EXAM II: HINTS FOR SOLVING PROBLEMS

1. With bulbs A, B, & C in place the current through A, B, & C are

$$I_A = \frac{4.5}{(\frac{3}{2})R} = \frac{3}{R}$$

$$I_B = \frac{3}{2R} = I_C$$

$R_{Eq} = R + \frac{R}{2} = \frac{3}{2}R$

All current goes thru A + $\frac{1}{2}$ of current thru B+C

When B is removed $R_{Eq} = 2R$ +

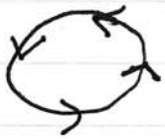
$$I_A' = \frac{4.5}{2R} = I_{B'} = \frac{2.25}{R}$$

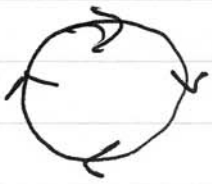
The current thru A decreases + it gets dimmer

The current thru B increases + it gets brighter

Remember Power $= I^2R$!

2. The particles move from left to right the field is into the board. Positive charges move toward the top of the page.

Actually the move in a circle as 

Negative Charges move in a circle in the opposite direction 

1) Therefore tracks 1+4 are positive charges
2) " " 2, 3, 5 are negative

3) Particles 4 + 5 are oppositely charged + seem to emerge from the track made by a neutral particle

4) The radius of the circular path is given by

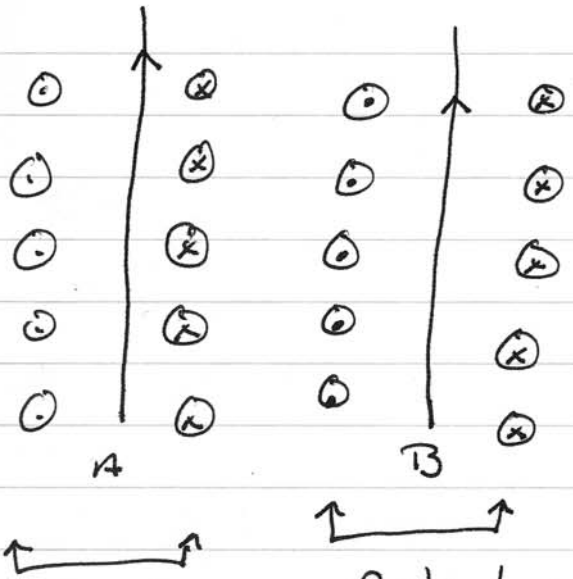
$$r = \frac{mv}{qB}$$

The radii are ordered as

$r_3 > r_1 > r_2$, so if $|q|$, B, + v are the same

$m_3 > m_1 > m_2$

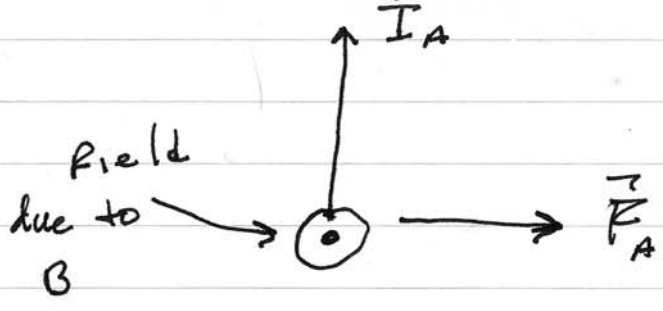
3. Two parallel wires attract if currents are in same direction



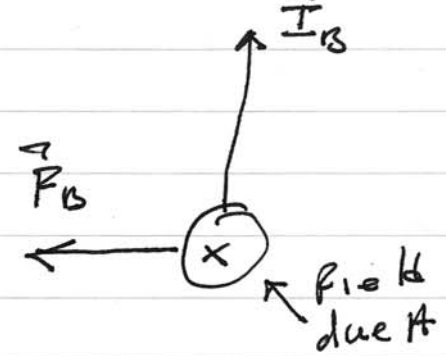
Field lines due to A as they cut plane of page

Field lines due to B as they cut plane of page

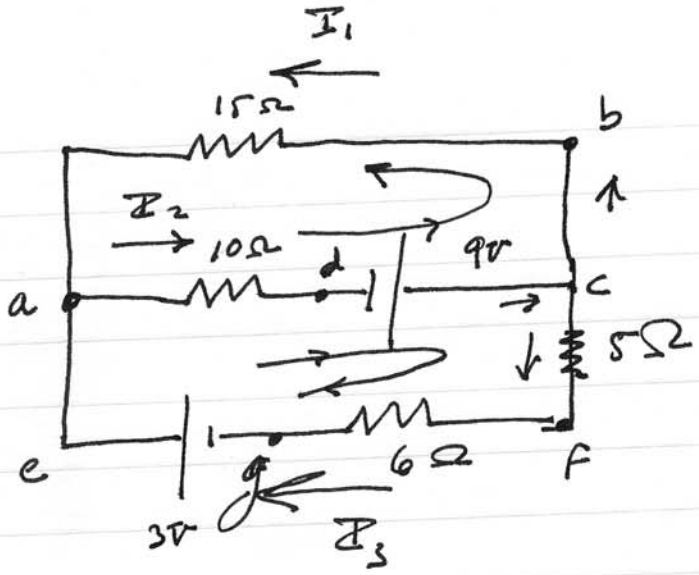
Consider force on A due to B



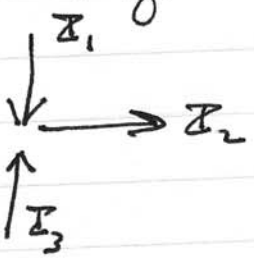
Force on B due to A



Wires attract



Junction eq at a



$$I_1 + I_3 = I_2$$

Loop eq. (Top loop)

$$\left.\begin{aligned} V_a - V_b &= -15 I_1 \\ V_b - V_c &= 0 \\ V_c - V_d &= 9 \\ V_d - V_a &= -10 I_2 \end{aligned}\right\} \quad 15 I_1 + 10 I_2 = 9$$

(Bottom loop)

$$\left.\begin{aligned} V_a - V_d &= 10 I_2 \\ V_d - V_c &= -9 \\ V_c - V_f &= 5 I_3 \\ V_f - V_g &= 6 I_3 \\ V_g - V_e &= -3 \\ V_e - V_a &= 0 \end{aligned}\right\} \Rightarrow \quad 10 I_2 + 11 I_3 = 12$$

The initial flux is given by BA_0, where

$$A_0 = \pi\left(\frac{2}{\sqrt{\pi}}\right)^2 \text{ cm}^2 = 4 \text{ cm}^2 = 4\times10^{-4} \text{ cm}^2$$

$$\Phi_0 = 4 \times 5 \times 10^{-4} = 20\times10^{-4} = 2\times10^{-3}$$

The finial flux is <u>zero</u> since final area = 0

Thus $\Delta\Phi = 0 - 2\times10^{-3} = -2\times10^{-3}$

$$\mathcal{E} = -N\frac{\Delta\Phi}{\Delta t}$$

$N = 1$, $-\Delta\phi = 2\times10^{-3}$, $\Delta t = 4\times10^{-1}$ sec

$$\mathcal{E} = \frac{2\times10^{-3}}{4\times10^{-1}} = .5\times10^{-2} \text{ V}$$