Some basic electrical ideas

- **Conductor** – a material that permits some of its charges to move freely within it.
  - Implication: If the charges in a conductor are not moving, the whole conductor is at the same $V$. Why?

- **Insulator** – a material that permits some of its charges to move a little, but not freely.

- **Battery** – a device that creates and maintains a constant potential difference across its terminals.

\[ \Delta V = V_0 \text{ volts} \]
Charging a capacitor

- What is the potential difference between the plates?
- What is the field around the plates?
- How much charge is on each plate?

Capacitor Equations

\[ \Delta V = E \Delta x = Ed \]

\[ E = 4\pi k_c \sigma = 4\pi k_c \frac{Q}{A} \quad \Rightarrow \quad Q = \left( \frac{A}{4\pi k_c} \right) E \]

\[ Q = \left( \frac{A}{4\pi k_c d} \right) \Delta V \]

\[ Q = C \Delta V \]

What does this "Q" stand for?