64. $\mathcal{E} = 100V$

$V_c = 1V$

$t = 10s$

a) $Q = \mathcal{E}C e^{-t/\tau}$

$\Rightarrow CV_c = \mathcal{E}C e^{-t/\tau}$

$\Rightarrow 1 = 100 e^{-10/\tau}$

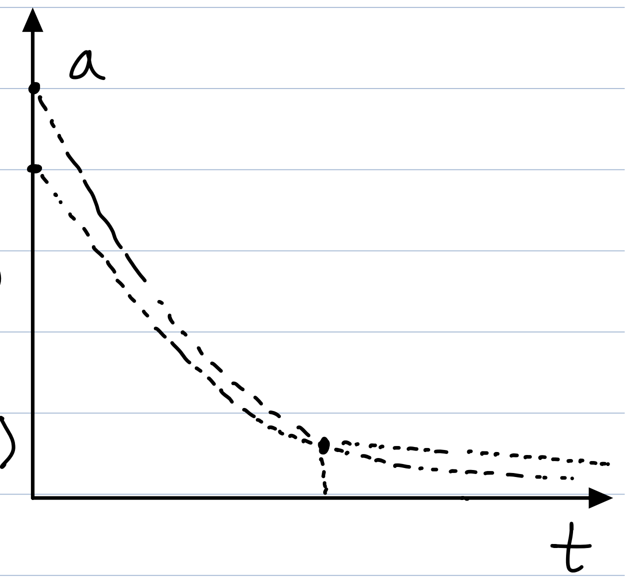
$\Rightarrow \ln\left(\frac{1}{100}\right) = -10/\tau$

$\therefore \tau = \dfrac{-10}{\ln\left(\frac{1}{100}\right)}$

b) $V_c = \mathcal{E}e^{-t/\tau}$

$\Rightarrow V_c = 100 e^{-17/\tau}$

66.



$$q_1 = q_{10}\, e^{-t/\tau_1} \quad \text{--- (i)}$$

$$q_2 = q_{20}\, e^{-t/\tau_2} \quad \text{--- (ii)}$$

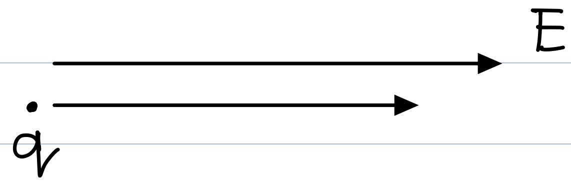
$$q_1 = q_2$$

$$q_{10}\, e^{-t/\tau_1} = q_{20}\, e^{-t/\tau_2}$$

$$\frac{q_{20}}{q_{10}} = \frac{e^{-t/R_1C_1}}{e^{-t/R_2C_2}}$$

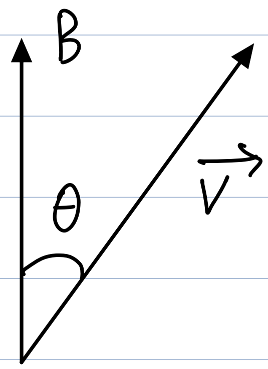
$$\Rightarrow \frac{q_{20}}{q_{10}} = e^{-t\left(\frac{1}{R_1C_1} + \frac{1}{R_2C_2}\right)}$$

Magnetic Field



$$\vec{F_E} = q\vec{E}$$

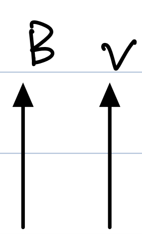
$$q > 0$$



$$\vec{F_B} = q\vec{V} \times \vec{B}$$

i) if $\vec{V} = 0$ then
$\vec{F_B} = 0$

ii) if $\vec{V} \parallel \vec{B}$

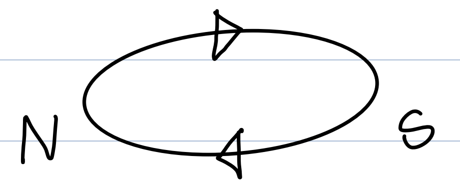


$$F = qVB \sin 0^\circ$$
$$= 0$$

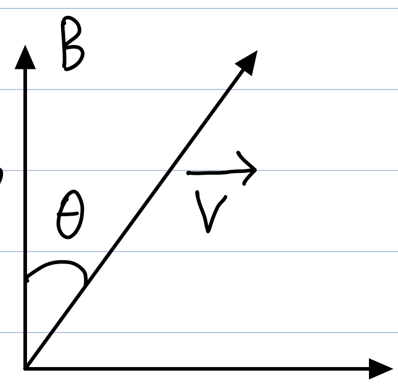
$\vec{F_B} \perp \vec{V}$

$\vec{F_B} \perp \vec{B}$

$+ \longrightarrow -$

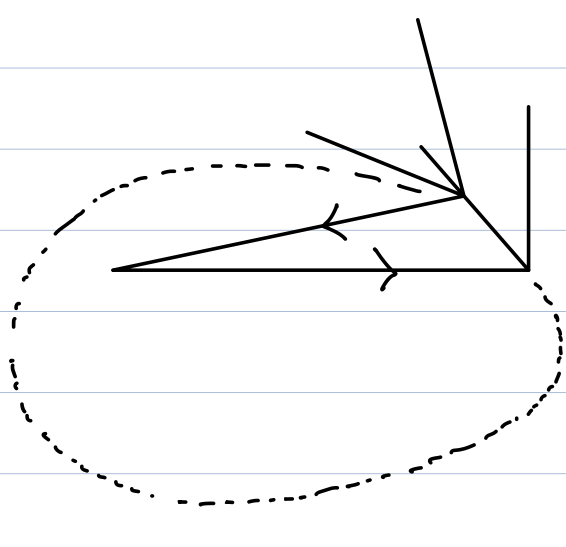


loop



$V_{\parallel} = V\cos\theta$

$V_{\perp} = V\sin\theta$



$$\sum F = ma$$

$$\Rightarrow F = \frac{m(v\sin\theta)^2}{r}$$

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

$$\Rightarrow r = \frac{mv\sin\theta}{qB}$$

$$|\vec{F_B}| = q|\vec{v_\perp} \times \vec{B}|$$

$$= qv\sin\theta B\sin 90^\circ$$

$$= qvB\sin\theta$$

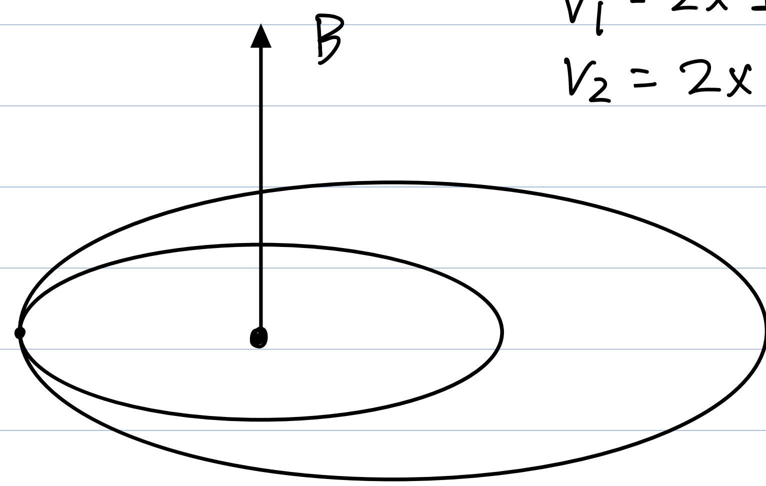
$$T = \frac{2\pi}{\omega}$$

$$= \frac{2\pi}{\left(\frac{v\sin\theta}{r}\right)}$$

$$= \frac{2\pi r}{v\sin\theta}$$

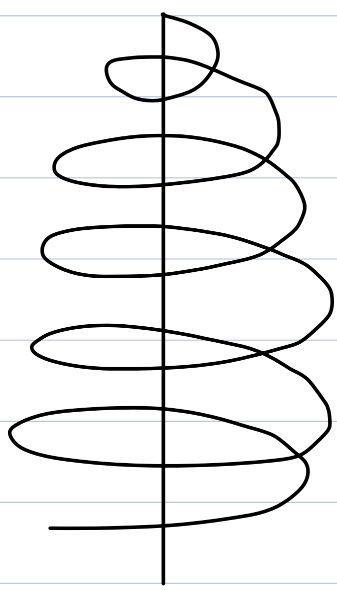
$$= \frac{2\pi \cdot mv\sin\theta}{v\sin\theta \cdot qB}$$

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



$V_1 = 2 \times 10^3$

$V_2 = 2 \times 10^7$



Helicoid motion

$S = ut + \frac{1}{2} a t^2$

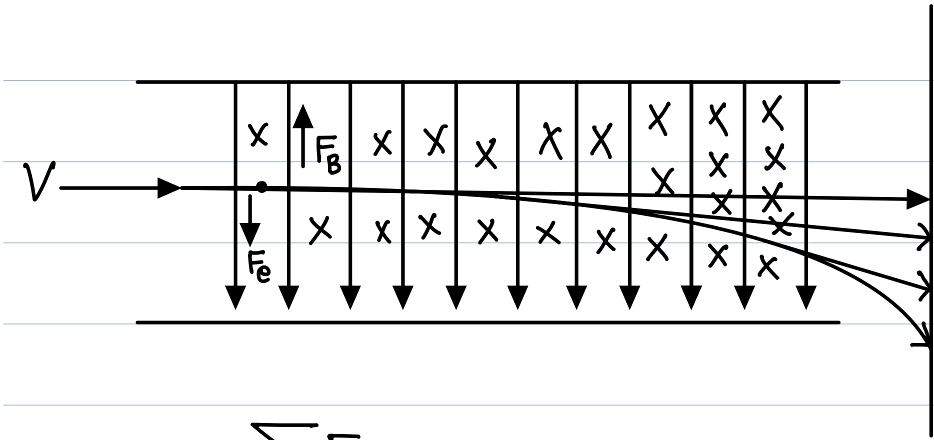
$S = ut$

$S = v\cos\theta \, t$

$P = v\cos\theta \, T$

$P = v\cos\theta \, \frac{2\pi m}{qB}$

$\vec{F} = q\vec{E}$



Screen

$\vec{F_B} = q\vec{V} \times \vec{B}$

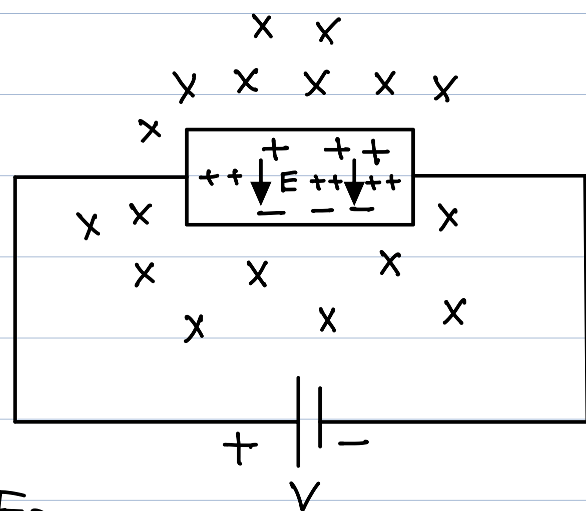
$\sum F = ma$

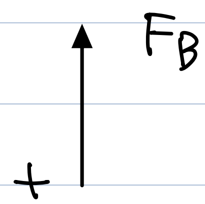
$\Rightarrow F_B - F_E = 0$

$\Rightarrow F_B = F_E$

$\Rightarrow qVB = qE$

$\Rightarrow E = VB$





$$F_B = F_E$$

$$\Rightarrow qvB = qE$$

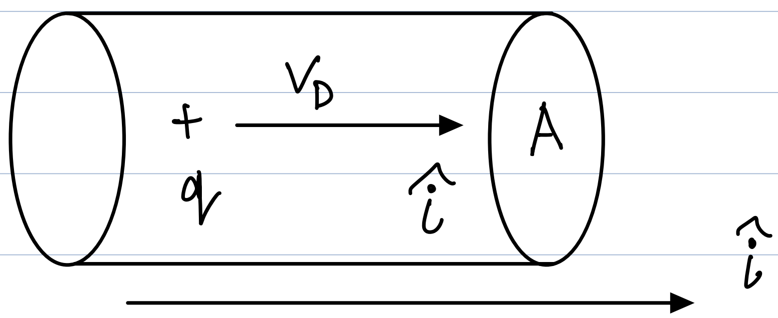
$$\Rightarrow E = vB$$

$$\Rightarrow \frac{V_H}{D} = vB$$

$$\therefore V_H = BvD$$

$$V_H = ED$$

$$E = \frac{V_H}{D}$$



$$\vec{F_B} = q\vec{V_D} \times \vec{B}$$

Total Force $\Rightarrow \vec{F}_{B_{total}} = nAlq\, \vec{V_D} \times \vec{B}$

$$= (nAV_Dq)\, l\, \hat{j} \times \vec{B}$$

$$= i\, l\, \hat{j} \times \vec{B}$$

$$= i\, \vec{l} \times \vec{B}$$

$1m^3 \longrightarrow n$

$1m^3$ total nq changes

All $\longrightarrow nAlq$

dl

$$d\vec{F} = i\,\vec{dl} \times \vec{B}$$