

Physics 202, Lecture 9

- **Current and Resistance (Ch 25)**
 - DC currents
 - Ohm's Law: Resistors and Resistance
 - Conductivity and Resistivity

Next lecture: DC circuits

Charge Motion in a Conductor

Electrons in a conductor have random motion ($v_{\text{ave}}=0$)

In an **external electric field** (e.g. as supplied by a source of potential difference such as a battery), electrons accelerate, produces **current**:

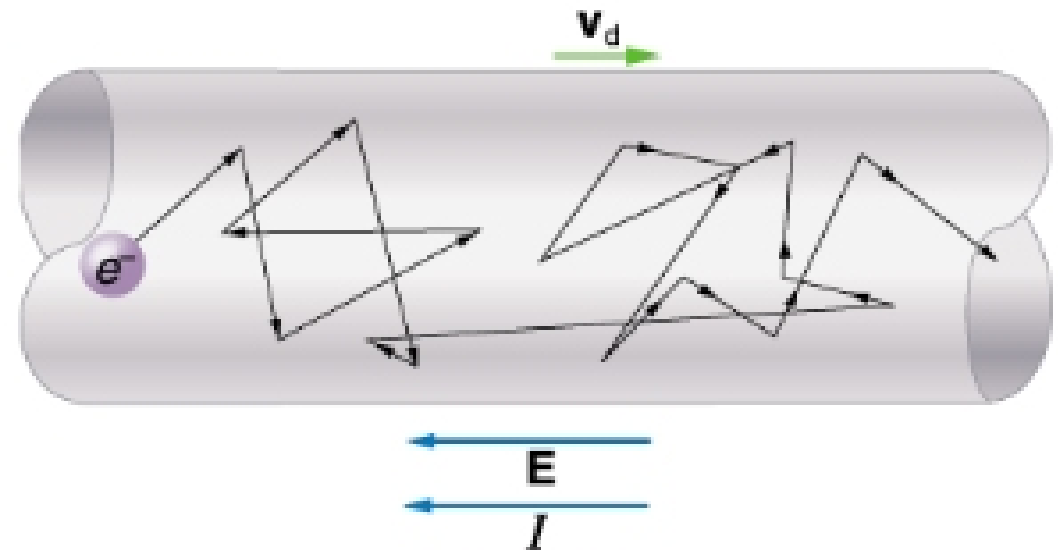
Average current:

$$I = \frac{\Delta Q}{\Delta t}$$

Instantaneous current:

$$I = \frac{dQ}{dt}$$

direct current (DC): I constant



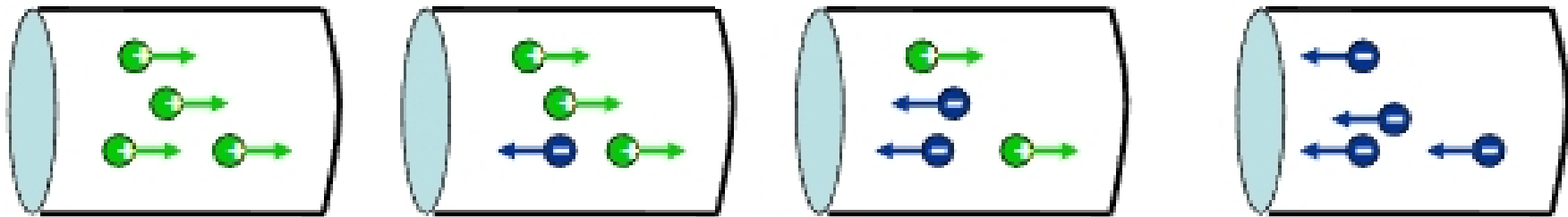
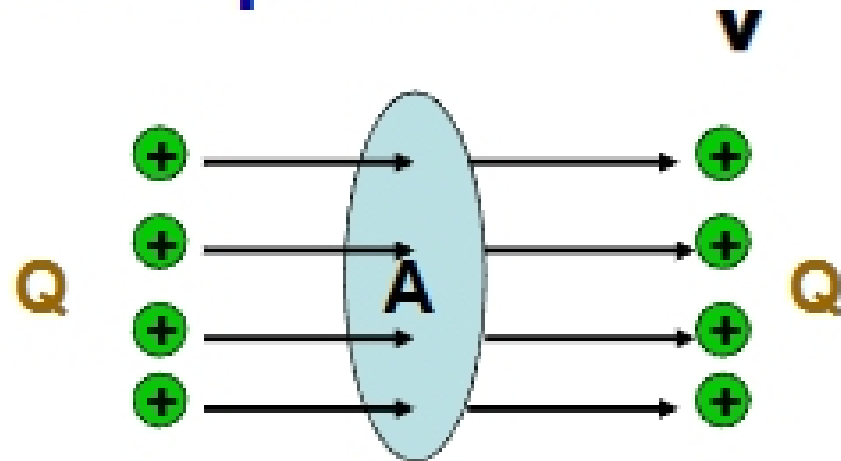
Current: Macroscopic View

Current: rate at which charge flows through surface:

Unit: 1 Ampere = 1 C/s

Current is directional: Follows positive charge (convention)

+q moving in +x direction \leftrightarrow -q in moving -x direction



Charge conservation → Current conservation

