DPP
DAILY PRACTICE PROBLEMS

Class : XIIth
Date :

Solutions

Subject : PHYSICS
DPP No. : 5

Topic :- MAGNETISM AND MATTER

1 **(a)**

$T = 2\pi\sqrt{\frac{1}{MB_H}}, T' = 2\pi\sqrt{\frac{1}{M(B_H - B)}} \Rightarrow T' = 2T = 4s$

3 **(b)**

Absolute permeability of material of rod

$\mu = \mu_r\mu_0 = (1 + X_m)\mu_0$

$\therefore\ \mu = (1 + 499) \times 4\pi \times 10^{-7} = 2\pi \times 10^{-4}\ \text{Hm}^{-1}$

4 **(b)**

Frog is leveited in magnetic field produced by the current in vertical solenoid below the frog due to repulsion, so body of frog behaves as diamagnetic substance.

5 **(b)**

Torque, $\tau = MB_H \sin\theta$

$\Rightarrow\ 0.032 = M \times 0.16 \sin 30°$

$\Rightarrow\ M = 0.4\ \text{J/T}$

6 **(c)**

Area enclosed by $B - H$ curve represents energy lost. If the area of hysteresis loop is less energy loss is low whereas if the area of hysteresis loop is large energy loss is high.

7 **(d)**

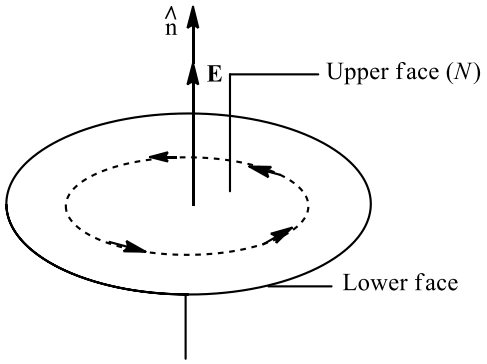
Magnetic potential at a distance d from the bar magnet on it's axial line is given by

$V = \frac{\mu_0}{4\pi}.\frac{M}{d^2} \Rightarrow V \propto M \Rightarrow \frac{V_1}{V_2} = \frac{M_1}{M_2}$

$\Rightarrow \frac{V}{V_2} = \frac{M}{M/4} \Rightarrow V_2 = \frac{V}{4}$

8 **(a)**

The magnetic dipole moment of the current loop (M) is directly proportional to (i) strength of current(i) through the loop and (ii) area (A) enclosed by the loop.



ie, $M \propto i$ and $M \propto A$

$\therefore \quad M = kiA \quad$ ... (i)

Where k is constant of proportionality.

If we define unit magnetic dipole moment as that of a small one turn loop of unit area carrying unit current, then from Eq.(i)

$1 = k \times 1 \times 1$ or $k = 1$

$\therefore$ From Eq.(i)

$$M = iA$$

For N such turns

$$M = NiA$$

Now, length of given wire $L = 2\pi r$

Or $$r = \frac{L}{2\pi}$$

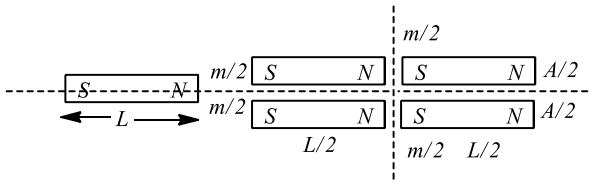
Now, area of the coil, $A = \pi r^2 = \frac{\pi L^2}{4\pi^2}$

$$= \frac{L^2}{4\pi}$$

Hence, magnitude of magnetic dipole moment is

$$M = iA = \frac{iL^2}{4\pi}$$

9 **(b)**



For each part $m' = \frac{m}{2}$

10 **(c)**

Cabin must be made of iron, which has large permeability.

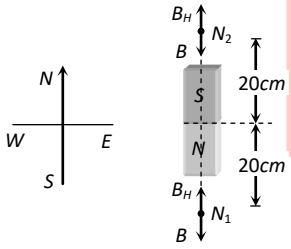
12 **(b)**

Magnetic susceptibility is give as

$$X_m = \frac{I}{H}$$

Large value of X_m implies that the material is more susceptible to the field and hence can be easily magnetized. For diamagnetic substance X_m is small and negative and is independent of temperature.

13 **(b)**



At neutral point

$$|B| = |B_H| \Rightarrow \frac{2M}{(20)^3} = 0.3 \Rightarrow M = 1.2 \times 10^3\ emu$$

15 **(b)**

Transformer core is of soft iron which has large retentivity and small coercivity. Therefore, its hysteresis loop is tall and narrow.

16 **(c)**

Work done, $W = MB.(1 - \cos\theta)$

$$= 20 \times 0.3(1 - \cos 30°)$$

$$= 6\left(1 - \frac{\sqrt{3}}{2}\right) = 3\left(2 - \sqrt{3}\right)$$

18 **(d)**

Given $\tan 37° = \frac{3}{4}$

The vertical component of the earth's magnetic field

$$B_H = 6 \times 10^{-5}\ \text{T}$$

$$\sin 37° = \frac{3}{5}$$

For vertical component

$$B_H = B \sin\theta$$

$$\text{or } B = \frac{B_H}{\sin\theta}$$

$$\text{or } B = \frac{2 \times 10^{-5}}{5} \times 5$$

$$\text{or } B = 10 \times 10^{-5}$$

$$\text{or } B = 10^{-4}\ \text{T}$$

19 **(d)**

Hysteresis loss is minimised by using Mu metal.

20 **(c)**

$$\frac{B_1}{B_2} = \frac{d_1}{d_2}\left(\frac{d_2^2 - l^2}{d_1^2 - l^2}\right)^2 \Rightarrow \frac{12.5}{1} = \frac{10}{20}\left(\frac{400 - l^2}{100 - l^2}\right)^2$$

$\Rightarrow l = 5\ cm$

Hence length of magnet $= 2l = 10\ cm$

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