**Group Discussion**

Particles A, B, C, and D, with the same charge and speed, are placed into a uniform magnetic field. Rank the particles by the magnitude of force they experience from highest to lowest.

![Diagram](image)

- \( B = D > C > A \)

**Work Problems**

1. Find the 5 equations that would solve for the 5 branch currents. (resistance is in ohms)

![Diagram](image)

- \( I_2 = I_3 + I_4 \leq 5 \)
- \( I_5 = I_3 + I_4 \leq 5 \)
- \( -25 + I_5 - 50 = 0 \leq L_1 \)
- \( -30 + I_2 + 20 + I_3 + 30 + 25 = 0 \leq L_2 \)
- \( -36.4 + I_2 + 20 + 75 + I_3 = 0 \leq L_3 \)

My conventions:
- **Drops** → positive
- **Rises** → negative
3. In the circuit shown, each capacitor initially has a charge of magnitude 3.5nC on its plates. After the switch is closed, what will be the current in the circuit at the instant that the capacitors have lost 80% of their initial stored energy?

\[
C_{eq} = \left(\frac{1}{10} + \frac{1}{20} + \frac{1}{15}\right)^{-1} = 4.615 \, \text{pF}
\]

\[
E_{\text{final}} = 0.2 \cdot E_{\text{initial}}
\]

\[
E = \frac{Q^2}{2C} \Rightarrow \frac{(Q_{\text{final}})^2}{2C} = 0.2 \cdot \frac{(Q_{\text{initial}})^2}{2C}
\]

\[
Q_{\text{final}}^2 = 0.2 (Q_{\text{initial}})^2
\]

\[
Q_{\text{final}} = \sqrt{0.2} \cdot Q_{\text{initial}}
\]

\[
C = \frac{Q}{V} \quad V = \frac{Q}{C} \quad \text{charge decrease at same rate as current}
\]

\[
\text{so} \quad I_{\text{final}} = \sqrt{0.2} \cdot I_{\text{initial}}
\]

\[
I_{\text{final}} = \sqrt{0.2} \cdot 30.334 = 13.6 \, \text{A}
\]

4. In a 1.25-T magnetic field directed vertically upward, a particle having a charge of magnitude 8.5uC and initially moving northward at 4.75km/s is deflected toward the east. (a) What is the sign of the charge? (b) Find the magnetic force exerted on the particle.

\[
\vec{F} = q \cdot \vec{V} \times \vec{B}
\]

(a) positive

(b) \[
\vec{F} = 0.0505 \, \text{N}
\]