DPP
DAILY PRACTICE PROBLEMS

Class : XIIth
Date :

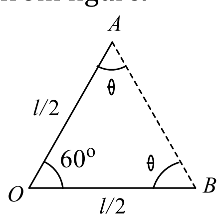
Solutions

Subject : PHYSICS
DPP No. : 9

Topic :- MAGNETISM AND MATTER

1 **(b)**

Pole strength $= m = \frac{M}{l}$. When the wire is bent at its middle point O at 60°, then as is clear from figure.



$60° + \theta + \theta = 180°$

$2\theta = 180° - 60° = 120°$,

$\therefore OAB$ is an equilateral triangle.

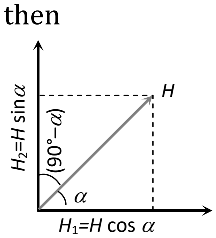
$\therefore AB = 2l' = l/2$

New magnetic moment

$$M' = m(2l') = \frac{ml}{2} = \frac{M}{2}$$

2 **(d)**

Let α be the angle which one of the planes make with the magnetic meridian. The other plane makes an angle $(90° - \alpha)$ with it. The components of H in these planes will be $H\cos\alpha$ and $H\sin\alpha$ respectively. If ϕ_1 and ϕ_2 are the apparent dips in these two planes, then



$$\tan\phi_1 = \frac{V}{H\cos\alpha}, i.e., \cos\alpha = \frac{V}{H\tan\phi_1} \quad \text{... (i)}$$

$$\tan\phi_2 = \frac{V}{H\sin\alpha}, i.e., \sin\alpha = \frac{V}{H\tan\phi_2} \quad \text{... (ii)}$$

Squaring and adding (i) and (ii), we get

$$\cos^2\alpha + \sin^2\alpha = \left(\frac{V}{H}\right)^2\left(\frac{1}{\tan^2\phi_1} + \frac{1}{\tan^2\phi_2}\right)$$

$$i.e., 1 = \frac{V^2}{H^2}[\cot^2\phi_1 + \cot^2\phi_2]$$

or $\frac{H^2}{V^2} = \cot^2\phi_1 + \cot^2\phi_2$, $i.e., \cot^2\phi = \cot^2\phi_1 + \cot^2\phi_2$

This is the required result

3 **(c)**

$$T_1 = 2\pi\sqrt{\frac{I}{MV}}$$

$$T_2 = 2\pi\sqrt{\frac{I}{MH}}$$

$$\frac{T_2}{T_1} = \sqrt{\frac{V}{H}} = \sqrt{\tan\theta}$$

or $\tan\theta = \left(\frac{T_2}{T_1}\right)^2 = \left(\frac{2}{2}\right)^2 = 1$

$\theta = 45°$

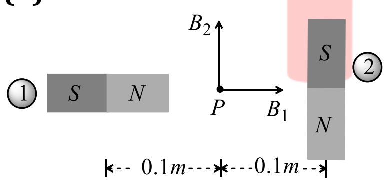
4 **(a)**

$B_H = 0.3\ oersted, I = 0.6\ oersted$

We have $B_H = I\cos\phi \Rightarrow \cos\phi = \frac{B_H}{I} = \frac{0.3}{0.6} = \frac{1}{2}$

$\therefore \phi = 60°$

5 **(d)**



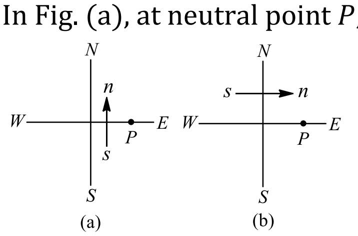
From figure $B_{net} = \sqrt{{B_a}^2 + {B_e}^2}$

$$= \sqrt{\left(\frac{\mu_0}{4\pi}.\frac{2M}{d^3}\right)^2 + \left(\frac{\mu_0}{4\pi}.\frac{M}{d^3}\right)^2}$$

$$= \sqrt{5}.\frac{\mu_0}{4\pi}.\frac{M}{d^3} = \sqrt{5}\times 10^{-7}\times\frac{10}{(0.1)^3} = \sqrt{5}\times 10^{-3} tesla$$

8 **(d)**

In Fig. (a), at neutral point P,



$$B_H = \frac{\mu_0}{4\pi}\left(\frac{M}{d^3}\right)$$

In Fig. (b)

Net magnetic induction at P = resultant of $\frac{\mu_0}{4\pi}\frac{2M}{d^3} = 2B_H$ along horizontal and B_H along vertical $= \sqrt{(2B_H)^2 + (B_H)^2} = \sqrt{5}B_H$

9 **(d)**

$$T' = \frac{T}{n} \Rightarrow T' = \frac{2}{2} = 1sec$$

10 **(c)**

$$R = \frac{H}{\cos\delta} = \frac{0.50}{\cos 30°} = \frac{0.50 \times 2}{\sqrt{3}} = \frac{1}{\sqrt{3}}$$

11 **(c)**

When a changing magnetic flux is applied to a bulk piece of conducting material then circulating current is called eddy currents are induced in material.

13 **(c)**

Time period, $T = 2\pi\sqrt{\frac{I}{MB}}$

$$T = 2s, \quad I' = \frac{I}{2}, \quad M' = \frac{M}{2}$$

$\therefore \quad T' = T$

$\Longrightarrow \quad T' = 2s$

15 **(c)**

$$T = 2\pi\sqrt{\frac{1}{MB_H}} \Rightarrow T \propto \frac{1}{\sqrt{M}} \Rightarrow \frac{M_A}{M_B} = \left(\frac{T_B}{T_A}\right)^2 = \frac{4}{1}$$

16 **(c)**

Electromagnets are made of soft iron because soft iron has high permeability and low retentivity

18 **(d)**

Time period of magnet is

$$T = 2\pi\sqrt{\frac{I}{MB_H}}$$

Or $M = \frac{4\pi^2 I}{T^2 B_H}$

Or $M = \frac{4 \times (3.14)^2 \times 49 \times 10^{-2}}{(8.8)^2 \times 0.5 \times 10^{-4}}$

Or $M = 5000 \text{ A} - \text{m}^2$

20 **(a)**

Flux $= B \times A$; $\therefore B = \frac{Flux}{A} = weber/m^2$

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