22-67

$P_{OUT} = 1.2 \times 10^6\ W$ $L = 7.0\ km$

2 wires each $\lambda = 5.0 \times 10^{-2}\ \frac{\Omega}{m}$

$P_{1200V} = ?$ lost to Heat

$P_{100:1} = ?$ lost to Heat

$$P_{lost\ Heat} = i^2 R$$

$$R = 2 \text{ wires} \times \lambda = 2\left(5.0 \times 10^{-2}\ \frac{\Omega}{m}\right)\left(7 \times 10^3\ m\right)$$

$$R = 0.700\ \Omega$$

$$P = iV \qquad i = \frac{P}{V}$$

$$P_{lost\ 1200V} = i^2 R = \left(\frac{P_O}{V_A}\right)^2 R$$

$$P_{lost\ 1200V} = \left(\frac{1.2 \times 10^6\ W}{1200\ V}\right)^2 (0.700\ \Omega)$$

$$P_{lost\ 1200V} = 7.00 \times 10^5\ W$$

$$V_s = V_p \left(\frac{100}{1}\right) \qquad \frac{V_s}{V_p} = \frac{N_s}{N_p}$$

$$V_s = (1200\,V)(100)$$

$$V_s = 1.2 \times 10^5\,V$$

$$P_{\substack{lost \\ 100:1}} = \left(\frac{1.2 \times 10^6\,W}{1.2 \times 10^5\,V}\right)^2 (0.700\,\Omega)$$

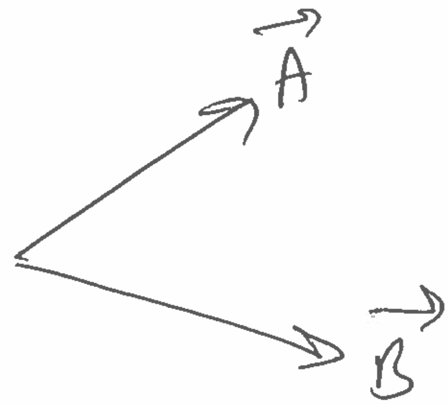
$$P_{\substack{lost \\ 100:1}} = \underline{70\,W}$$

RT Hand Rules so far.

1) $\vec{A} \times \vec{B}$

Remember Result of $\vec{A} \times \vec{B}$ must be perpendicular to plane formed by $\vec{A}$ and $\vec{B}$

$$\vec{C} = \vec{A} \times \vec{B}$$



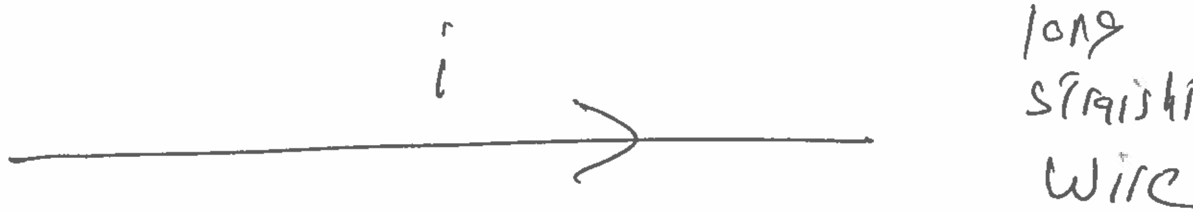
$\vec{C}$ $\hat{\otimes}$ into paper

$\vec{D} = \vec{B} \times \vec{A}$ $\vec{D}$ $\hat{\odot}$ out of paper.

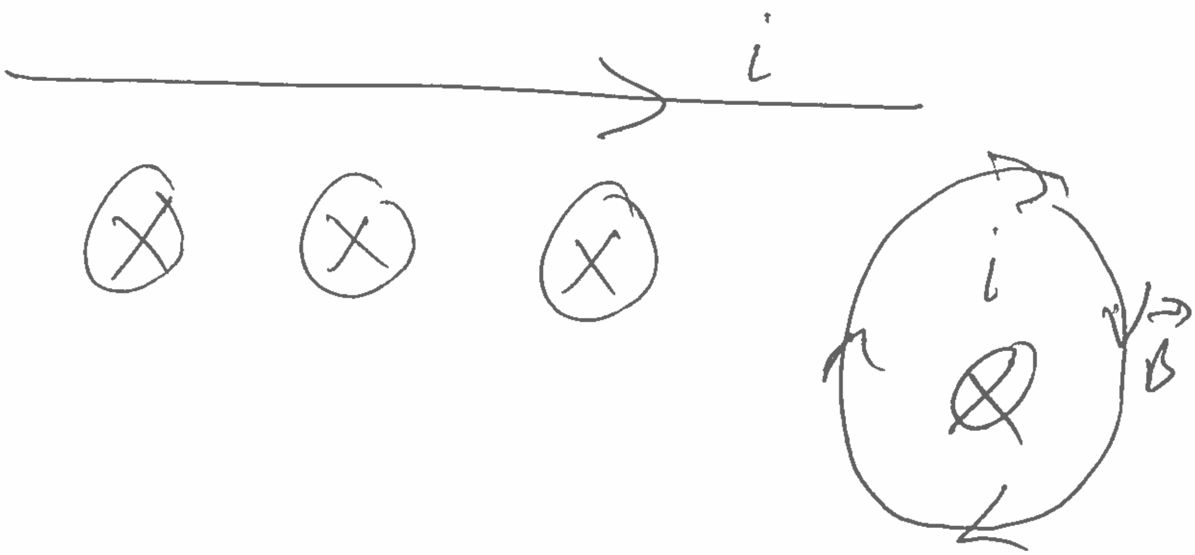
$\vec{F} = q\vec{v} \times \vec{B}$ $\vec{F} = i\vec{L} \times \vec{B}$

$$\vec{\tau} = \vec{\mu} \times \vec{B}$$

2) Direction of $\vec{B}$ fields created by currents.

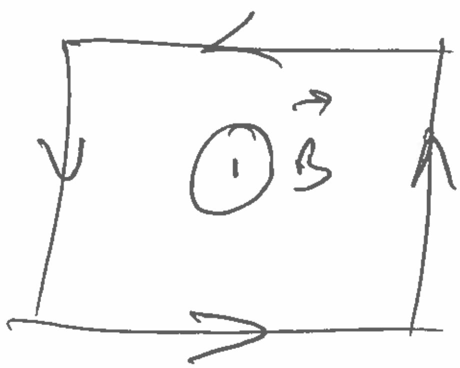


Put Thumb in direction of current my fingers curl in direction of $\vec{B}$ field lines



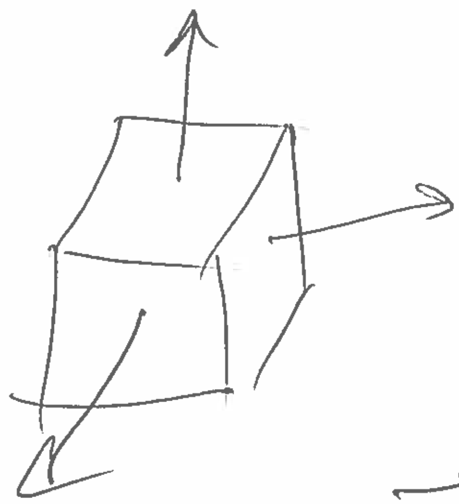
2 - cont

with a loop
curl fingers
with current
thumb points
in direction
of $\vec{B}$ inside loop
<u>only</u>

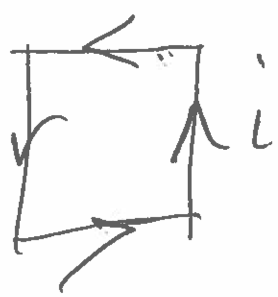


3) Finding direction of $\vec{Area}$

Two Things if Area covers an enclosed volume $\vec{Area}$ Points outward

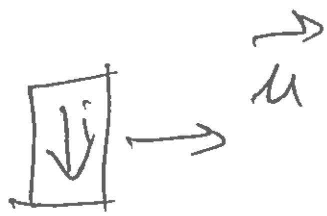


Magnetic moment $\vec{\mu} = Ni\vec{A}$



$\vec{\mu}$ $\hat{\odot}$ out of paper

because current flows $\hat{ccw}$

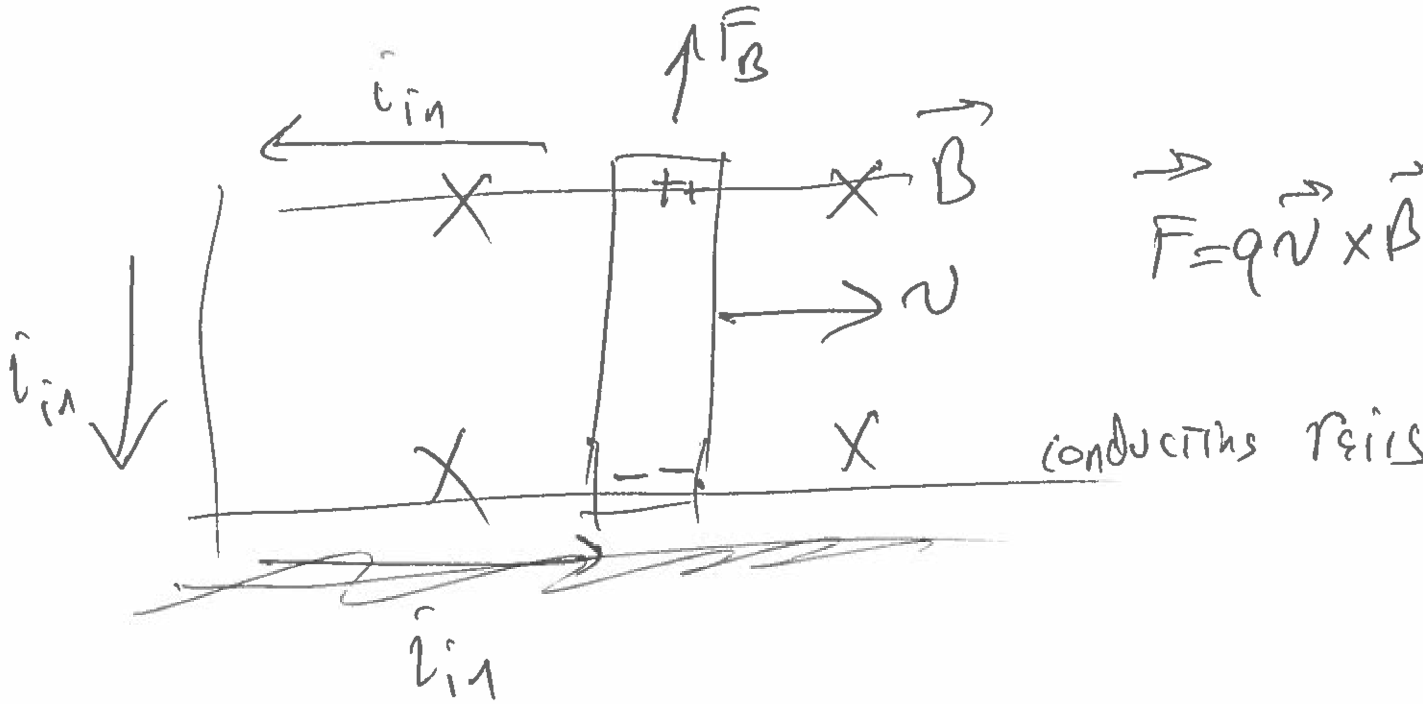


To find which way coil Twists in B

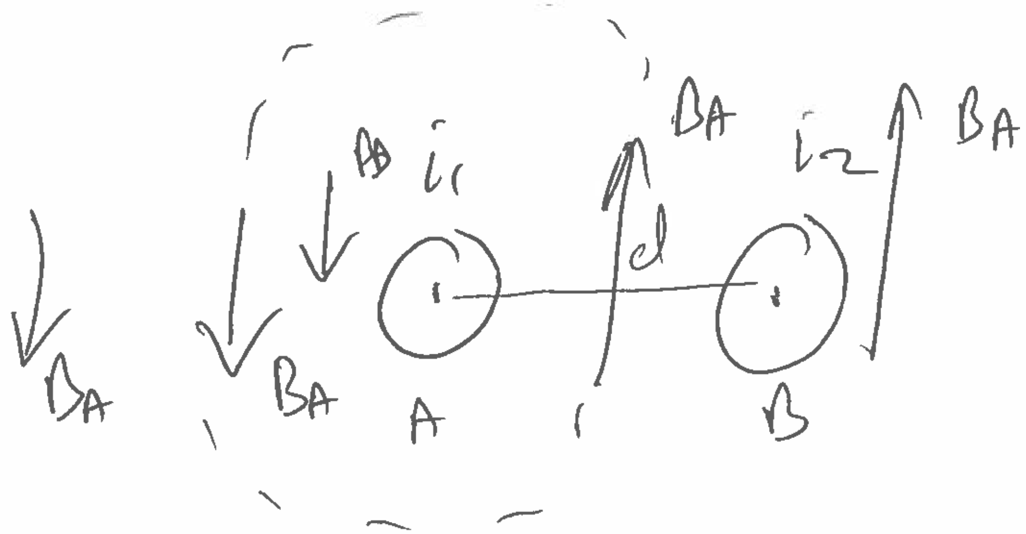
$$\vec{A}\cdot\vec{B} = AB\cos\theta_{AB}$$

$$|\vec{A}\times\vec{B}| = |AB\sin\theta_{AB}|$$

direction by cross product rule



$$\vec{F} = q\vec{v}\times\vec{B}$$



$$\vec{F}_{A\to B} = i_B \vec{L}_B \times \vec{B}_A$$

$$\vec{F}_{B\to A} = i_A \vec{L}_A \times \vec{B}_B$$

$$B_{\substack{\text{long}\\ \text{wire}}} = \frac{\mu_0 i}{2\pi r} \quad \text{circles}$$

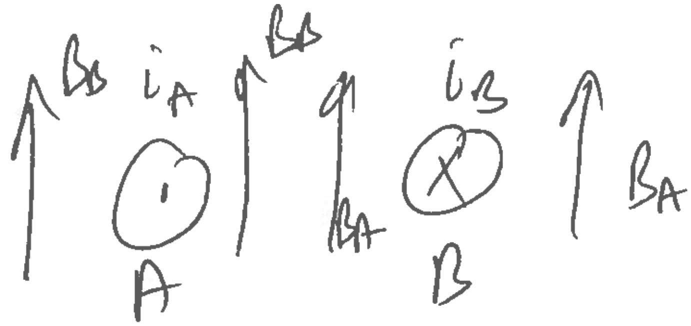
$$\vec{B}_A = \frac{\mu_0 i_A}{2\pi d} \hat{UP}$$

$$\vec{F}_{A\to B} = i_B L_B \hat{\odot} \times \frac{\mu_0 i_A}{2\pi d} \hat{UP}$$

$$F_{B\to A} \Rightarrow \hat{\text{Right}}$$

$$\vec{F}_{A\to B} = \frac{\mu_0 i_A i_B L_B}{2\pi d} (\hat{\odot} \times \hat{UP})$$

Left



$\vec{F}_{B \to A}$ $\hat{\text{Left}}$

$\vec{F}_{A \to B}$ Right

$$\frac{\mathcal{E}_s}{\mathcal{E}_p} = \frac{N_s}{N_p}$$

$$P_p = P_s$$

$$\mathcal{E}_p i_p = \mathcal{E}_s i_s \Rightarrow \frac{\mathcal{E}_s}{\mathcal{E}_p} = \frac{i_p}{i_s}$$

$$\frac{\mathcal{E}_s}{\mathcal{E}_p} = \frac{N_s}{N_p} = \frac{i_p}{i_s}$$

$$\frac{\mathcal{E}_p}{\mathcal{E}_s} = \frac{N_p}{N_s} = \frac{i_s}{i_p}$$