BCM SCHOOL, BASANT AVENUE, DUGRI

ANSWER KEY

AUG 8, 2024. CHAPTER – MOVING CHARGES & MAGNETISM

1 – (b)

2 – (b)

3 – (a)

4 – (b)

5 – (a)

6 – (c)

7 – (a)

8 – (b)

9 – (a)

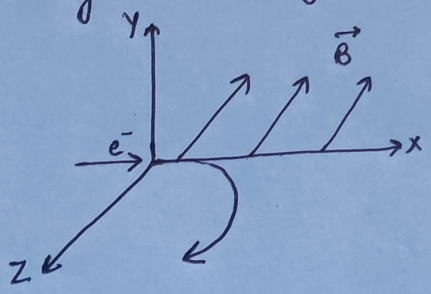
10 – Assertion is False, Reason is true.

11 – Derivation

12 – $T = \frac{\pi r}{v} = \frac{\pi}{v}\left(\frac{mv}{qB}\right) = \frac{\pi m}{qB}$

Work done by the magnetic field is zero.

13 –



14. $V = 10kV$

$B = 2 \times 10^{-3} T$

$q = +2e$

$$r = \frac{\sqrt{2mqV}}{qB} = \frac{\sqrt{2 \times 6.4 \times 10^{-27} \times 2 \times 1.6 \times 10^{-19} \times 10^4}}{2 \times 1.6 \times 10^{-19} \times 2 \times 10^{-3}}$$

$= 100\ m.$

15. V is same

	p	d	α
$q \rightarrow$	e	e	2e
$m \rightarrow$	m	2m	4m

$K.E = qV$

$K.E. \propto q$

$(K.E.)_p : (K.E.)_d : (K.E.)_\alpha = e : e : 2e = 1 : 1 : 2$

$\left[\because r \propto \sqrt{\frac{m}{q}}\right]$ Acc. to formula $r = \frac{\sqrt{2mqV}}{qB}$

$$\frac{r_d}{r_p} = \sqrt{\frac{m_d}{q_d} \times \frac{q_p}{m_p}}$$

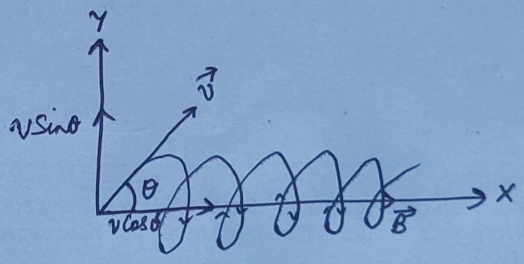
$$\frac{r_d}{5} = \sqrt{\frac{2m}{e} \times \frac{e}{m}}$$

$$\boxed{r_d = 5\sqrt{2}\ cm}$$

$$\frac{r_\alpha}{r_p} = \sqrt{\frac{m_\alpha}{q_\alpha} \times \frac{q_p}{m_p}} = \sqrt{\frac{4m}{2e} \times \frac{e}{m}}$$

$$\boxed{r_\alpha = 5\sqrt{2}\ cm}$$

16.



$v_{\parallel} = v\cos\theta$

$v_{\perp} = v\sin\theta$

$(F_x) = q\, v_{\parallel} B \sin 0^\circ = 0$

$F_y = q(v_{\perp}) B \sin 90^\circ = max.$

Due to $v_{\parallel}$, no force is acting along X-axis. So charged particle will follow straight line path. Due to $v_{\perp}$ component, max. force is acting. So it will follow circular path along $-Z$ axis.

Therefore, resultant path will be helical.