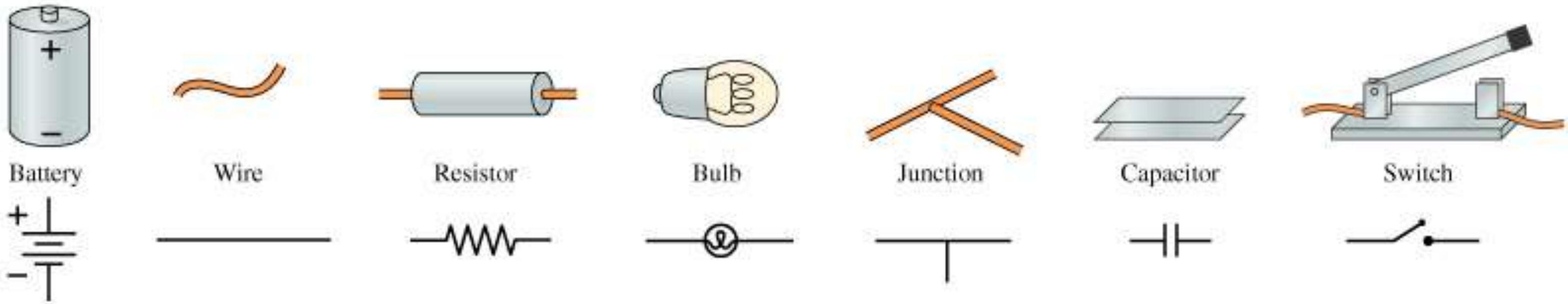
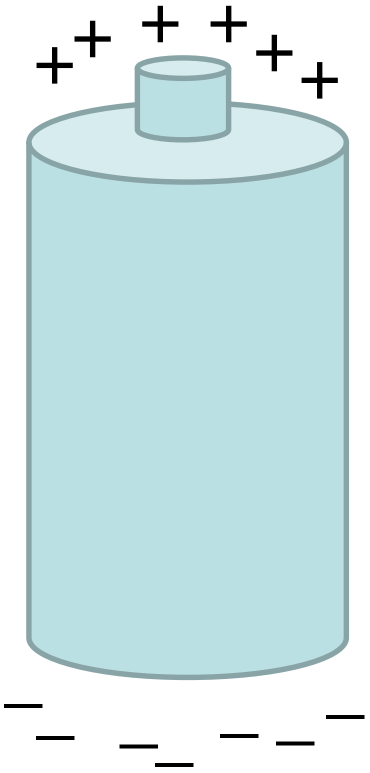
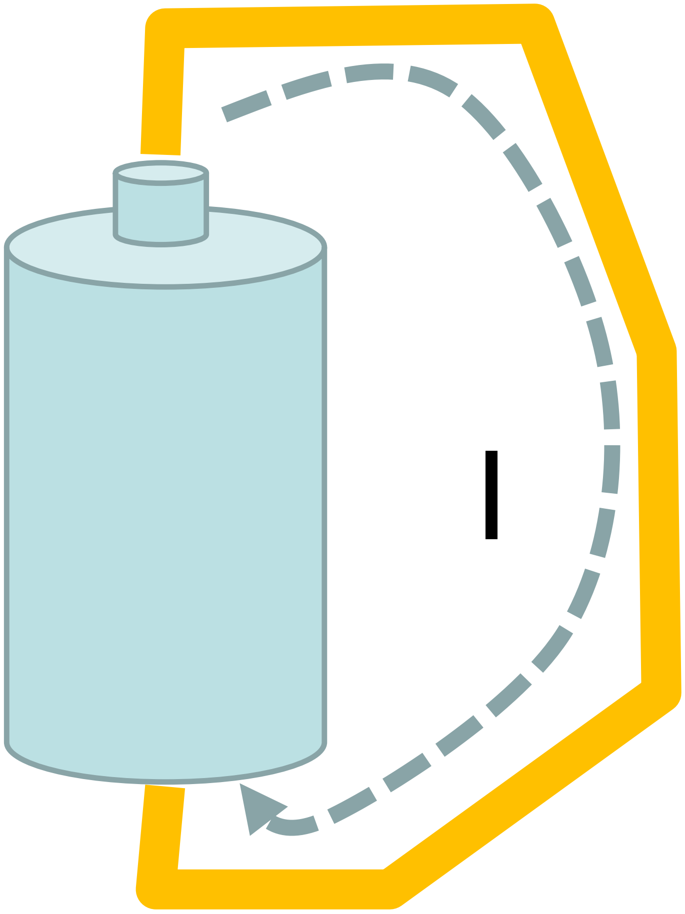

Battery
Wire
Resistor
Bulb
Junction
Capacitor
Switch
+
−

Batteries

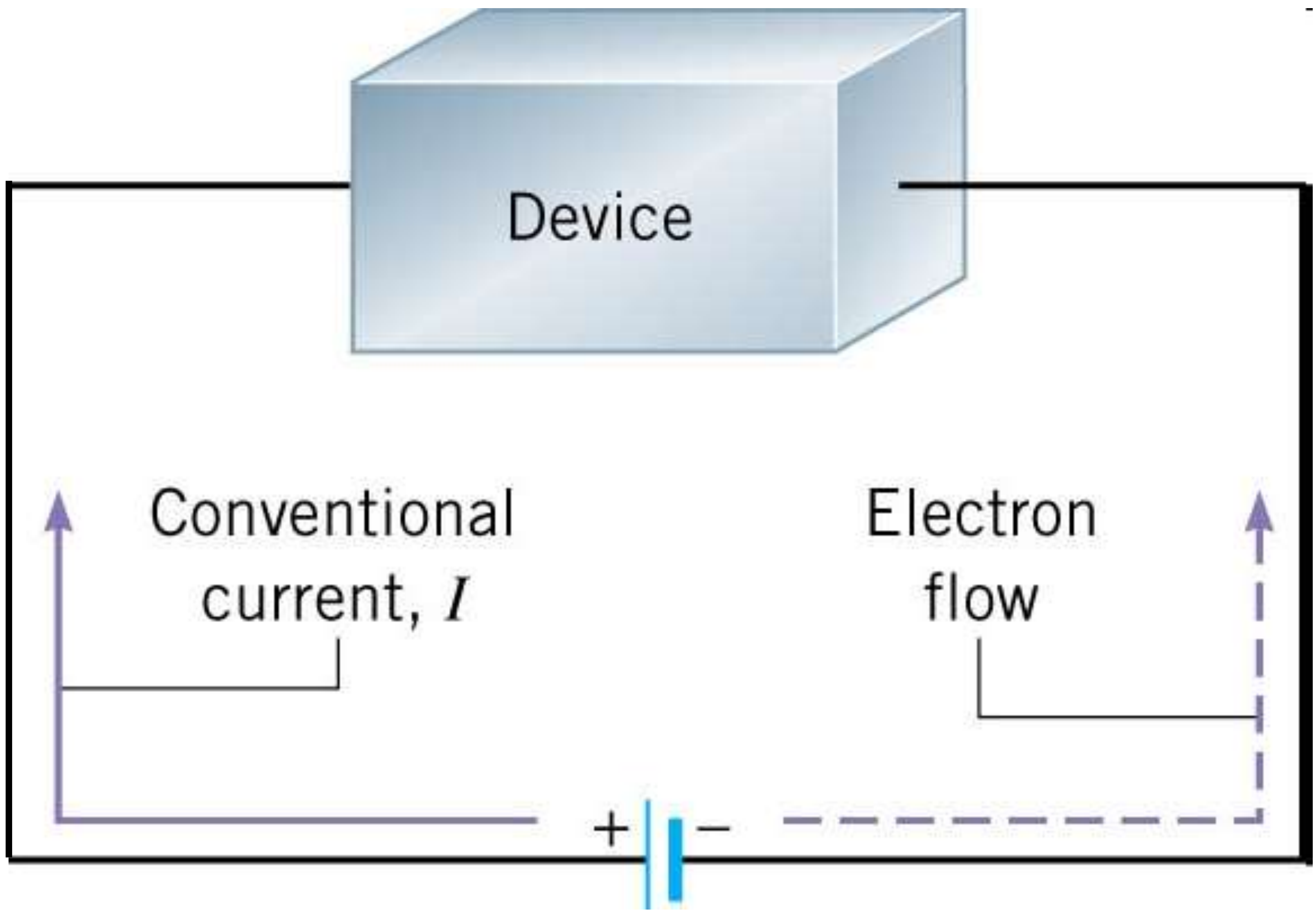


- Use chemical energy to maintain a charge separation
- Voltage or potential difference
- $V = {}^{E}/_{q}$, constant
- Unit is the Volt (V)

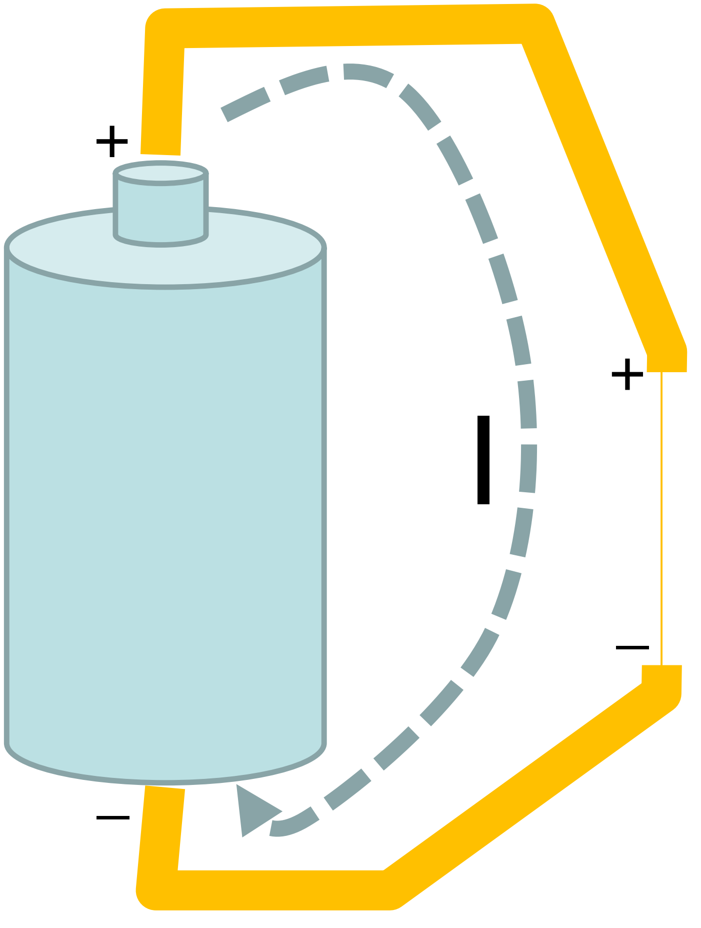
Current



- Air is an insulator
- Connect a conductor from + to -, have a circuit
- Charge flows
- Chem E used up keeping charge separation
- Current I = q/t
- Unit is Amperes (A)

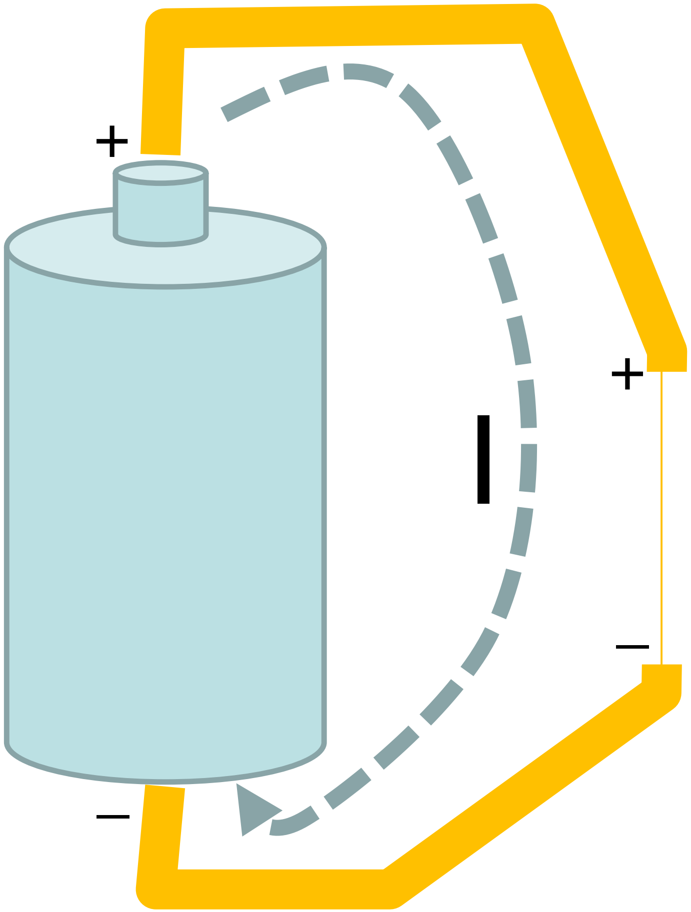

Device
Conventional
current, I
Electron
flow
+
−

Resistor



- Very thin conductor
- Restricts current flow
- Thinner means higher resistance
- Creates a traffic jam.
- Result is a charge separation or voltage V_R across resistor in a circuit.

Power



- Power, $P = E / t$ (watts)
- Simple math trick

$$P = E/q \times q/t = VI$$

- Battery supplies power and drives current
- Resistor dissipates power as heat "Joule Heating"
- Energy is conserved

$$\therefore P_{in} = P_{out}$$

$$V_B I = V_R I \rightarrow V_B = V_R$$

Ohm's Law

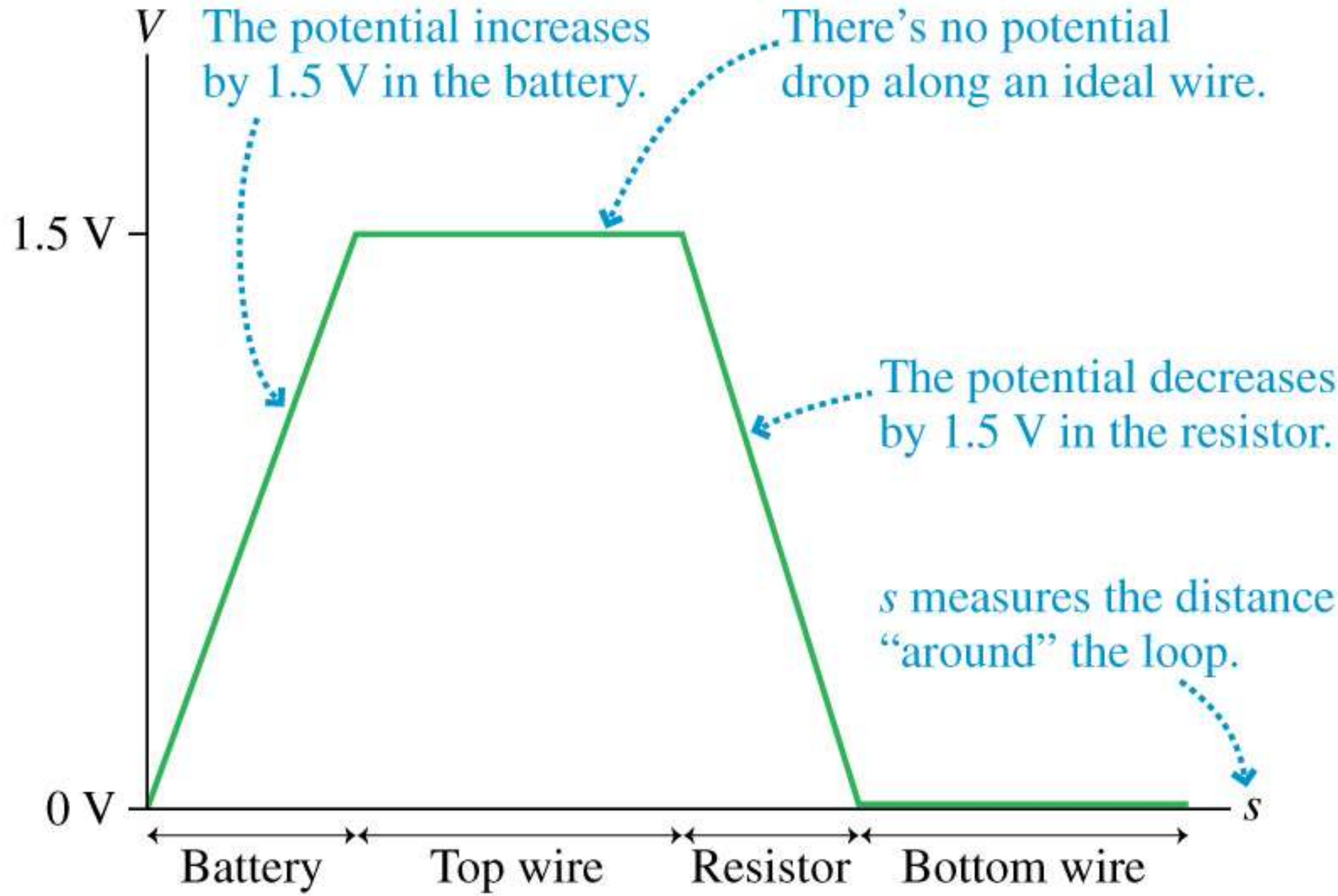
- For conductors, define resistance

$$R = \frac{V_R}{I}$$ unit is Ω (Ohm)

- For certain conductors (the type we make resistors out of), R is constant

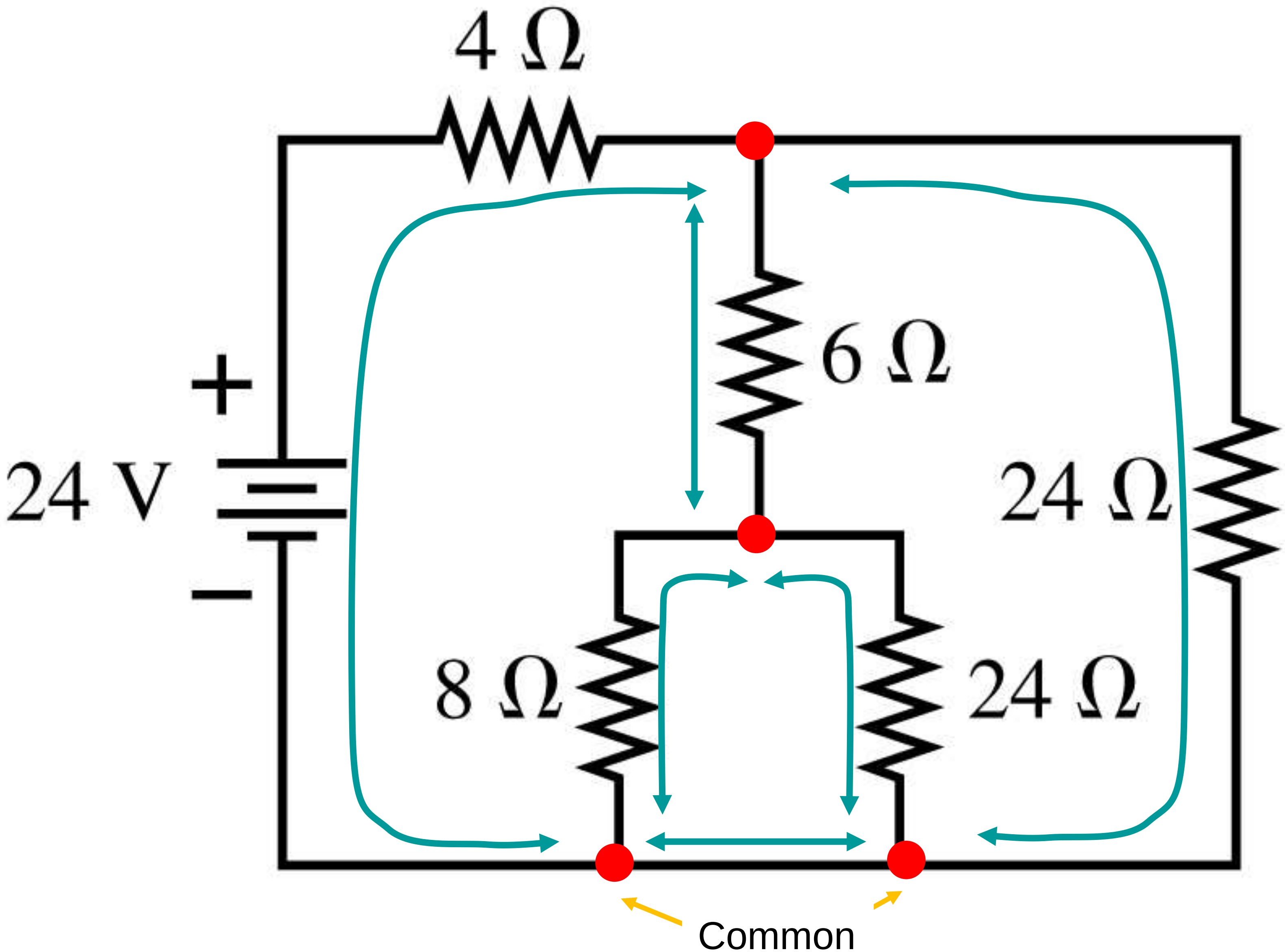
Battery-Resistor Circuit

Simulation


V
The potential increases by 1.5 V in the battery.
There's no potential drop along an ideal wire.
1.5 V
The potential decreases by 1.5 V in the resistor.
s measures the distance "around" the loop.
0 V
s
Battery
Top wire
Resistor
Bottom wire

Goal

- Analyze circuit with many resistors
- Find nodes/junction where three or more wires come together
- Identify branches, paths from one node to the next
- Identify common nodes – connected by a bare wire (no resistor)
- Use $P_{in} = P_{out}$
- Use $I_{in} = I_{out}$
- Use V = IR, Ohm’s Law


4 Ω
6 Ω
24 V
24 Ω
8 Ω
24 Ω
Common