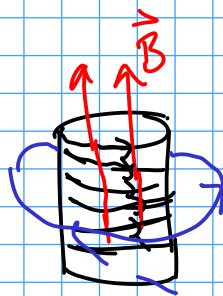


What is \vec{A} ?

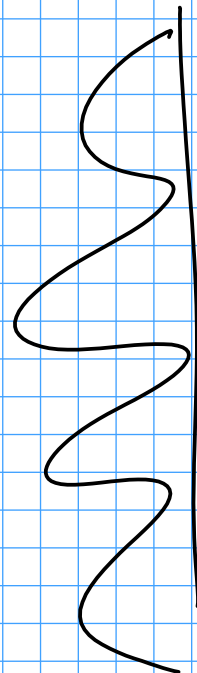
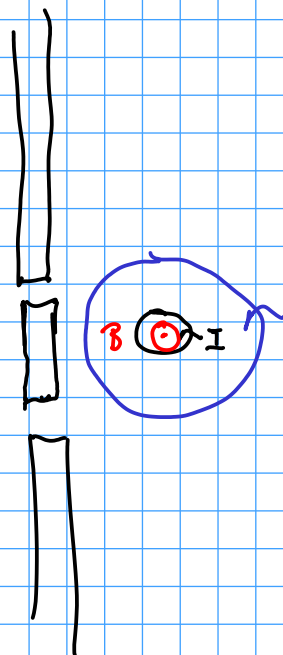
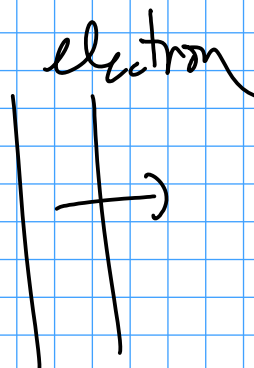
ONTOLOGY: What exists? Is \vec{A} just a math construct?

EPISTEMOLOGY: What do we know & how do we know it?

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



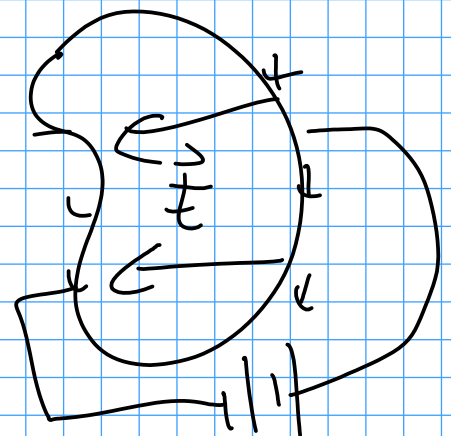
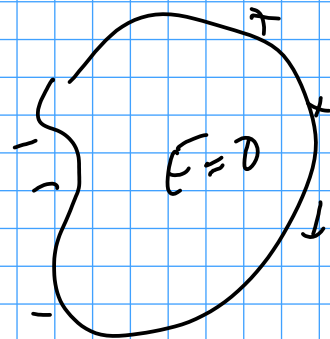
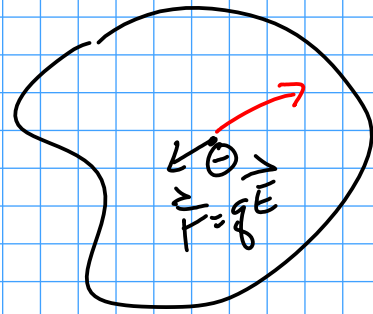
Solenoid



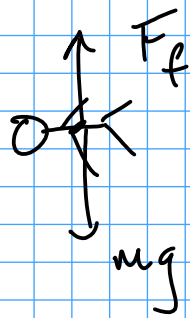
Aharonov-Bohm effect (see wikipedia)

- "How to win friends & influence people," Dale Carnegie (1936)
- "Flow: Psychology of optimal experience," M. Csikszentmihalyi (1990)
- "A different universe: Reinventing physics from the bottom down," R. Laughlin (2007)

E inside conductors



electrons move on average at const speed



$$\sum F_y = 0$$

$$F_f = kv = mg$$

const depends on v

$$v = \frac{m}{k} g \quad v \propto g$$

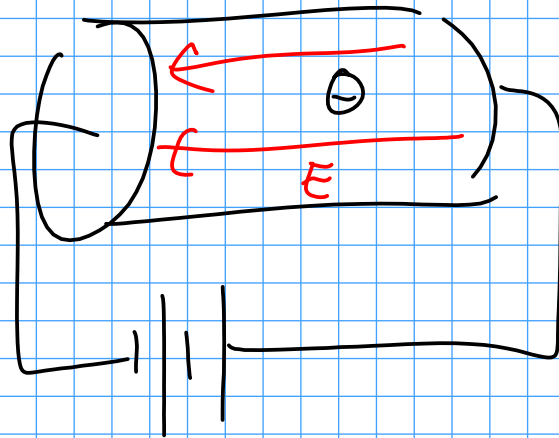
$$F = mg$$

$$g = \frac{F}{m} \quad \frac{\text{force}}{\text{mass}}$$

In conductor

$$F = qE$$

$$\frac{\text{force}}{\text{mass}} \rightarrow \frac{\text{force}}{\text{charge}} = E$$



v electron in conductor $\propto E$

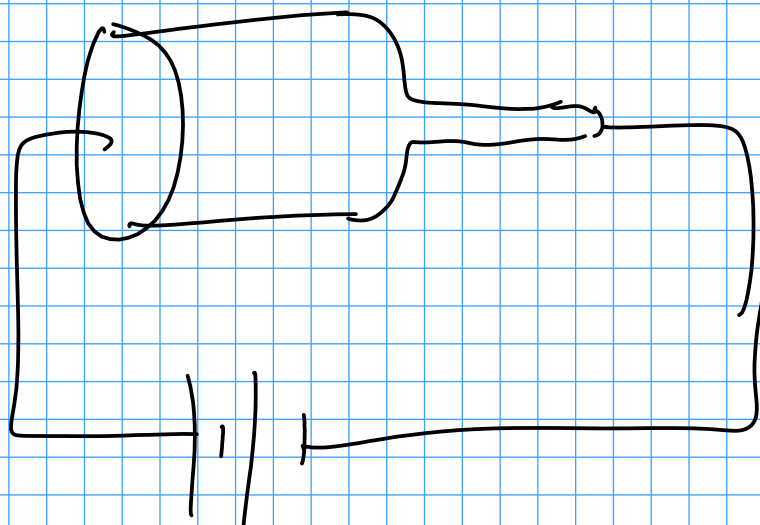
Ohm's Law

$$J = \rho v \propto E$$

$$\boxed{J = \sigma E}$$

↑
conductivity

Assume σ is constant



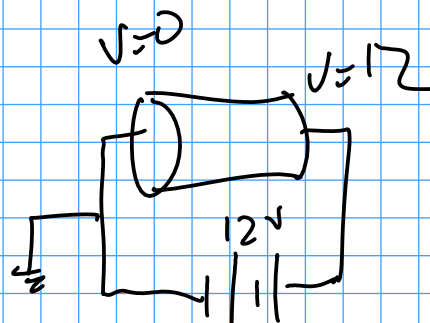
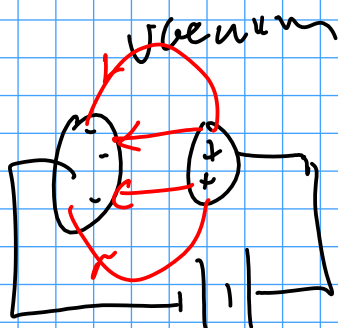
$\nabla \cdot \vec{J} = -\frac{\partial \rho}{\partial t}$ assume magnetostatic $\frac{\partial}{\partial t} \rightarrow 0$

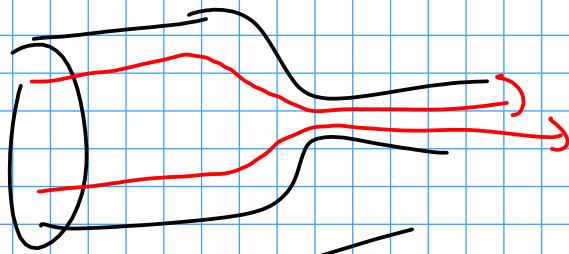
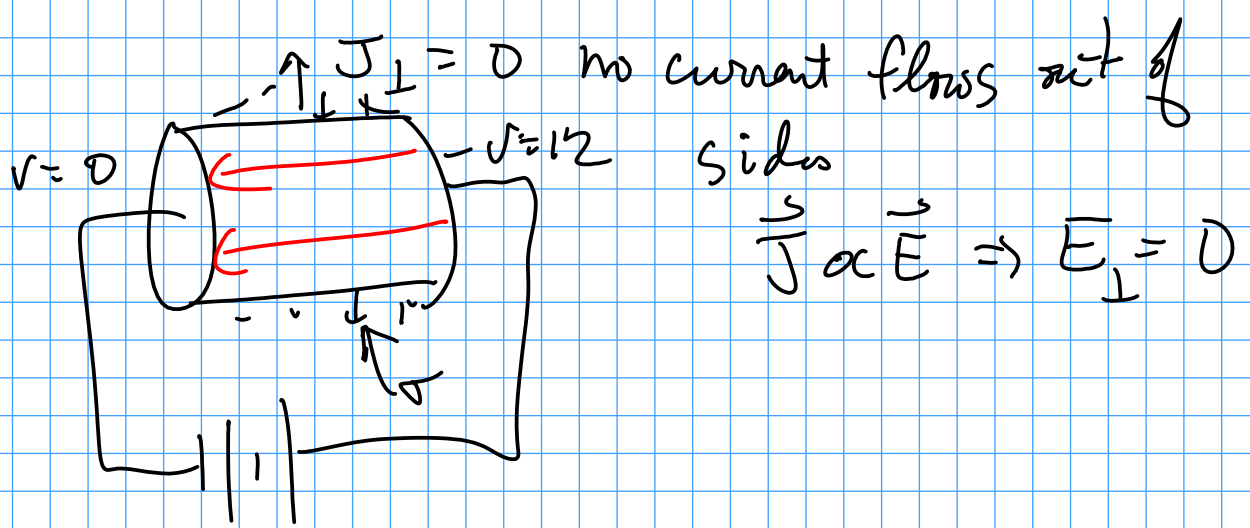
Cons charge

$\nabla \cdot \vec{J} = 0$ thus $\vec{J} = \sigma \vec{E}$

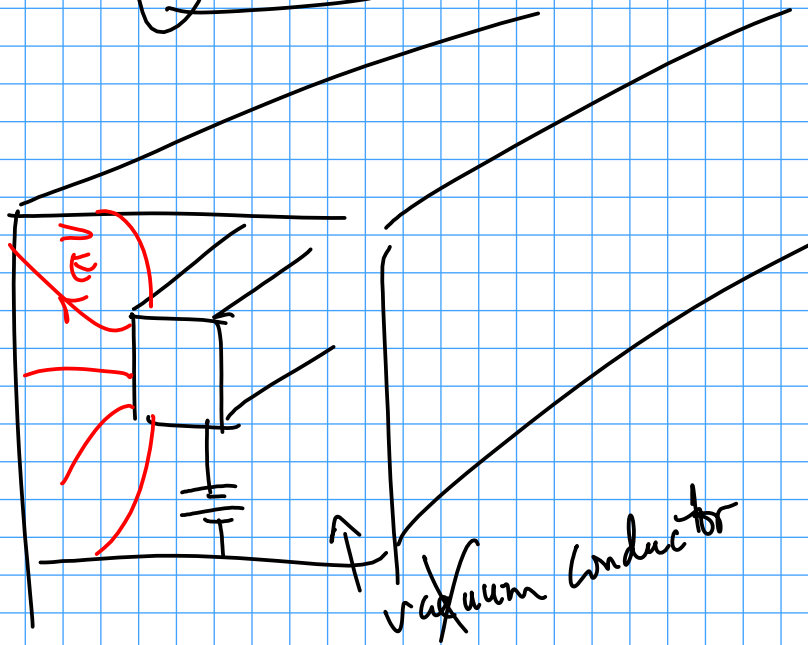
$\nabla \cdot \sigma \vec{E} = \sigma \nabla \cdot \vec{E} = 0$ $\vec{E} = -\vec{\nabla} V$

$\nabla^2 V = 0$ Laplace's Eqn.





$\vec{J} = \sigma \vec{E}$



$\nabla^2 V = 0$ with boundary conditions