Physics Solutions
Class Test - 1751

Physics Code 1751

1. $B = \frac{\mu_0}{2} \times \frac{i}{r}$ & $i = \frac{\omega}{2\pi} \times e$

So $B = \frac{\mu_0}{2} \times \frac{\omega}{2\pi} \times \frac{e}{(d/2)} \Rightarrow \omega = \frac{B \cdot d}{\left(\frac{\mu_0}{4\pi}\right) e \times 2}$

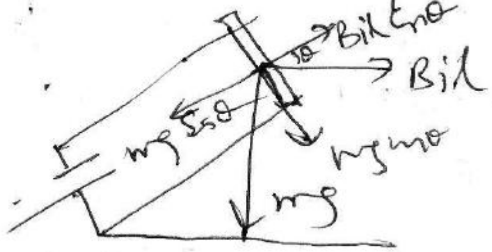
3. $\frac{\mu_0}{2} \times \frac{i}{r} \times \frac{(\theta)}{2\pi}$

4. $R = \frac{\sqrt{2mKE}}{qB}$ & $R' = \frac{\sqrt{2 \times 4m \times KE}}{2qB}$

$R' = R$

6. $x = v\cos\theta \times \frac{2\pi m}{qB} = v\cos\theta \times \frac{2\pi}{(q/m)B}$

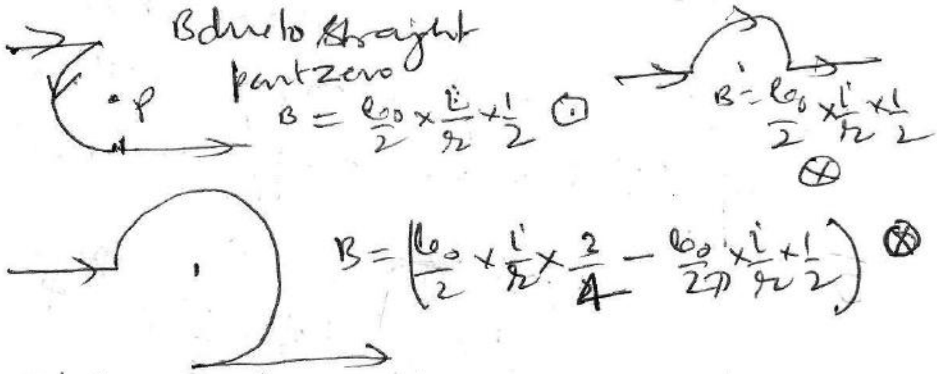
7.



$mg\sin\theta = Bil\cos\theta$

$\Rightarrow i = \frac{mg\tan\theta}{Bl}$

8.



get the ratio

9. Same force on ab & bc as component of length bc ⊥ to B is ab.

10. $\frac{\mu_0}{2} \times \frac{i}{r_1} \times \frac{3}{4} + \frac{\mu_0}{2} \times \frac{i}{r_2} \times \frac{1}{4}$

11. $B = \frac{\mu_0}{2\pi} \times \frac{2}{d}$

Magnetic field due to vertical wire

$B' = \frac{\mu_0}{2\pi} \times \frac{4}{2d} = B$

As both the field are in the same dirn

Net $B'' = 2.0B$ R

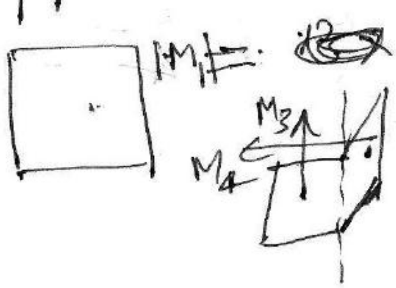
12. $R = \frac{p}{qB} = \frac{\sqrt{2mKE}}{qB}$

$R' = \frac{\sqrt{2m \times 2KE}}{q3B}$

14. $\tau = MB\sin 90 = MB$ → Torque due to the magnetic field

$(M = NiA)$

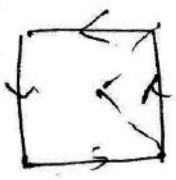
So the equal torque will have to be applied in the opposite dirn.

15. 

$|M_1| = L^2 \times i$ $|M_2| = \sqrt{M_3^2 + M_4^2}$

$|M_3| = \frac{L^2}{4} i$

$|M_4| = \frac{L^2}{4} i$

16. 

$B = 4\times\frac{\mu_0}{4\pi}\times\frac{i}{0.5}\int_{\pi/4}^{3\pi/4}\sin\theta\,d\theta$

and $4 = 2\pi R$

$B_2 = \frac{\mu_0}{2}\times\frac{i}{R}$

17. More attractive force towards C

18. $\frac{\mu_0}{2\pi}\times\frac{i}{R}\times\frac{1}{2} + \frac{\mu_0}{2}\times\frac{i}{R}\times\frac{1}{2}$

19. 

$F = qvB\sin 90$

$F = qv\frac{B_0}{2}$

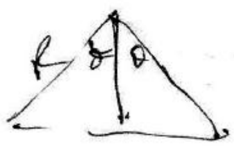
20. B at x distance from A

$= \frac{\mu_0}{2\pi}\times\frac{i}{x} - \frac{\mu_0}{2\pi}\times\frac{I}{5-x} - \frac{\mu_0}{2\pi}\times\frac{2i}{5+5-x}$

$= 0$ [get x, x is ans]

21. $B = \frac{\mu_0}{2}\times\frac{i}{R}\times\frac{(2\pi-2\theta)}{2\pi}$ (due to circular part)

$+\frac{\mu_0}{4\pi}\times\frac{i}{R\cos\theta}\int_{90-\theta}^{90+\theta}\sin\alpha\,d\alpha$ (due to straight part)



22. $B = \frac{\mu_0}{2}\times\frac{i}{R}\times\frac{1}{4}$ (due to circular arc) $+ 2\times\frac{\mu_0}{4\pi}\times\frac{i}{R\cos 45^\circ}\int_{\pi/4}^{3\pi/4}\sin\theta\,d\theta$

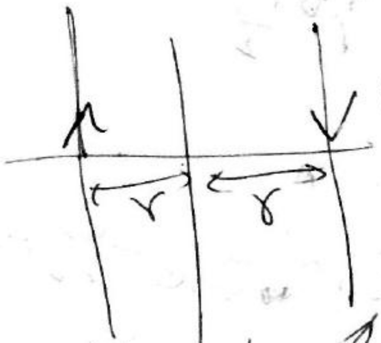
23. B_1 must be equal to B_2

$$\frac{\mu_0}{2\pi}\times\frac{i}{r}\ (\text{due to straight parts outwards}) = \frac{\mu_0}{2}\times\frac{i}{r}\times\frac{\theta}{2\pi}$$
(two inwards due to circular parts)

24. $$\alpha = \frac{\frac{\mu_0}{2}\times\frac{i}{r}}{i\times\pi r^2}$$

$$\alpha' = \frac{\frac{\mu_0}{2}\times\frac{2i}{2r}}{2i\times\pi(2r)^2}$$

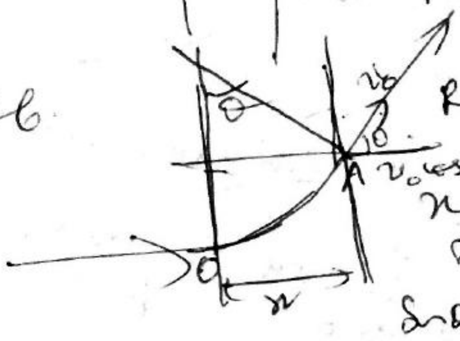
25.



$B_1 = \frac{\mu_0}{2\pi}\times\frac{i}{r}\times 2$ (X)

$B_2 = \frac{\mu_0}{2\pi}\times\frac{i}{2r} - \frac{\mu_0}{2\pi}\times\frac{i}{4r}$ (⊙)

26.



$R = \frac{mv_0}{qB} = \frac{v_0}{\alpha B_0}$

$x < R$ hence the path will be as shown

$\sin\theta = \frac{x}{R} = \frac{\sqrt{3}}{2}\frac{v_0\,\alpha B}{B_0\alpha\, v_0}$

$\Rightarrow \theta = 60^\circ$

So time to reach $OA = \frac{2\pi m}{qB}\times\frac{1}{6} = \frac{\pi}{3B\alpha}$

the total displacement along x direction in time t

$= x + \left(t - \frac{\pi}{3B\alpha}\right)\frac{v_0}{2}$

27. $\vec{F} = (1.0\hat{i} + 3.0\hat{j}) \times 10^{-13}$

$\vec{v} = (2.5\times10^{7})\hat{k}$

Let $B = B_x\hat{i} + B_y\hat{j} + B_z\hat{k}$

find $\vec{F} = e(\vec{v}\times\vec{B})$ & compare the coefficients for $\vec{F}$ get B_x, B_y & B_z

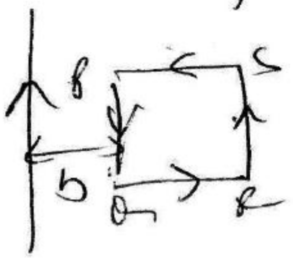
then find $\vec{F} = e(\vec{v}\times\vec{B})$

for $\vec{v} = (1.5\hat{i} - 2.0\hat{j})\times10^{7}$

(28) inward current inside the loop $= 1+2+3 = 6A$.

outward " " " $= 1+4 = 5A$.

So $\oint B\cdot dl = \mu_0(6-5)$

29. 

$L = a$

force on QR & PS are equal & opposite (on PS downwards on QR (upwards))

force on PQ (towards right)

$= \frac{\mu_0}{2\pi}\times\frac{i_1}{b}\times i_2\times a$

force on RS (towards left)

$= \frac{\mu_0}{2\pi}\times\frac{i_1}{(a+b)}\times i_2\times a$

30. find $\vec{F} = q(\vec{v}\times\vec{B})$

keep $F = 0$, get the cond^n