PHYSICS

151. (2)

Magnetic field at the centre of a circular coil of radius R carrying current i is $B = \frac{\mu_0 i}{2R}$

The circumference of the first loop = 2πR.

If it is bent into n circular coil of radius r′.

$n \times (2\pi r') = 2\pi?$

$\Rightarrow nr' = R$ … (i)

New magnetic field, $B' = \frac{n \cdot \mu_0 i}{2r'}$ … (ii)

From (i) and (ii), $B' = \frac{n\mu_0 i \cdot n}{2\pi R} = n^2 B$

152. (3)

Torque on circular loop, τ = MB sin θ

where, M = magnetic moment and B magnetic field

Now, Using τ = Iα

∴ τ = MB sin θ = Iα

$\Rightarrow \pi R^2 I B \theta = \frac{mR^2 \alpha}{2}$

(∵ m = IA and moment of inertia of circular loop, $I = \frac{mR^2}{2}$)

$\Rightarrow \pi R^2 I B \theta = \frac{mR^2}{2} \omega \theta$

$\Rightarrow \omega = \sqrt{\frac{2\pi IB}{m}} \Rightarrow \frac{2\pi}{T} = \sqrt{\frac{2\pi IB}{m}}$

$\Rightarrow T = \sqrt{\frac{2\pi m}{IB}}$

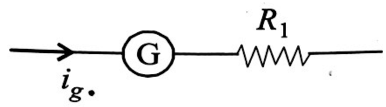
153. (1)

Magnetic moment, $\mu = IA = \frac{qv}{2\pi r}(\pi r^2)$

or $\mu = \frac{qr\omega}{2\pi r}(\pi r^2) = \frac{1}{2} q r^2 \omega$

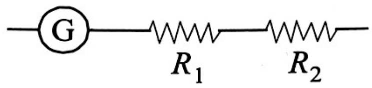
154. (4)

Galvanometer of resistance (G) converted into a voltmeter of range 0-1 V.



$V_1 = 1 = i_g (G + R_1)$ … (i)

To increase the range of voltmeter 0-2 V



$2 = i_g (R_1 + R_2 + G)$

Dividing eq. (i) by (ii), $\frac{1}{2} = \frac{G + R_1}{G + R_1 + R_2}$

$\Rightarrow G + R_1 + R_2 = 2G + 2R_1$

$\therefore R_2 = G + R_1$

155. (2)

When current is passed through a spring then current flows parallel in the adjacent turns on the same direction. As a result the various turn attract each other and spring get compress.

156. (2)

Radius of the circle $= \frac{mv}{Bq}$

or radius ∝ my if B and q are same.

$(\text{Radius})_A > (\text{Radius})_B$

$\therefore m_A v_A > m_B v_B$

157. (1)

The charged particle will be accelerated parallel (if it is a positive charge) or anti-parallel (if it is a negative charge) to the electric field, i.e. the charged particle will move parallel or anti-parallel to electric and magnetic field. Therefore, net magnetic force on it will be zero and its path will be a straight line.

158. (1)

Radius of the circular path is given by

$r = \frac{mv}{Bq} = \frac{\sqrt{2Km}}{Bq}$

Here, K is the kinetic energy to the particle.

Therefore, $r \propto \frac{\sqrt{m}}{q}$ if K and B are same.

$\therefore r_p : r_d : r_\alpha = \frac{\sqrt{1}}{1} : \frac{\sqrt{2}}{1} : \frac{\sqrt{4}}{1} = 1 : \sqrt{2} : 1$

Hence, $r_\alpha = r_p < r_d$

159. (1)

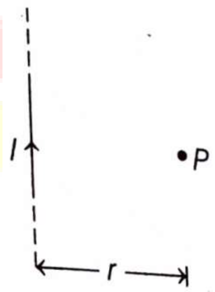
Z Path C is undeviated. Therefore, it is of neutron' s path.

From Fleming' s left hand rule magnetic force on positive charge will be leftwards and on negative charge is rightwards. Therefore, track D is of electron. Among A and B one is of proton and other of α-particle.

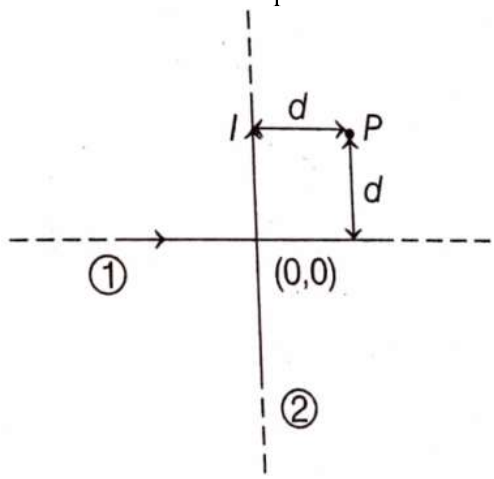
160. (1)

Magnetic field due to an infinitely long straight wire at point P is given as

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



Thus, in the given situation, magnetic field due to wire 1 at point P is



$B_1 = \frac{\mu_0}{2\pi}\frac{I}{d}, \otimes$

Similarly, magnetic field due to wire 2 at point P is $B_2 = \frac{\mu_0}{2\pi}\frac{I}{d}$

Resultant field at point P is $B_{net} = B_1 + B_2$

Since, $|B_1| = |B_2|$, but they are opposite

Thus, $B_{net} = 0$

Therefore net magnetic field at point P will be zero.