

PHY 112

QUIZ - 4

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sec : 8

Ans to the or no qn 4

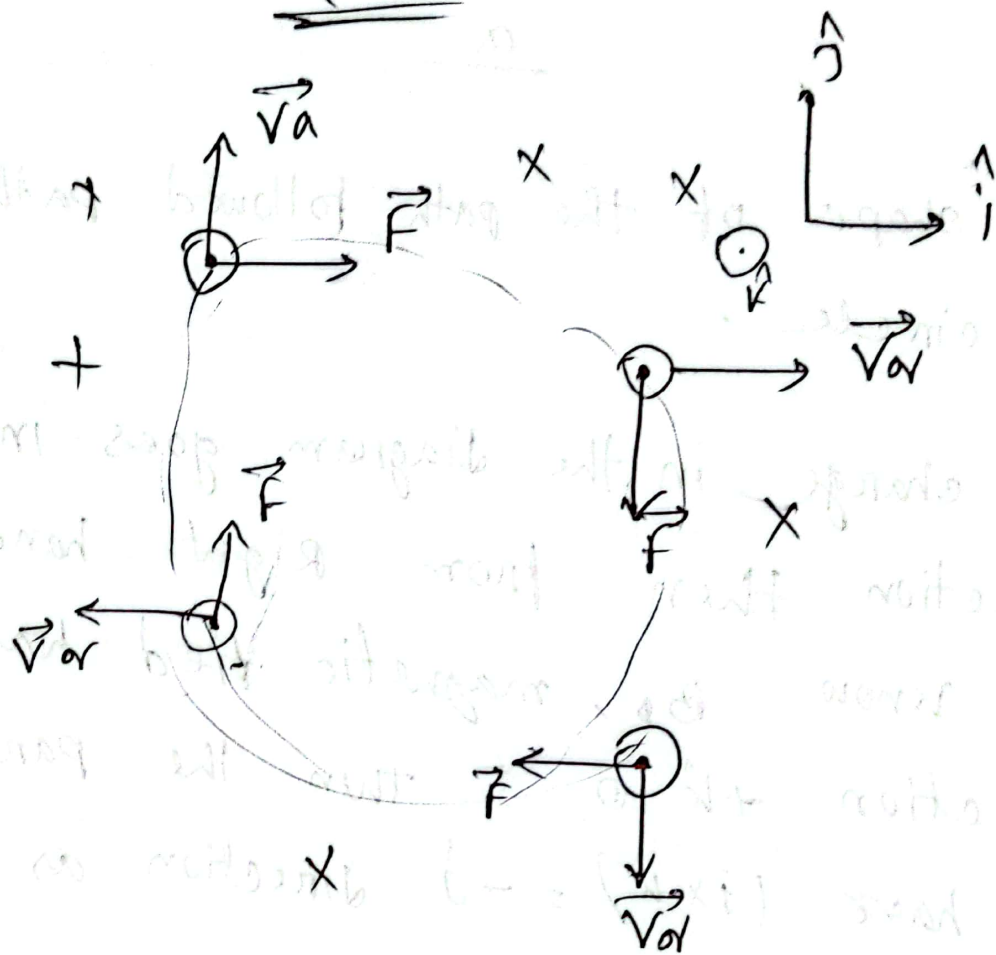
a

The shape of the path followed path will be a circle.

The charge in the diagram goes in a \hat{i} direction then from Right hand rule we know B , magnetic field has the direction $+\hat{k}$  then the particle will have $(\hat{i} \times \hat{k}) = -\hat{j}$ direction as velocity.

Then the force's direction being $-\hat{i}$ will ~~give~~ help to form a circle as the particle moves.

(b)



∴ Direction of force is $(+)\hat{j}$ -direction

C

Given,

$$B_1 = 3.2 \text{ T}$$

$$B_2 = 9.7 \text{ T}$$

$$\sigma = 5.8 \text{ } \mu\text{C} = 5.8 \times 10^{-6} \text{ C}$$

$$v = 26 \text{ m s}^{-1}$$

$$m = 0.057 \times 10^{-3} \text{ kg}$$

we know,

$$\text{Angular frequency, } \omega = 2\pi f = \frac{\sigma B_1}{m}$$

\therefore Angular frequency in blue region,

$$\omega_1 = \frac{\sigma B_1}{m} = \frac{5.8 \times 10^{-6} \times 3.2}{0.057 \times 10^{-3}}$$

$$= 0.3256 \text{ rad/s}$$

\therefore Angular frequency in green region,

$$\omega_2 = \frac{\sigma B_2}{m} = \frac{5.8 \times 10^{-6} \times 9.7}{0.057 \times 10^{-3}}$$

$$= 0.98701 \text{ rad/s}$$

we know, $\omega = 2\pi f = \frac{2\pi}{T}$

Again, $T = \frac{2\pi R}{v}$

$$\therefore \omega = \frac{2\pi}{T} \times \frac{v}{2\pi R}$$

$$\omega = \frac{v}{R}$$

$$\therefore \omega \propto v$$

~~\therefore~~

\therefore The angular frequency in the blue region will double if we double the velocity of the particle since $\omega \propto v$

(d)

The particle charge moves ~~in~~ with radius r .

We know, in circular motion charge,

$$\begin{aligned} r &= \frac{mv}{qB} \\ &= \frac{0.057 \times 10^{-3} \times 26}{5.8 \times 10^{-6} \times 3.2} \\ &= 79.84 \text{ m} \end{aligned}$$

Since radius $r = 79.84$ is greater than $h = 53.12 \text{ m}$, it will be able to leave the blue region.

\therefore Minimum value of h for which it will not enter green region.