DPP
DAILY PRACTICE PROBLEMS

Class : XIIth
Date :

Solutions

Subject : PHYSICS
DPP No. : 1

Topic :- MOVING CHARGES AND MAGNETISM

1 **(c)**

Frequency $f=\frac{Bq}{2\pi m}$

As proton, electron, Li^+, He^+ have same charge in magnitude and since magnetic field is also constant.

So, $f\propto\frac{1}{m}$

Among the given charged particles, Li^+ has highest mass, therefore it will have minimum frequency.

2 **(b)**

The magnetic field produced at the centre of the circular coil carrying current is given by

$B=\frac{\mu_0 NI}{2r}$

For one turn $N=1$

$B_0=\frac{\mu_0 I}{2r}$

As the coil is rewound

$r'=\frac{r}{3},\quad N'=3$

$\therefore B'=\frac{\mu_0 I\times 3}{2\times\left(\frac{r}{3}\right)}$

$=\frac{9\mu_0 I}{2r}=9B_0$

3 **(b)**

$F=qvB$ also kinetic energy $K=\frac{1}{2}mv^2\Rightarrow v=\sqrt{\frac{2K}{m}}$

$\therefore F=q\sqrt{\frac{2K}{m}}B$

$=1.6\times10^{-19}\sqrt{\frac{2\times200\times10^6\times1.6\times10^{-19}}{1.67\times10^{-27}}}\times5=1.6\times10^{-10}N$

4 **(b)**

$B=\frac{\mu_0}{4\pi}\times\frac{2\pi NiR^2}{(R^2+x^2)^{3/2}}\Rightarrow B\propto\frac{1}{(r^2+x^2)^{3/2}}$

$\Rightarrow\frac{8}{1}=\frac{(R^2+x_2^2)^{3/2}}{(R^2+x_1^2)^{3/2}}\Rightarrow\left(\frac{8}{1}\right)^{2/3}=\frac{R^2+0.04}{R^2+0.0025}$

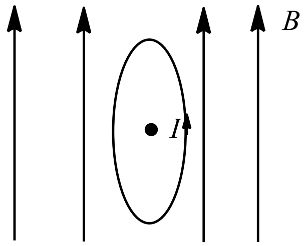
$\Rightarrow\frac{4}{1}=\frac{R^2+0.04}{R^2+0.0025}$. On solving $R=0.1\ m$

5 **(d)**

Torque (τ) acting on a loop placed in a magnetic field B is given by

$\tau=nBIA\sin\theta$

Where A is area of loop, I the current through it, n the number of turns, and θ the angle which axis of loop makes with magnetic field B.
Since, magnetic field (B) of coil is parallel to the field applied, hence $\theta = 0°$ and $\sin 0° = 0$
$\therefore \quad \tau = 0$



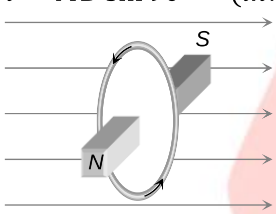
6 **(a)**
Magnetic field at the centre of circular coil

$$B_H = \frac{\mu_0}{4\pi}\frac{2\pi n I}{r}$$

I and r being the current and radius of circular coil respectively.
or $I = \frac{4\pi}{\mu_0} = \frac{rB_H}{2\pi n}$

$$= \frac{10^7 \times 0.1 \times 0.314 \times 10^{-4}}{2 \times 3.14 \times 10} = 0.5 \text{ A}$$

7 **(c)**
As shown in the following figure, the given situation is similar to a bar magnet placed in a uniform magnetic field perpendicularly. Hence torque on it
$\tau = MB \sin 90° = (i\pi r^2)B$



9 **(d)**
Cyclotron frequency is given by

$$v = \frac{qB}{2\pi m}$$

$$\therefore v = \frac{1.6 \times 10^{-19} \times 6.28 \times 10^{-4}}{2 \times 3.14 \times 1.7 \times 10^{-27}}$$

$$= 0.94 \times 10^4 \approx 10^4 \text{ Hz}$$

10 **(c)**
Force on the charged particle in electric field, $F = qE$; acceleration of particle, $a = F/m = q\,E/m$; using the relation $v^2 = u^2 + 2a$, we have $v^2 = 0 + 2(qE/m)y$
Or $\frac{1}{2}mv^2 = q\,E\,y$; so KE is $q\,Ey$.

11 **(b)**
Radius of circular path
$R = \frac{mv}{qB}$
But $mv = \sqrt{2mqV}$

$$\therefore R = \frac{\sqrt{2mqV}}{qB} \text{ or } R \propto \sqrt{m}$$

or $\frac{R_1^2}{R_2^2} = \frac{M_1}{M_2}$
or $\frac{M_1}{M_2} = \frac{R_1^2}{R_2^2} = \left(\frac{R_1}{R_2}\right)^2$

12 **(d)**

The charge moving on a circular orbit acts like the current loop. Magnetic field at the centre of the current loop is $B = \frac{\mu_0 2\pi I}{4\pi R}$

$$B = \frac{\mu_0 2\pi q v}{4\pi R} \textbf{ or } R = \frac{\mu_0 2\pi q v}{4\pi B}$$

Substituting the given values, we get

$$R = \frac{4\pi \times 10^{-7} \times 2\pi \times 2 \times 10^{-6} \times 6.25 \times 10^{12}}{4\pi \times 6.28} = 1.25m$$

13 **(c)**

As, $qV = \frac{1}{2}mv^2$ or $v = \sqrt{\frac{2qV}{m}}$; when particle describes a circular path of radius R in the magnetic field

$$q v B = \frac{mv^2}{R} \quad \text{or} \quad R = \frac{m v^2}{q v B} = \frac{m v}{q B}$$

Or $R = \frac{m}{qB}\sqrt{\frac{2qV}{m}} = \frac{1}{B}\sqrt{\frac{2Vm}{q}}$

$ie,\quad R \propto \sqrt{m} \qquad \therefore \frac{m_x}{m_y} = \left(\frac{R_1}{R_2}\right)^2$

14 **(b)**

$$i = \frac{k}{nBA}\theta \quad \text{or} \quad \theta = \frac{nBA}{k} \; ie, \theta \propto n.$$

15 **(b)**

To convert a galvanometer into a voltmeter, a resistance $R = \frac{V}{i_g} - G$ is connected in series of it.

To convert galvanometer into an ammeter, a resistance $S = i_g G/(i - i_g)$ is to be connected in parallel of galvanometer.

16 **(d)**

For a point at a distance $x = +a$, the angle between $d\vec{I}$ and $\vec{r}$ is zero. Hence, $d\vec{I} \times \vec{r} = 0$.

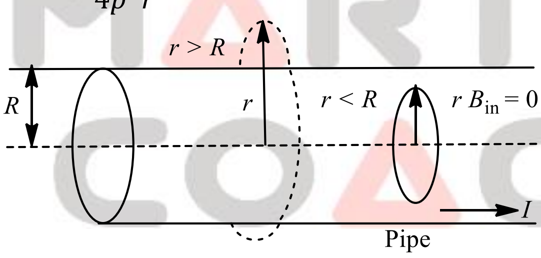
17 **(d)**

By Fleming's left hand rule

18 **(c)**

Required arrangement is shown in figure. According to Ampere's circuital law

$$B_{out} = \frac{m_0}{4p}\frac{2I}{r}$$



For an internal point, $r < R$

$$B_{internal} = \frac{\mu_0(0)}{2\pi r} = 0$$

For a point on the pipe, $r = R$

$$B = \frac{\mu_0 I}{2\pi r}$$

For an external point, $r < R$

$$B_{external} = \frac{\mu_0 I}{2\pi r}$$

Therefore, option (c) is correct.

19 **(d)**

The magnetic field at any point on the axis of wire be zero

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