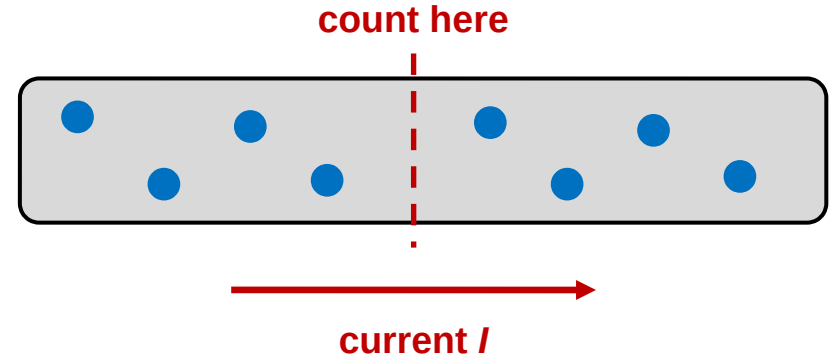


Essential Question

What makes charges flow through a circuit?

Electric Current

- Current: the flow of charge
- Amount of charge per second
- Unit: ampere (A)



1 A = 1 coulomb passes each second

The Current Equation

$$I = q / t$$

I

current (A)

q

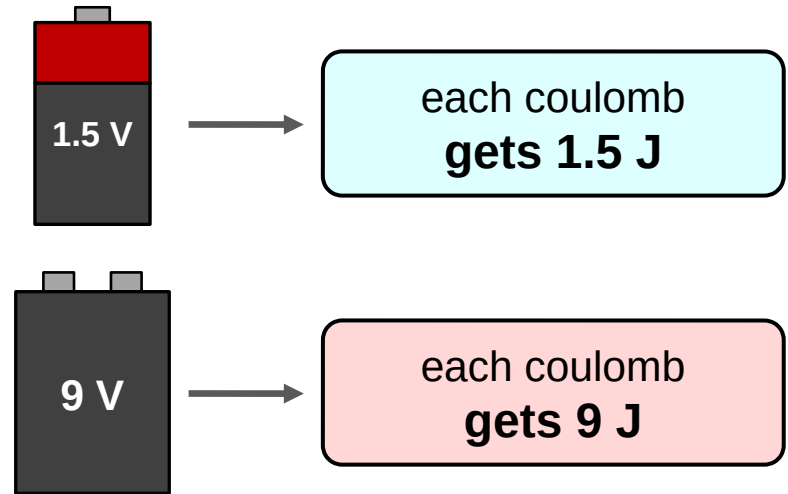
charge (C)

t

time (s)

Voltage

- Energy given to each coulomb
- The "push" from the battery
- Unit: volt (V) = 1 J/C



more volts, more energy per coulomb

The Voltage Equation

$$\Delta V = PE / q$$

ΔV

voltage (V)

PE

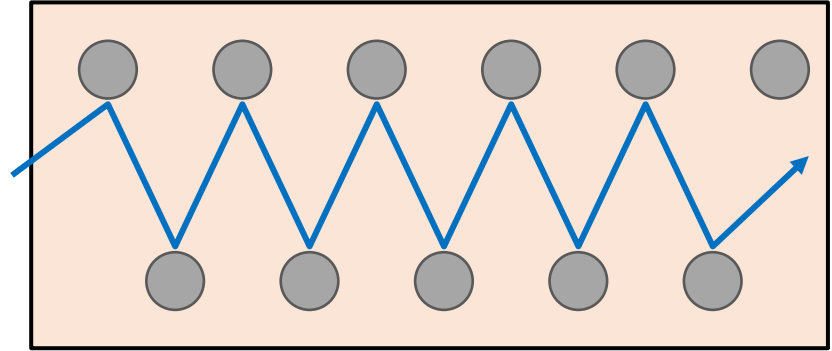
energy (J)

q

charge (C)

Resistance

- Opposes the flow of charge
- Unit: ohm (Ω)
- More resistance, less current
- Energy turns into heat



charges bump into atoms, which heats the material

What Affects Resistance?

- Longer wire: more resistance
- Thicker wire: less resistance
- Material matters



short: less R



long: more R



thin: more R



thick: less R



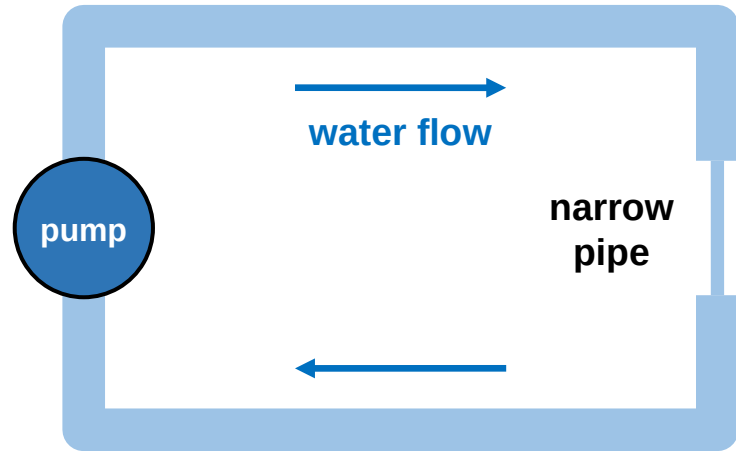
copper: less R



nichrome: more R

The Water Analogy

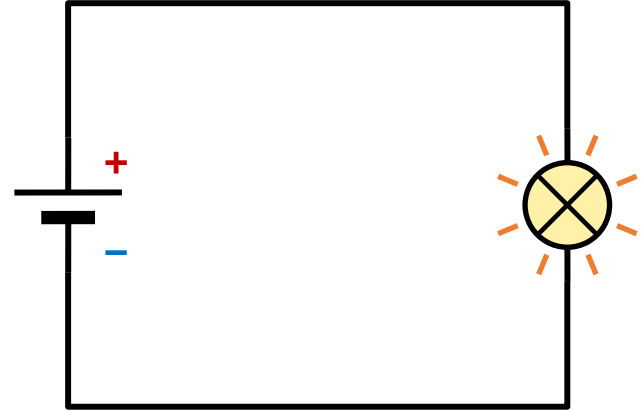
- Pump $\leftrightarrow$ battery
- Water flow $\leftrightarrow$ current
- Pump's push $\leftrightarrow$ voltage
- Narrow pipe $\leftrightarrow$ resistance



pump pushes, narrow pipe resists, water flows

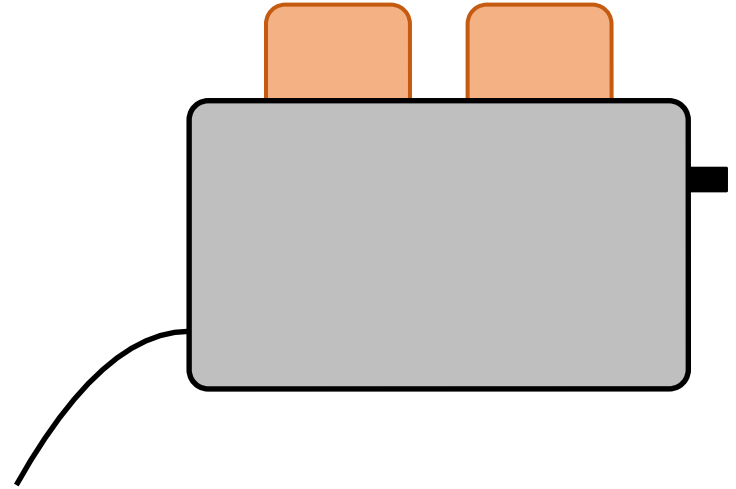
Example: Finding Current

A total charge of 12 C flows through a bulb in 4.0 s. What is the current in the bulb?



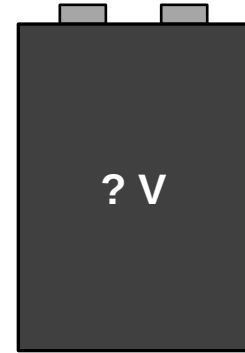
Example: Finding Charge

A toaster draws a current of 2.5 A for 30.0 s . How much charge flows through it?



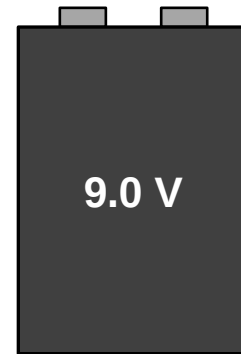
Example: Finding Voltage

A battery gives 36 J of energy to 3.0 C of charge. What is the battery's voltage?



Example: Finding Energy

A 9.0 V battery moves 0.50 C of charge through a circuit. How much energy does the battery give to the charge?



Big Ideas

- Current is the flow of charge: $I = q/t$ (A)
- Voltage is energy per charge: $\Delta V = PE/q$ (V)
- Resistance opposes current (Ω)
- Long, thin wires have more resistance