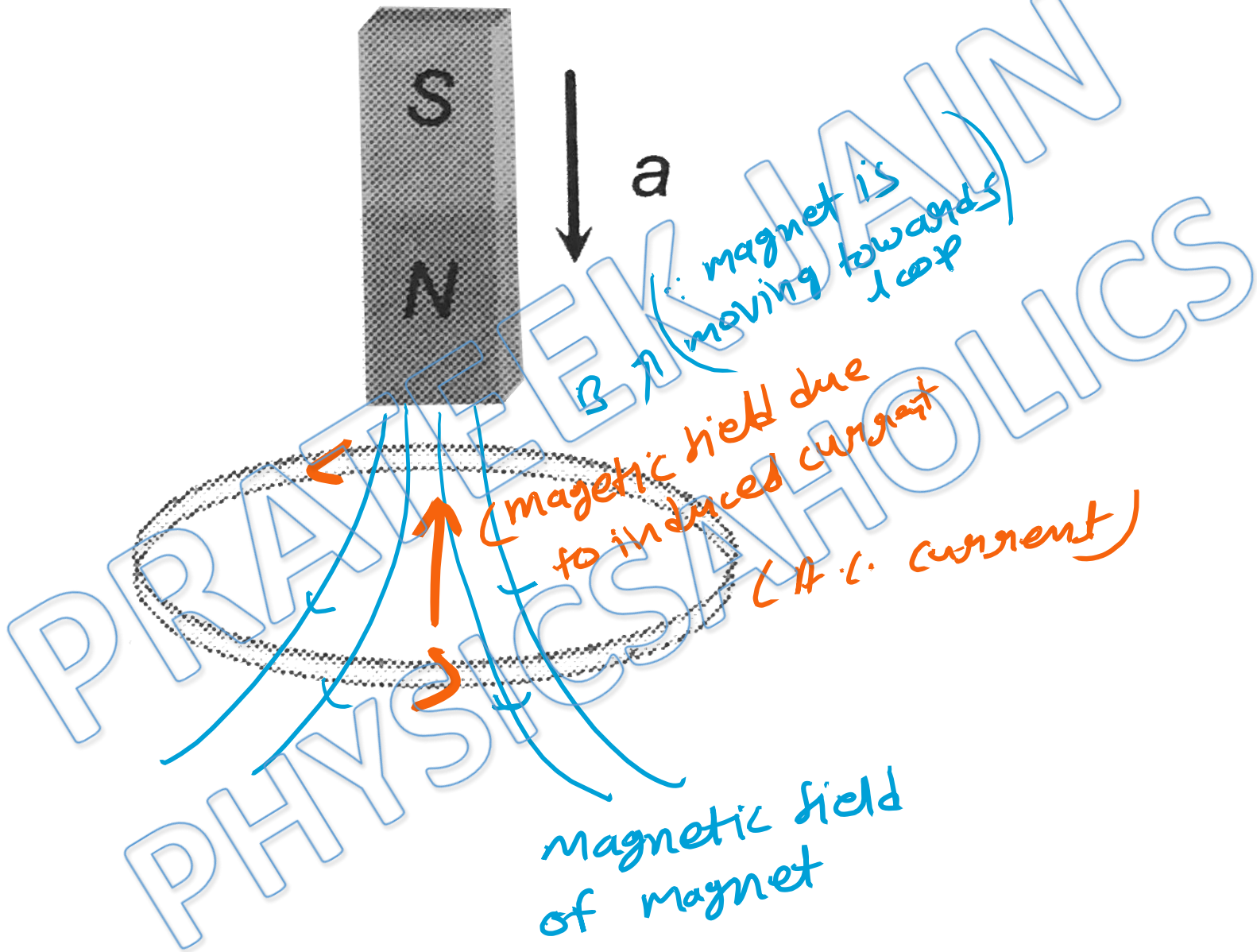


NEET & JEE Main
Physics DPP

DPP- 1 : EMI – Magnetic flux, Faraday's first and second law, Lenz law

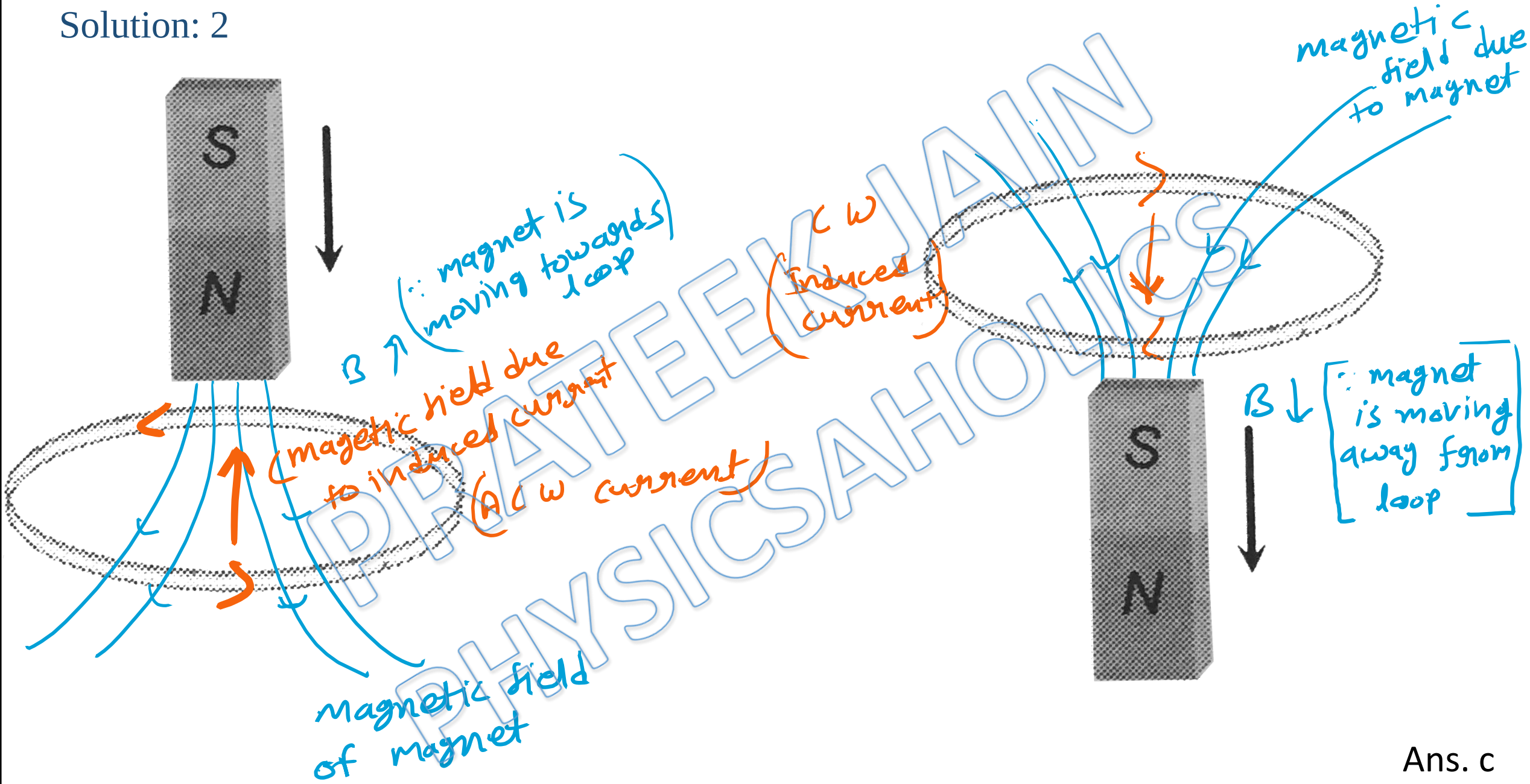
By Physicsaholics Team

Solution: 1



Ans. c

Solution: 2



Ans. c

Solution: 3

$A = 1\ m^2$

$n = 5$

$B_H = 3 \times 10^{-5}\ wb/m^2$

$\phi = nBA\cos\theta$

$\cos\theta = 1 \quad (\theta = 0^\circ)$

$\phi = 5 \times 3 \times 10^{-5} \times 1$

$\phi = 15 \times 10^{-5}\ wb$ / Ans.

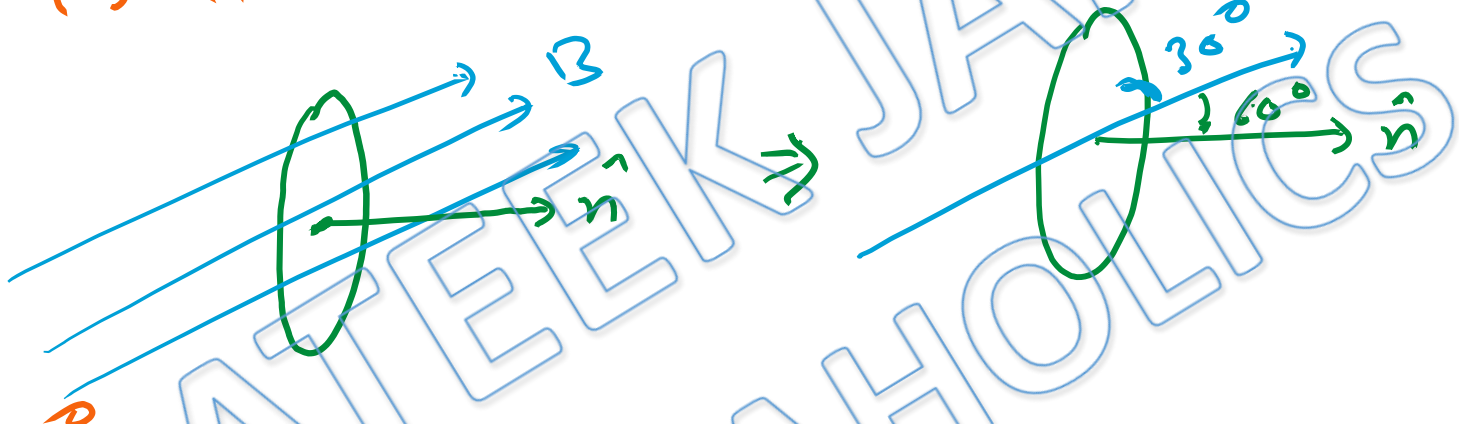
Ans. c

Solution: 4

$A = (20 \times 10^{-2})^2 = 4 \times 10^{-2}\ m^2$

$n = 600$

$B = 4.5 \times 10^{-4}\ wb/m^2$



$\theta = 60^\circ$

$\phi = nBA\cos\theta$

$= 600 \times 4.5 \times 10^{-4} \times 4 \times 10^{-2} \times \cos 60^\circ$

$= 24 \times 4.5 \times 10^{-4} \times 1/2 = 12 \times 4.5 \times 10^{-4}$

$\phi = 54.0 \times 10^{-4}\ wb$

$\boxed{\phi = 54 \times 10^{-4}\ wb}$ Ans.

Ans. b

Solution: 5

$$|\varepsilon| = \frac{d\phi}{dt}$$

$$\phi_1 = B_0 A_0 \; ; \; \phi_2 = 4 B_0 A_0$$

$$|\Delta\phi| = 3 B_0 A_0$$

$$\varepsilon = \frac{\Delta\phi}{\Delta t} = \frac{3 B_0 A_0}{t}$$

$$\boxed{\varepsilon = \frac{3 B_0 A_0}{t}}$$ Ans.

Ans. a

Solution: 6

$1G = 10^{-4}\ T$

$\frac{dB}{dt} = 10^8\ G/s = 10^4\ T/sec$

$A = 10\ cm^2 = 10 \times 10^{-4}\ m^2$

$n = 10$ turns

$|\mathcal{E}| = \left|\frac{d\phi}{dt}\right| = nA\frac{dB}{dt}$ [$\because \phi = nBA$]

$\mathcal{E} = 10 \times 10 \times 10^{-4} \times 10^4$

$\mathcal{E} = 100$ Volt

$R = 20\ \Omega$

$\Rightarrow I = \frac{\mathcal{E}}{R}$

$I = \frac{100}{20}$

$I = 5$ Amp Ans.

Ans. d

Solution: 7

$$\phi = BA$$

$$\frac{d\phi}{dt} = A\frac{dB}{dt} = 2 \times \left(\frac{t-1}{2}\right)$$

$$\boxed{\frac{d\phi}{dt} = 3}$$

$$|E_{avg}| = \frac{d\phi}{dt}$$

$$\boxed{E_{avg} = 3\ Volt}\ \text{Ans.}$$

Ans. b

Solution: 8

$B = 1 \text{ wb/m}^2$

$n = 80$

$A = 0.01 \text{ m}^2$

$\phi_i = nBA = 80 \times 1 \times 0.01 = 0.8$

$\phi_f = 0$

$|\Delta\phi| = 0.8$

$|\varepsilon| = \left|\frac{d\phi}{dt}\right| = \frac{0.8}{0.1} = 8 \text{ Volt}$

$\boxed{\varepsilon = 8 \text{ Volt}}$ Ans.

Ans. d

Solution: 9

$$\phi = 5t^2 + 3t + 16$$

$$\frac{d\phi}{dt} = 10t + 3$$

$$\mathcal{E} = -\frac{d\phi}{dt} = -(10t+3)\ V$$

$$|\mathcal{E}| = (10t+3)\ \text{Volt}$$

at $t = 4$ sec

$$\mathcal{E}_1 = 10\times4+3 = 43\ \text{Volt}$$

at $t = 3$ sec

$$\mathcal{E}_2 = 10\times3+3 = 33\ \text{Volt}$$

Since $\mathcal{E}.mf.$ is linearly increasing with time

$$\mathcal{E}_{av} = \frac{\mathcal{E}_1+\mathcal{E}_2}{2} = \frac{33+43}{2} = 38V$$

ANS(A)

Solution: 10

$$\phi = 8t^2 + 3t + 5$$

$$\frac{d\phi}{dt} = 16t + 3$$

$$\mathcal{E} = -\frac{d\phi}{dt} = -(16t + 3) \text{ Volt}$$

$$\mathcal{E}_{t=4} = -(16 \times 4 + 3)$$

$$\mathcal{E}_{t=4} = -67 \text{ Volt}$$

$$\boxed{|\mathcal{E}|_{t=4} = 67 \text{ Volt}} \quad \text{Ans.}$$

Ans. c

Solution: 11

$B = 2t$

$\phi = BA$

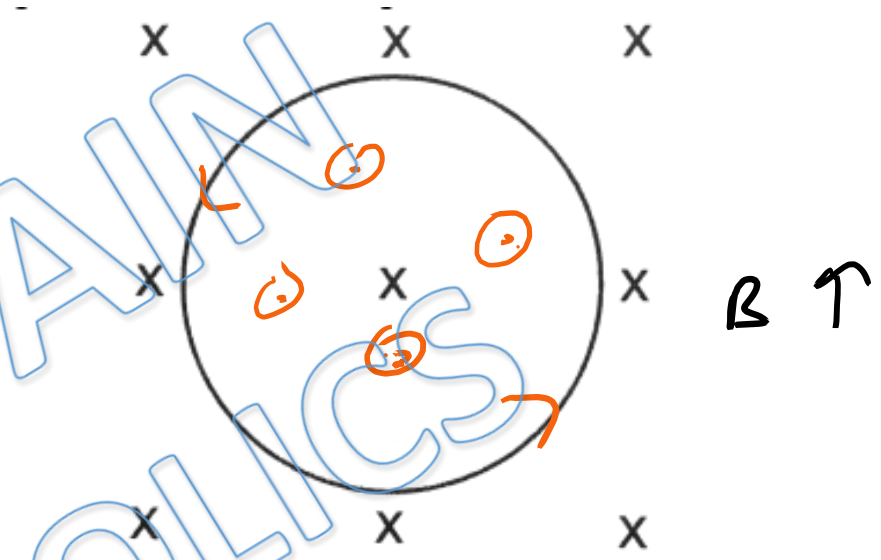
$\frac{d\phi}{dt} = A\frac{dB}{dt}$

$\therefore \frac{dB}{dt} = 2$

$\therefore \frac{d\phi}{dt} = +ve$

or $\phi \uparrow$

$\therefore$ Direction will be A.C.W.



OR →

$\vec{B}$ is ⊗ and increasing.

$\Rightarrow$ $\vec{B}$ of induced will be ⊙

$\Rightarrow$ Induced current will be anticlockwise.

Ans. b

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