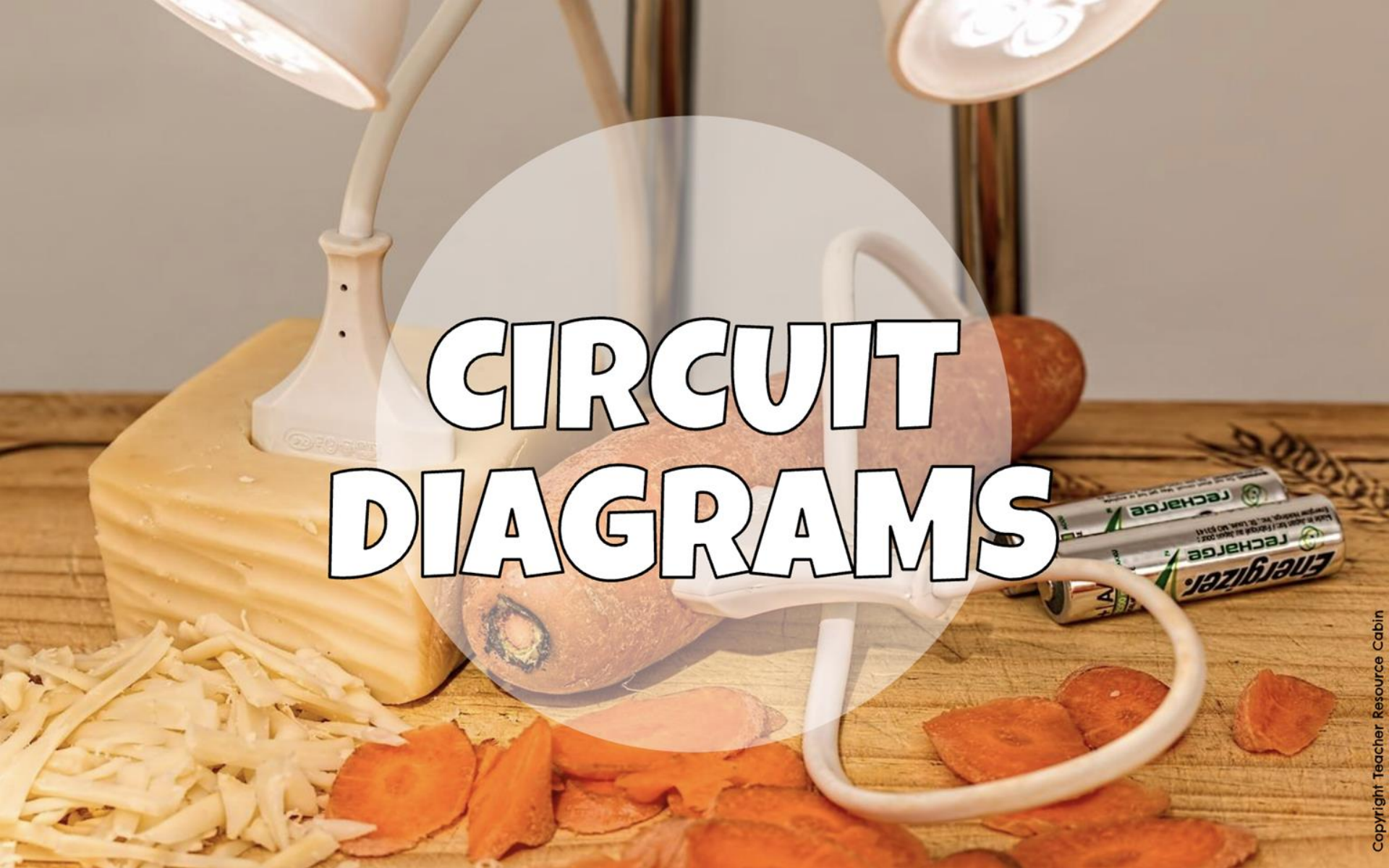


VOLTAGE AND CURRENT

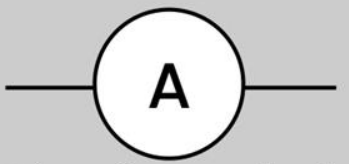
- Voltage is the force that pushes an electrical current (electrons).
- In most cases, voltage is **provided by a power source**.
  - Represented by letter V
- Higher voltage indicates a greater electrical force.
- Voltage is measured using a voltmeter.

Circuit Symbol:
Voltmeter

VOLTAGE AND CURRENT

- Current is the rate of electron flow or current in an electrical conductor.
- Measured in **amperes** or "amps".
  - Represented by letter A
- Electrical current is measured using an ammeter.

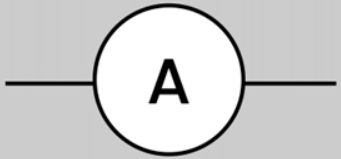
(Rouslan Nabioullin, CC BY-SA 4.0)



Circuit Symbol:
Ammeter

VOLTAGE AND CURRENT

Circuit Symbol:
Voltmeter

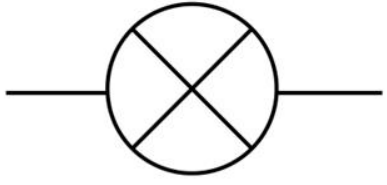


Circuit Symbol:
Ammeter

- Voltage provided by a source, like a battery, will attempt to make an electrical current.
- Electrical current is only possible with a complete circuit
- In a **direct current** (DC), the direction of the current is **always the same**.

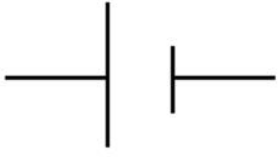
VOLTAGE AND CURRENT

- The following symbols are used in DC circuit diagrams:



Lamp

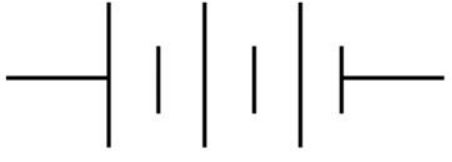
Resistor



One Cell

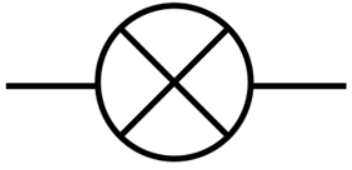
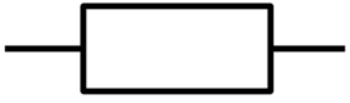
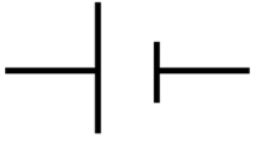
Switch (Open)

Switch (Closed)

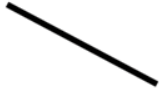
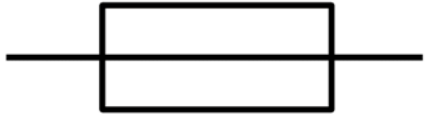


Three Cell Battery

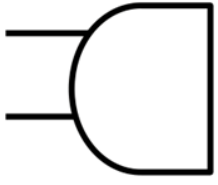
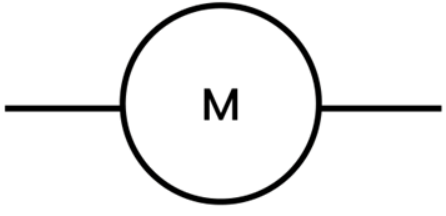
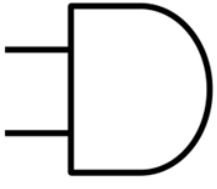
VOLTAGE AND CURRENT

Component	Drawing	Explanation
Lamp		A transducer which converts electrical energy to light
Resistor		A resistor restricts the flow of charge
One Cell		A single battery cell
Three Cell		A collection of battery cells (three)

VOLTAGE AND CURRENT

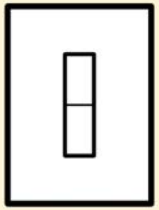
Component	Drawing	Explanation
Open Switch		A switch that is open
Closed Switch		A switch that is closed
Fuse		A safety device which will 'blow' (melt) if the current flowing through it exceeds a specified value

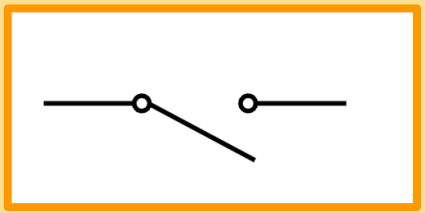
VOLTAGE AND CURRENT

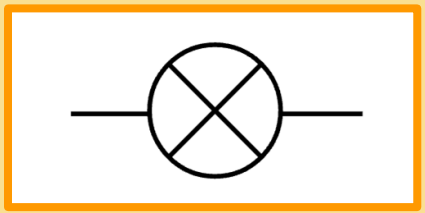
Component	Drawing	Explanation
Buzzer		A transducer which converts electrical energy to sound
Motor		A transducer which converts electrical energy to kinetic energy (motion)
Bell		A transducer which converts electrical energy to sound

Think about it!

Drag and drop each circuit symbol to the correct image.

Light bulb	Wire	Battery	Switch
			





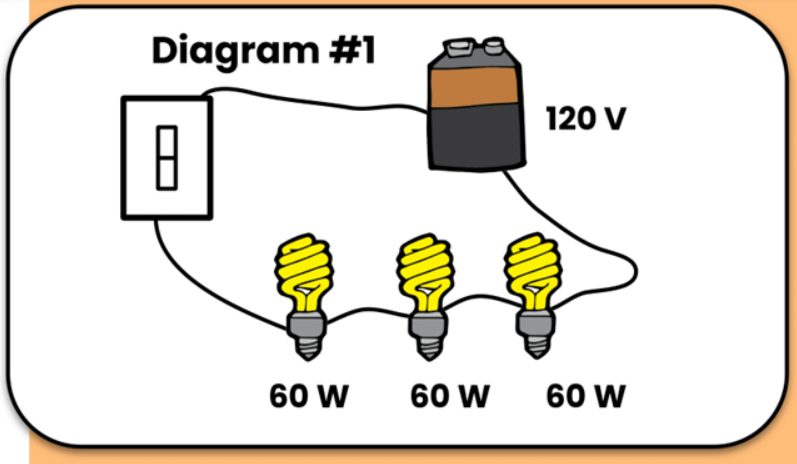
SERIES CIRCUITS: VOLTAGE AND CURRENT

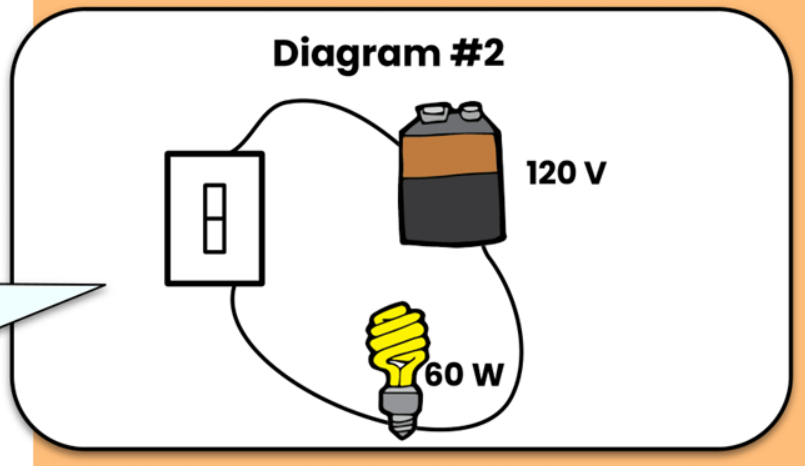
- In a **series circuit,** the resistance of the circuit will increase as the number of lamps in the circuit increases.
- A series circuit with only one lamp will receive the full voltage of the current flow.
    - However, as the number of lamps increase, so will the resistance of the current.

SERIES CIRCUITS: VOLTAGE AND CURRENT

- The circuit in Diagram #1 shows three 60 W lamps connected to 120 V.
- Since these lamps are in a series circuit, each lamp would only receive one-third of the electrical current.
- **Note**: This is only the case if the same lamps are used.

How would the brightness of the lights in Diagram #1 compare to Diagram #2?





VOLTAGE AND CURRENT

- Three factors affect the amount of flow in an electrical current:

1. The number of lamps or components in a circuit

2. The resistance of each component in a circuit

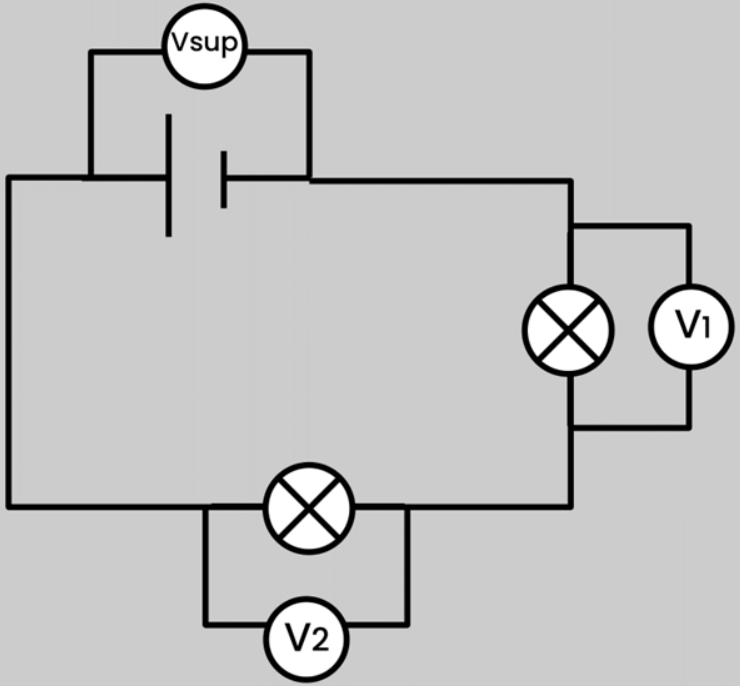
3. The number of cells (e.g. batteries) in a circuit

VOLTAGE AND CURRENT

- The **current** will always be the same in a circuit regardless of where the ammeter is attached.

- The **sum of the voltage** in each of the components of a circuit will **equal the voltage of the cell.**

$V_{sup} = V_1 + V_2$



VOLTAGE AND CURRENT

- The sum of the resistance of each component of a circuit will equal the total resistance of the circuit.

- The resistance of a component is measured using an ohmmeter.
    - An ohmmeter is an instrument for indicating resistance in ohms directly.

R_{total} (Total Resistance) = $R_1 + R_2$....

Ω

Ohm Symbol

An analog ohmmeter

? ? ?

What is an ohmmeter?

How can a current's total flow be determined?

Ω

Ohm Symbol