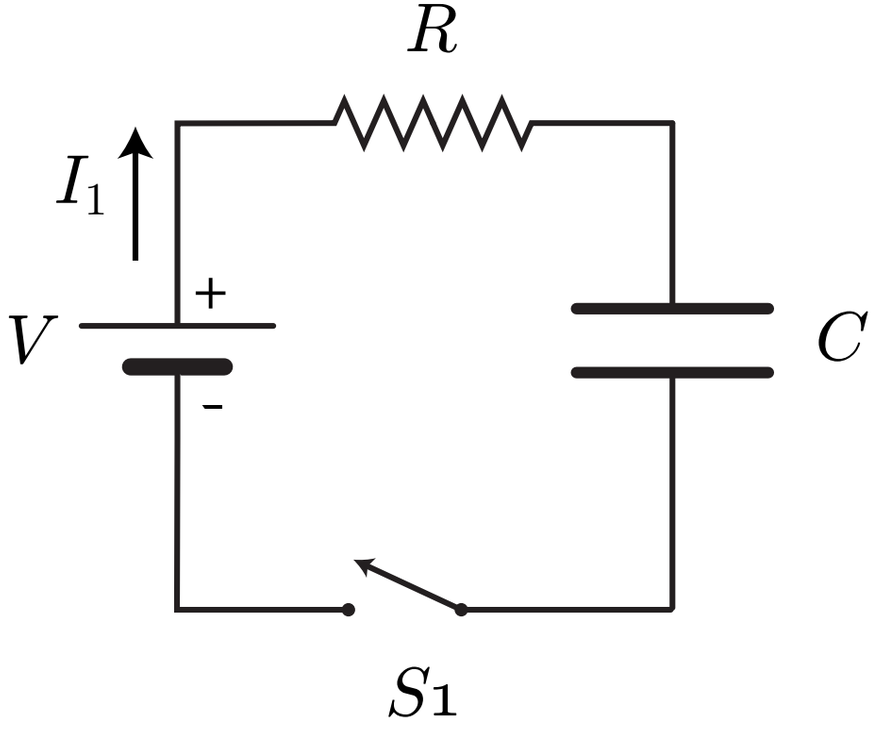
MT3 Review

Lecture 24

Units Units Units

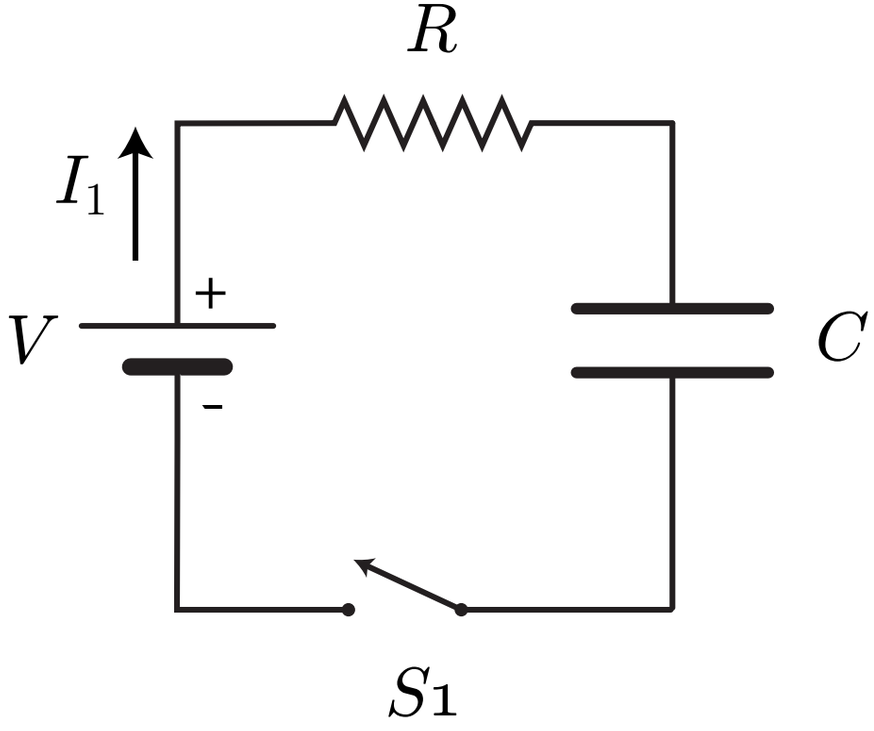
- Always Always Always convert to MKS
  - cm -> m
  - ms -> s
  - mA -> A
  - etc…

RC Circuits



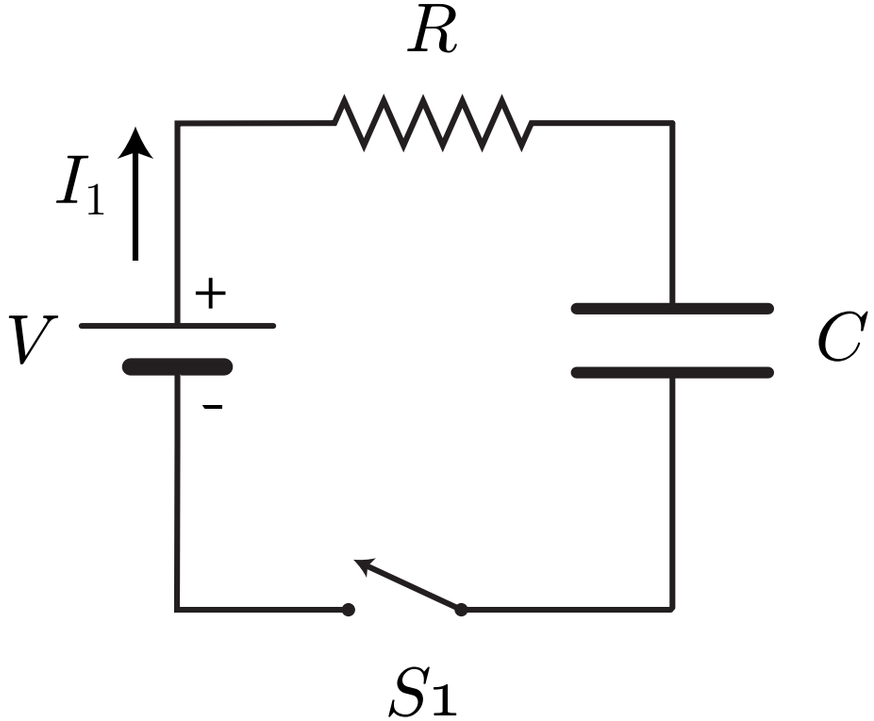
- C is uncharge at t = 0.
- What is the current the instant after S1 is closed?
- Why?

RC Circuits



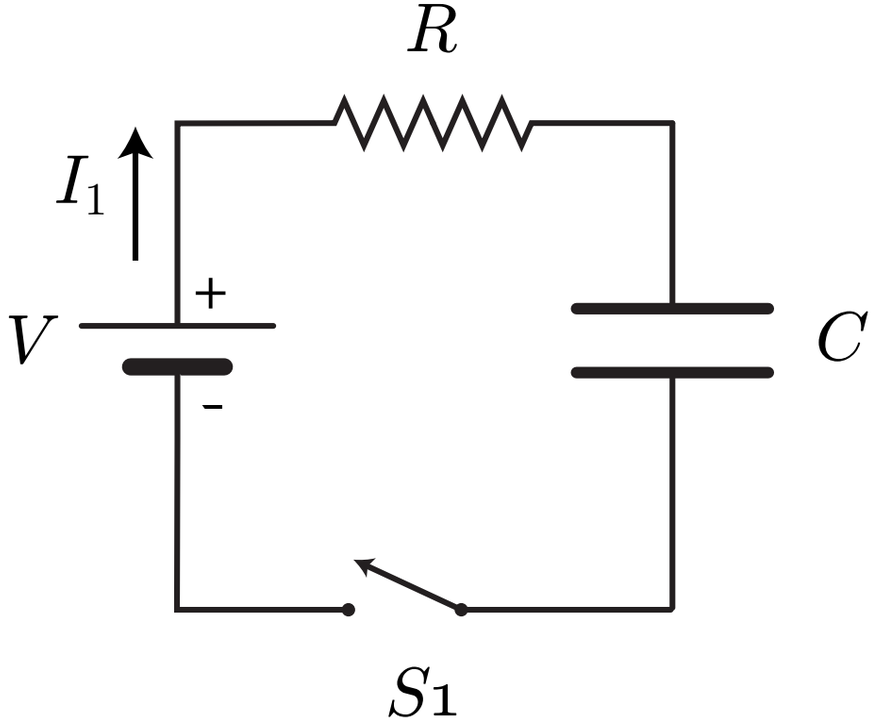
- C is uncharge at t = 0.
- What is the current at long times after S1 is closed?
- Why?

RC Circuits



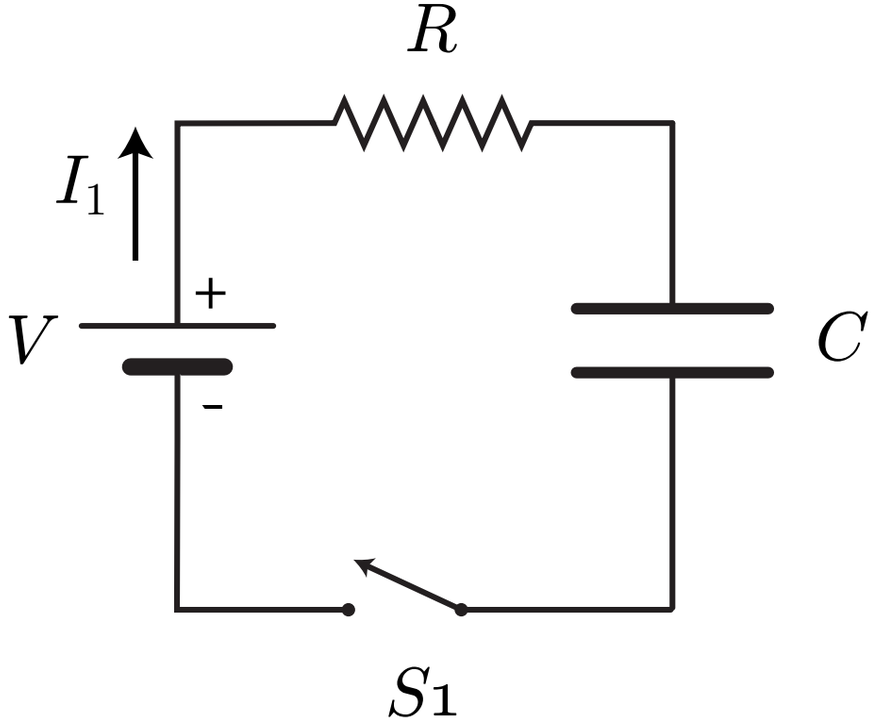
- C is uncharge at t = 0.
- What is the time constant?

RC Circuits



- C is uncharge at t = 0.
- Sketch the voltage across the capacitor as a function of time

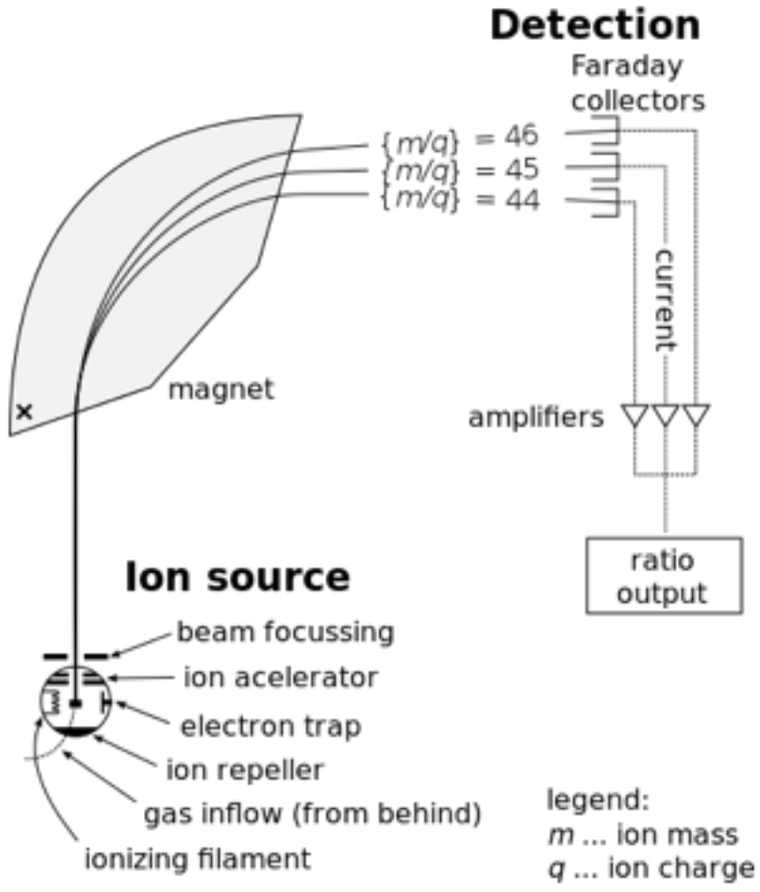
RC Circuits



- If R is doubled, how should the components be changed to get the same V_c(t) curve?

- Do I(t) and Q(t) change?

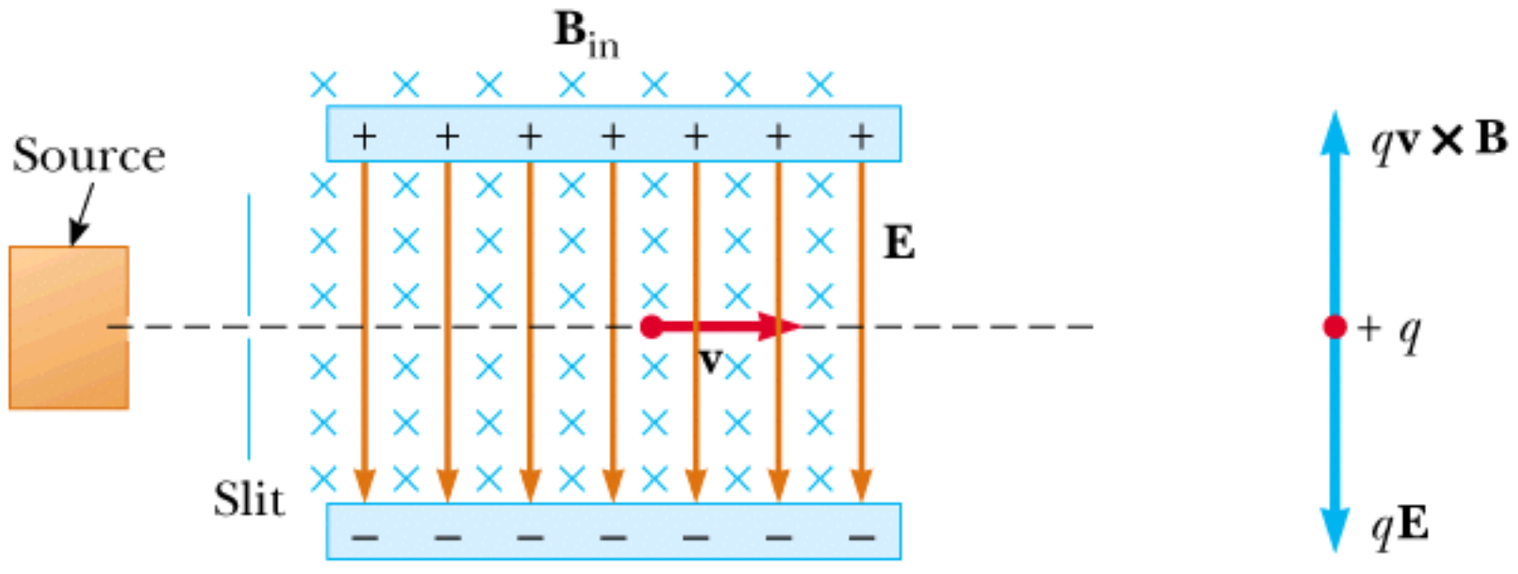
Charges Moving in a B Field: Mass Spectrometer



If the mass of the particle is doubled, how must the magnitude of the charge change such that the deflection of the particle is unchanged?

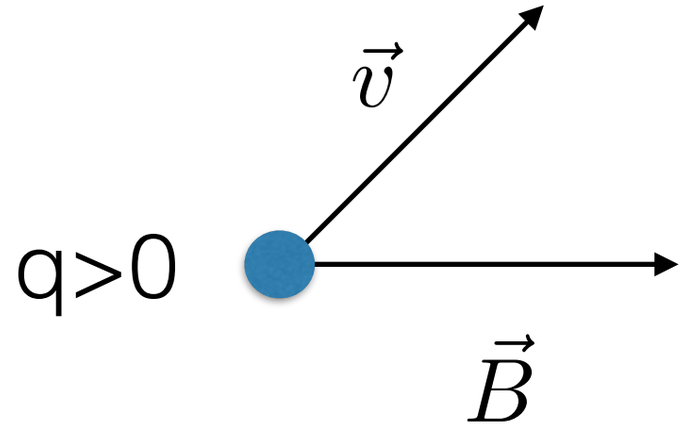
Charges Moving in a B Field: Velocity Selector

How does a velocity selector work?



Charges Moving in a B Field

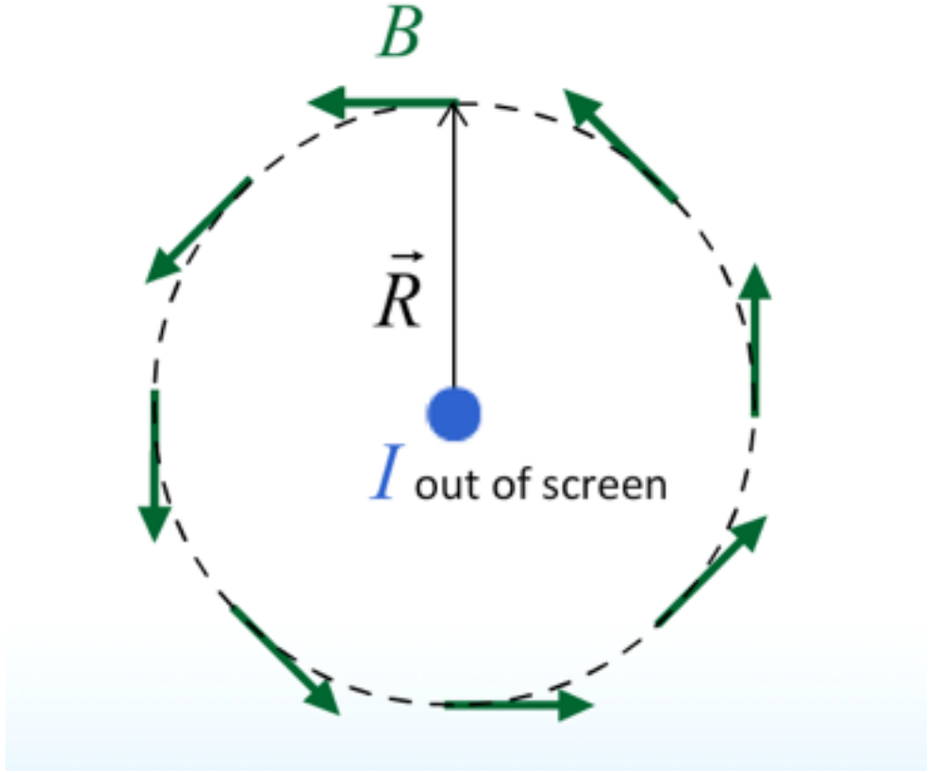
- What is the trajectory of this particle?



Ampère Law: Infinite Wire (1)

(Overhead)

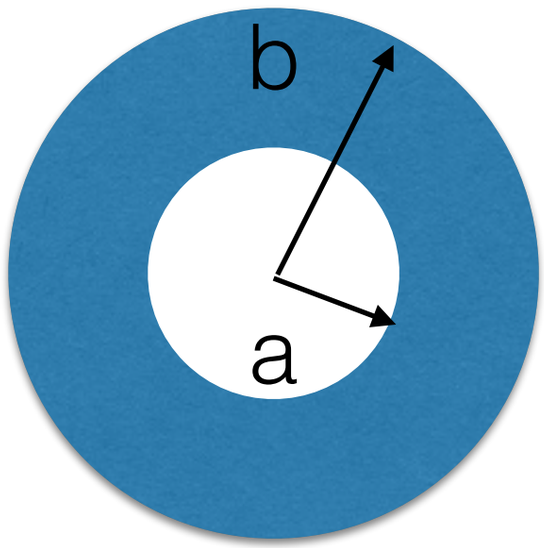
1. Identify **symmetry**
2. Draw B field/field lines
3. Choose a Ampère Loop
4. Compute B



$$B = \frac{\mu_0 I}{2\pi R}$$

Ampère Law: Weird Wires

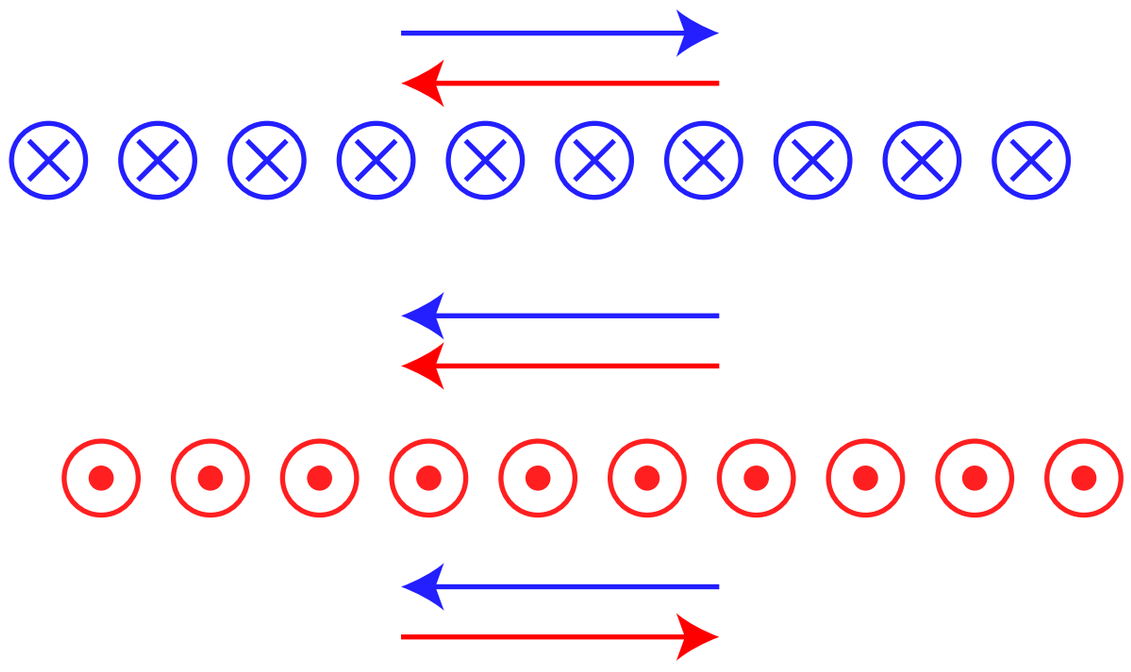
I (out of the board)



- A wire cross section is shown to the left. What is the B field as a function or the displacement r?

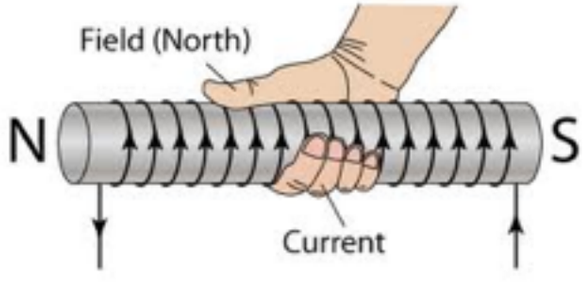
Ampère Law: B field for an ∞ solenoid

- Intuitive picture: ~ 2 infinite sheets

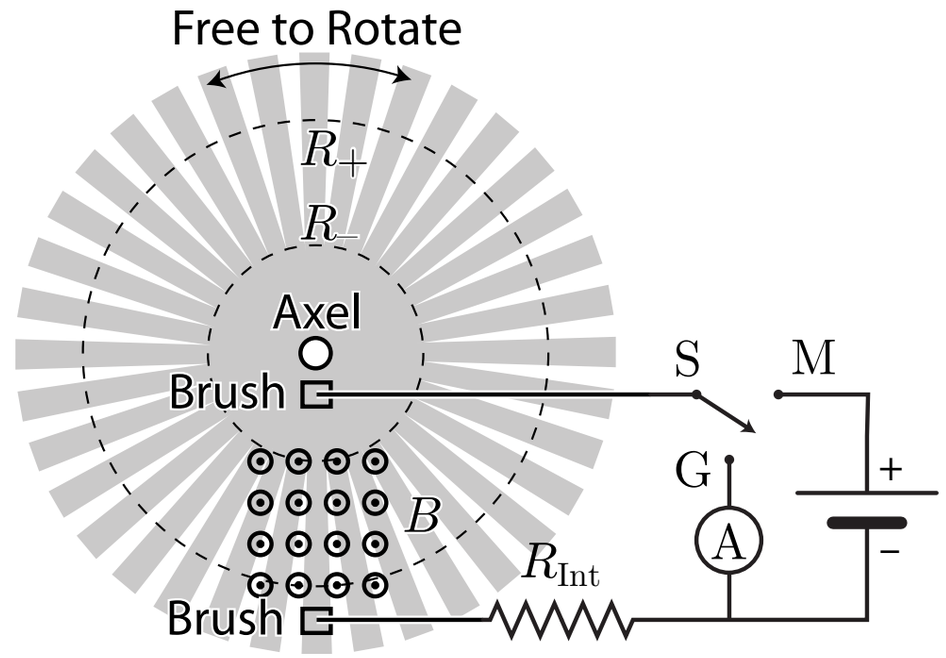


- Field is ~ zero outside

$$B = \mu_0 n I$$

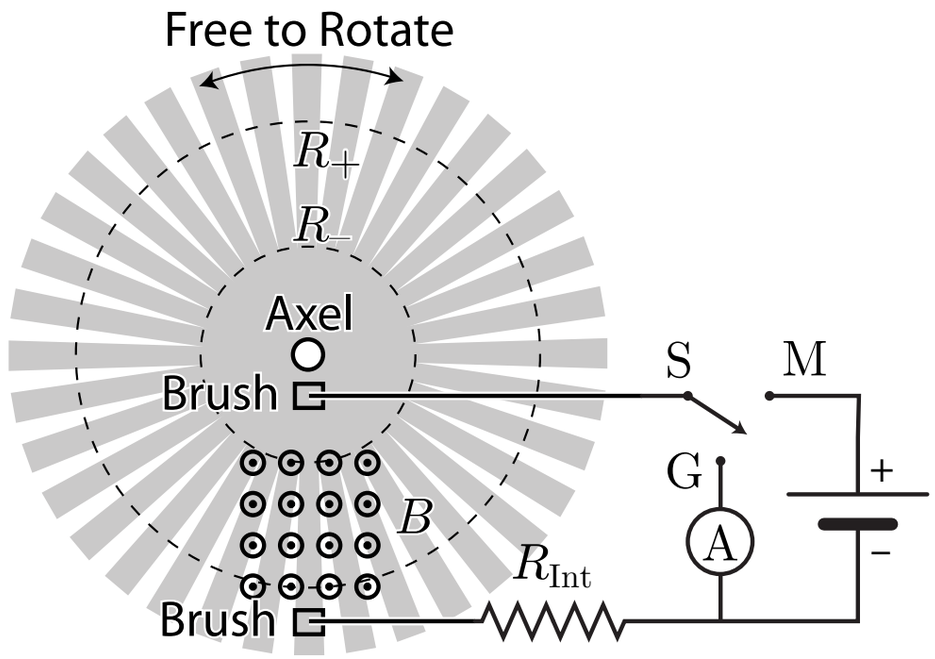


Right Hand Rule…motors and generators…



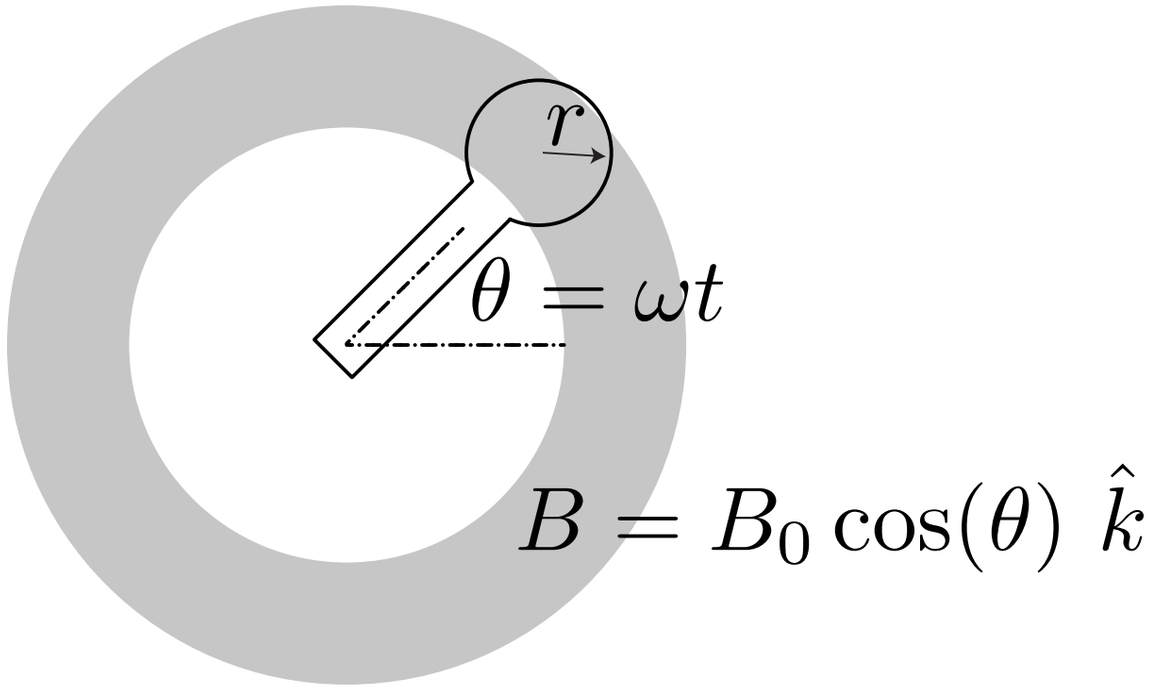
- S is connected to terminal M. What happens?

Right Hand Rule…motors and generators…



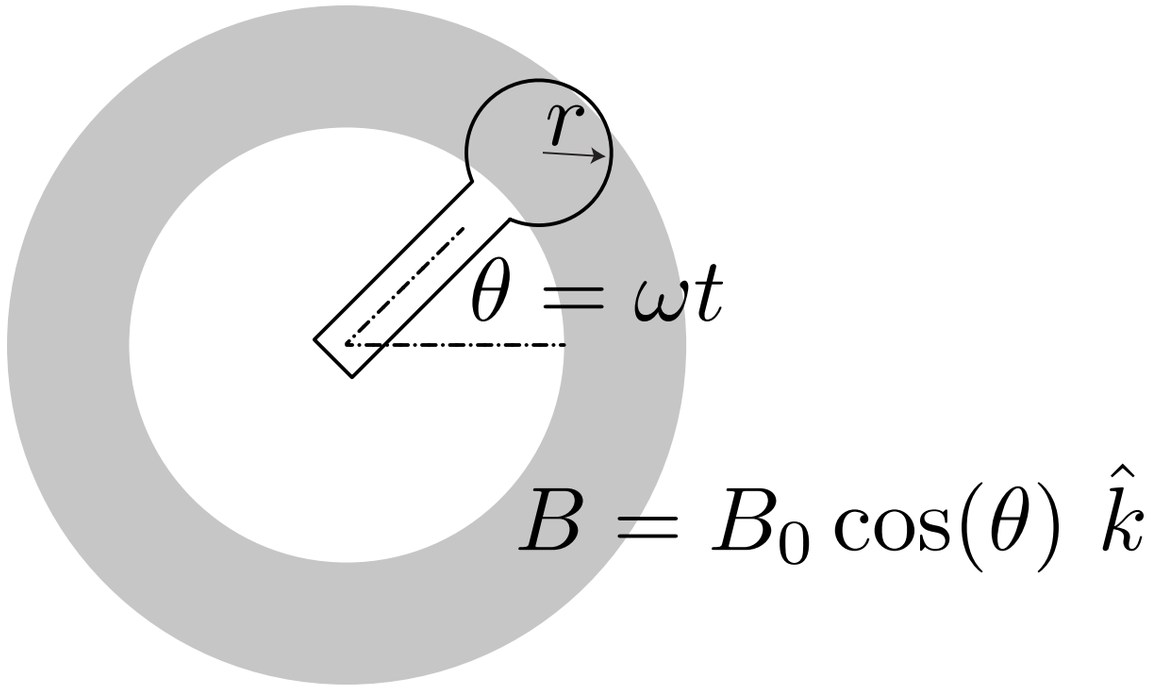
- S is connected to terminal G and the disk is rotated CCW. What happens?

Faraday Law / Lenz's Law



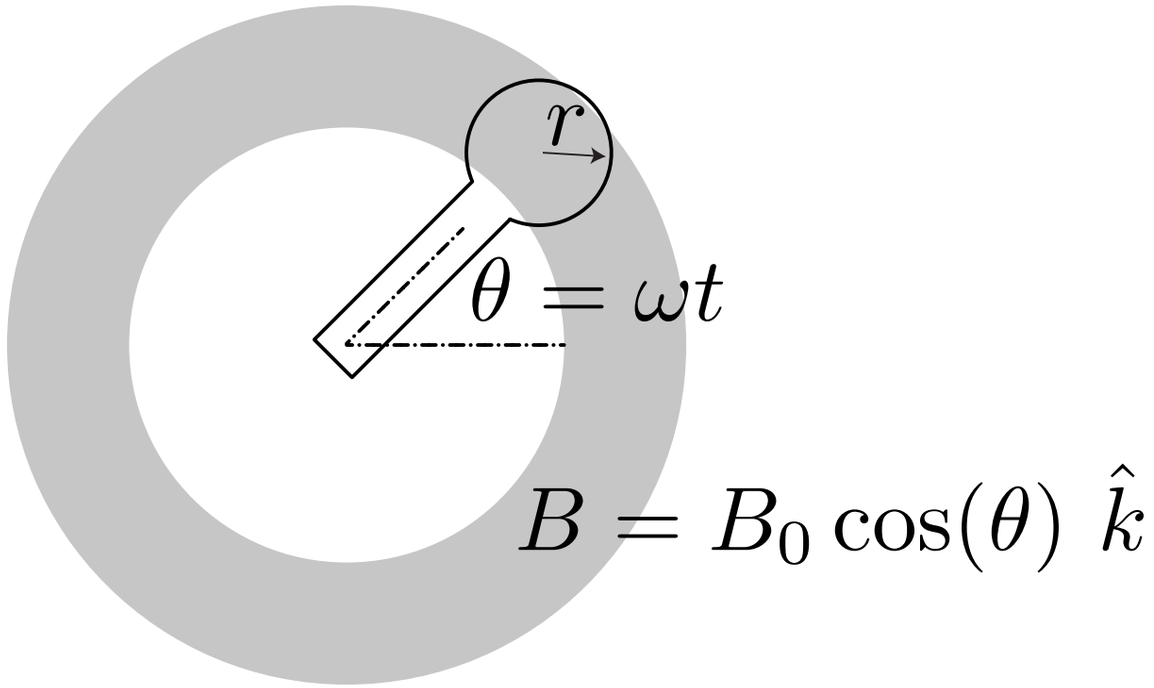
- What is the EMF generated by the generator?

Faraday Law / Lenz's Law



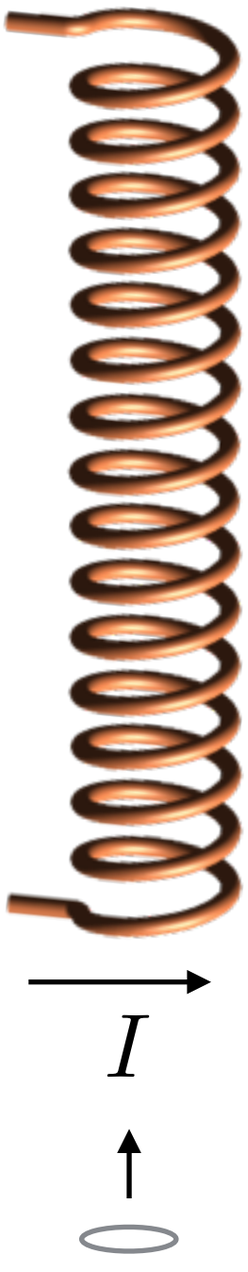
- If the total internal resistance is R, what is the current.

Faraday Law / Lenz's Law



- How much torque needs to applied to keep the loop rotating at a constant angular frequency?

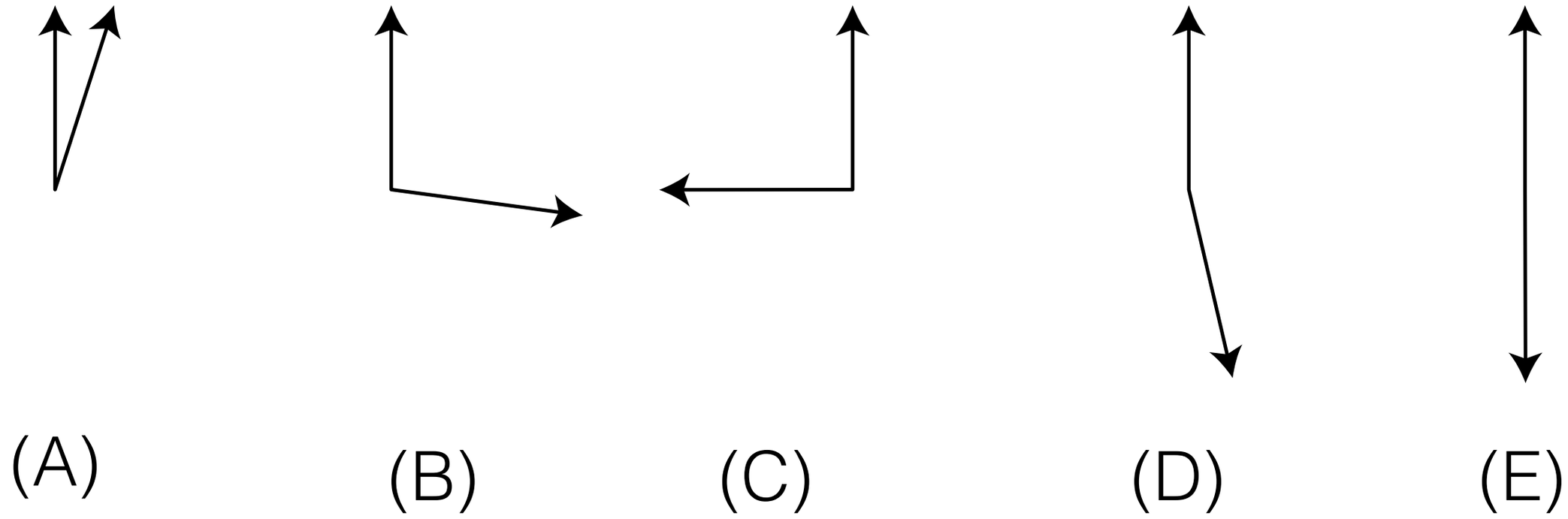
Faraday Law/Lenz's Law



- Sketch the current and the force as a function of the loop position as it moves through a finite length solenoid.

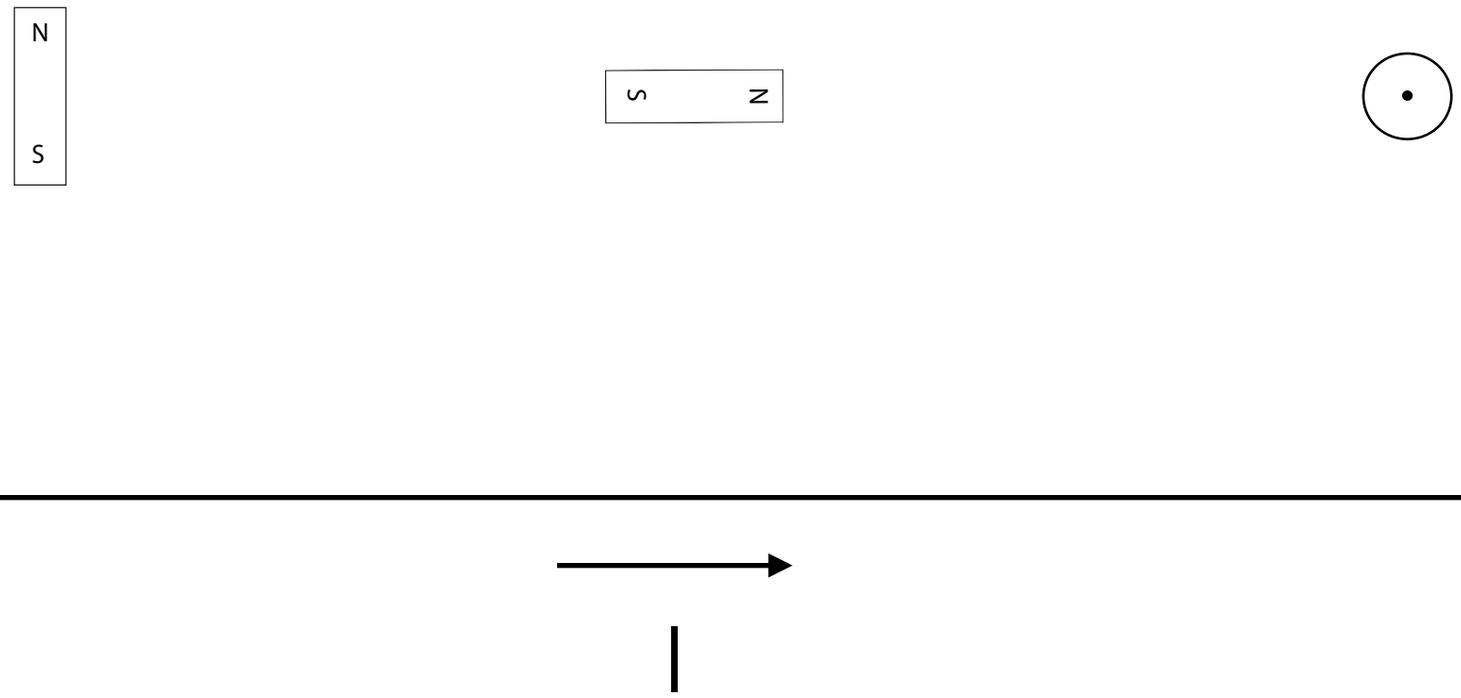
Torques and Dipoles

μ and B:



- Which configuration has the largest magnitude torque?

Torques and dipoles



- Which configuration has the largest torque?