10/7/21

Home Assignment :

1) The radius can be described as :

$$r = \frac{1}{B}\sqrt{\frac{2mV}{q}}$$

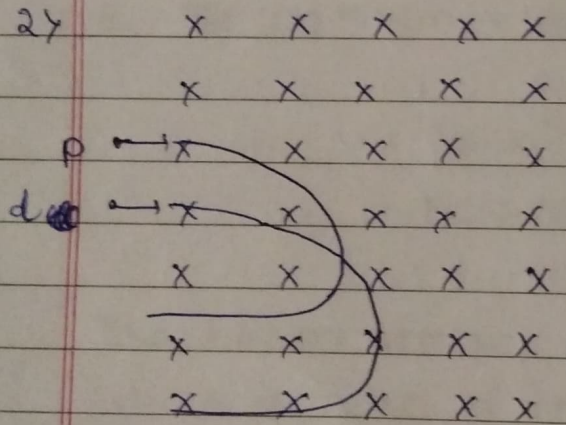
$r \propto \sqrt{V}$

Let r' be the ~~p.d~~ radius when p.d is 2V.

$$\frac{r'}{r} = \sqrt{\frac{2V}{V}} = \sqrt{2}$$

$\therefore r' = \sqrt{2}\, r$

2)



$$r = \frac{mv}{qB}$$

$r \propto \frac{m}{q}$ for same v and B.

$$\frac{r_p}{r_d} = \frac{(m/q)_p}{(m/q)_d} = \frac{m/e}{2m/e} = \frac{1}{2}$$

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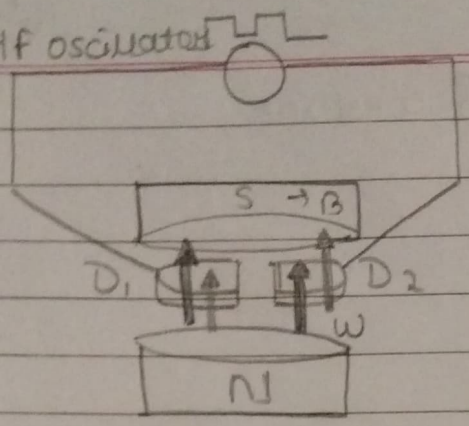

D_1, D_2 - Dees N, S - Magnetic pole pieces
W - Window B - Magnetic field.

Principle : A charged particle can be accelerated to very high energies by making it pass through a moderate electric field a no. of times. This can be done with the help of a perpendicular magnetic field which throws the charged particle into a circular motion, the frequency of which does not depend on the speed of the particle and the radius of the circular orbit.

$$F_c = F_m$$

$$\Rightarrow \frac{mv^2}{r} = qvB$$

$$\Rightarrow \frac{v}{r} = \frac{qB}{m}$$

$$\Rightarrow \omega = \frac{qB}{m}$$

$$\Rightarrow 2\pi f = \frac{qB}{m}$$

$$\Rightarrow f = \frac{qB}{2\pi m}$$

- The frequency is independent of velocity

4) $f = \frac{Bq}{2\pi m}$ keeping $\vec{B}$ constant,

$f \propto \frac{q}{m}$

$\frac{f_p}{f_\alpha} = \frac{q/m}{q/2m} = \frac{2}{1}$

∴ The frequency of proton is twice than the frequency of alpha particles.

ii) The particles will not exist the dees with same velocity. The velocity of proton is twice than the velocity of alpha particle.

5) electron and alpha particle will follow a circular path in clockwise direction according to fleming's left hand rule.
But neutron will pass without any deviation as magnetic field does not exert on neutral particle.