HOME ASSIGNMENT

Date
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(1) q V

$\vec{E} = 100\ KV/m$ $\vec{B} = 50mT$ $\vec{F} = q(\vec{v} \times \vec{B})$

a) $qVB = qE$ (For undeflected proton beam)

$V = \frac{E}{B} = \frac{100 \times 10^3}{50 \times 10^{-3}} = 2 \times 10^6\ ms^{-1}$

$= \boxed{2 \times 10^6\ ms^{-1}}$ Ans

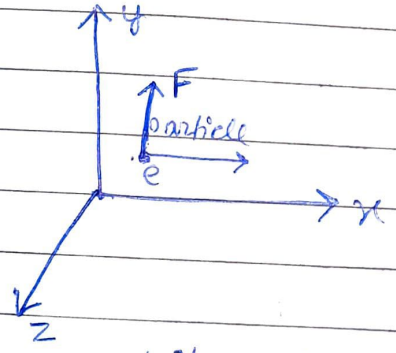
b) $I = 0.8\ mA = 8 \times 10^{-4} A$

$n = \frac{I}{e} = \frac{8 \times 10^{-4}}{1.6 \times 10^{-19}} = 5 \times 10^{15}\ s^{-1}$

$m_p = 1.675 \times 10^{-27}\ kg$ $F = m_p n V$

$= \boxed{1.675 \times 10^{-5} N}$ Ans

(2)



By Flemings left hand rule magnetic field must be along negative z-axis.

(3) When a charge of 1C, moving with velocity 1 m/s, normal to the magnetic field, experiences a force of 1N, then the $\vec{B}$ is said to be tesla.

(4) Electron moves in a circular path with a higher frequency

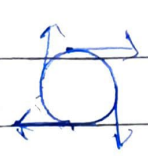
$\frac{mv^2}{r} = qVB$, $\Rightarrow r = \frac{mV}{qB}$

$\omega = \frac{V}{r} = \frac{qB}{m}$ $\omega = 2\pi f \Rightarrow \frac{qB}{m} = 2\pi f \Rightarrow f \propto \frac{1}{m}$

Since $m_e < m_p$, Therefore $f_e > f_p$

(5) When an electron enters normal to the field

Trajectory = Circular



When an electron enters at 30°

Trajectory = Helical