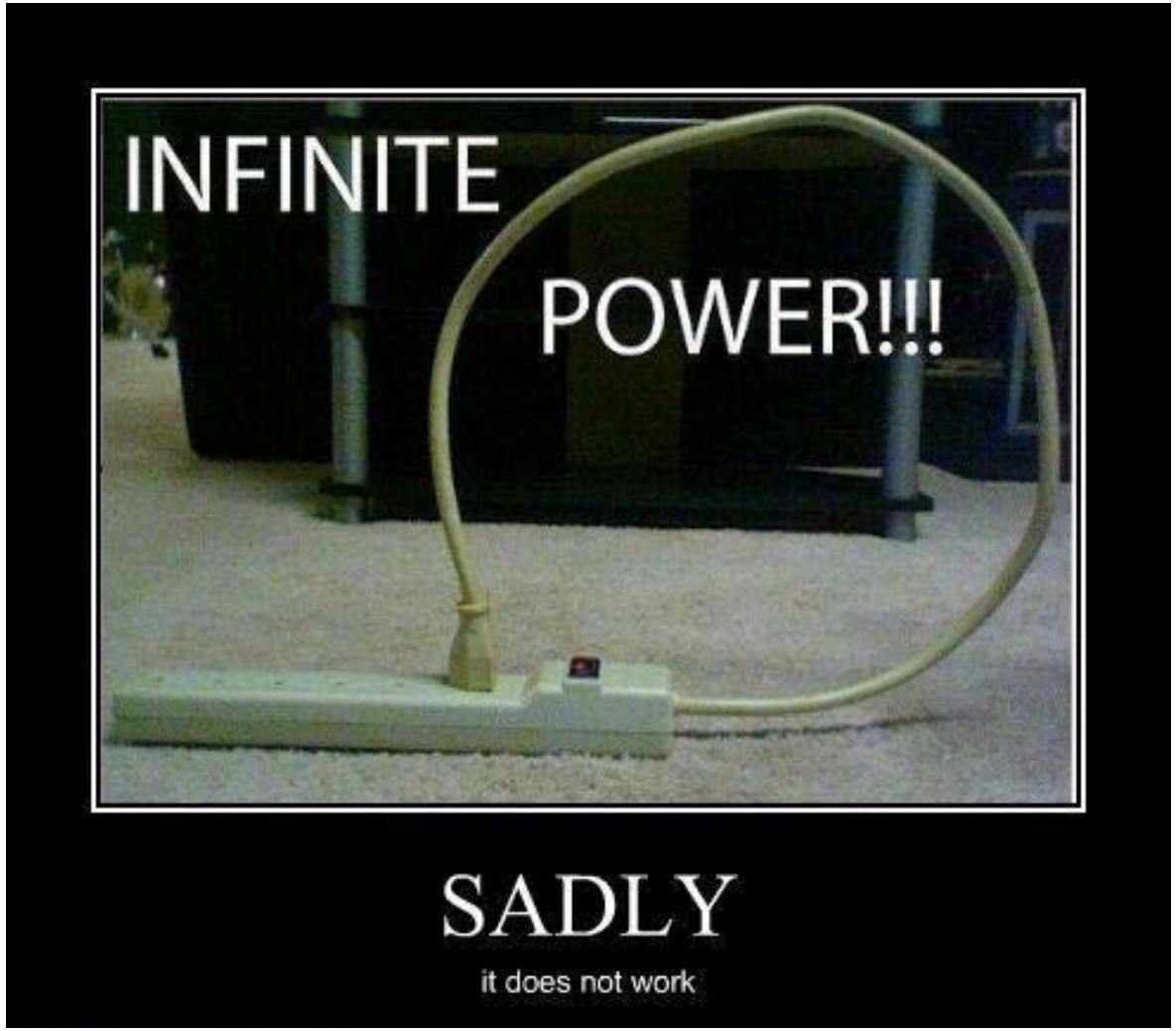
Diagramming Circuits



S1-3-14 Construct electric circuits using schematic diagrams. Include: series, parallel.

The Parts of an Electric Circuit…

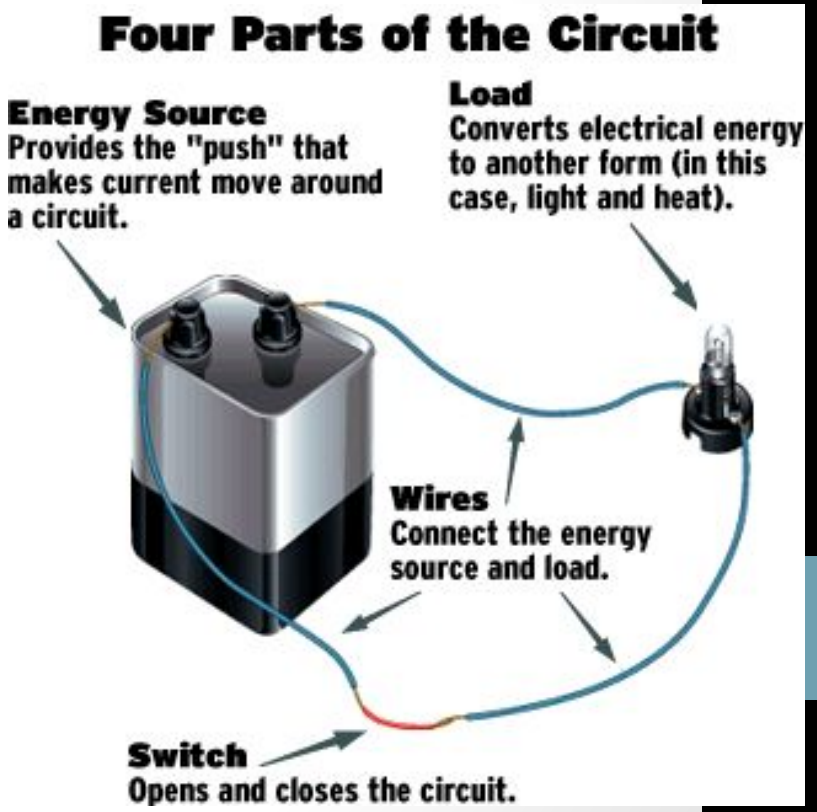
For current electricity to occur, we must have a **CIRCUIT** - a **PATHWAY** for electricity to **FLOW**.

1. **Energy Source:**
   - Place where the **CURRENT** comes from
   - **BATTERY**, **GENERATOR**, **TURBINE**, **WALL OUTLETS**, etc.

2. **Electrical Load:**
   - Anything that converts **ELECTRICAL ENERGY** into another form of **ENERGY**. → **RESISTORS**, **LIGHT BULBS**

3. **Control Device:**
   - - **SWITCHES**, **THERMOSTATS**, etc.

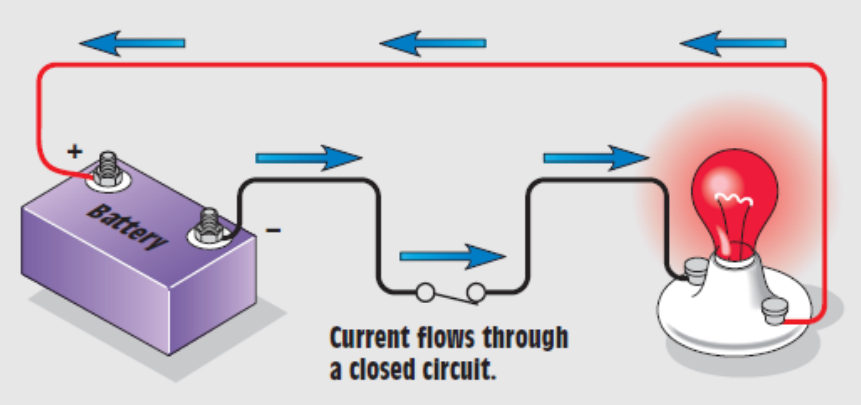
4. **Connectors:**
   - **WIRES**



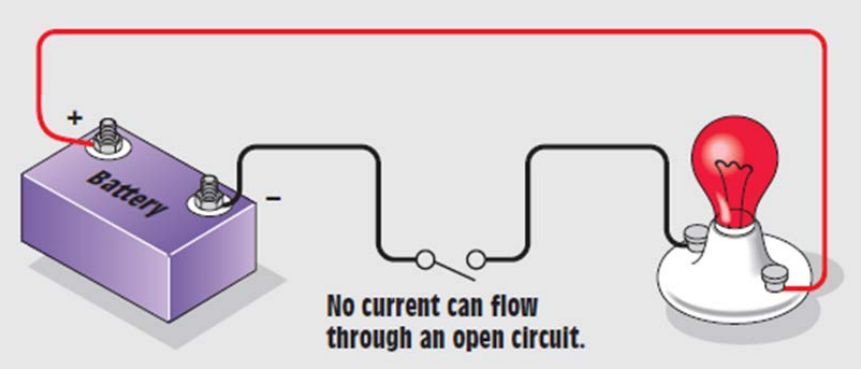
Circuits…

A circuit usually forms a "**LOOP**" from the **ENERGY SOURCE** through **WIRES** and back to the **POWER SOURCE** or to the **GROUND** A circuit can be:

- **CLOSED -** A circuit that is **OPERATING**, the **PATHWAY** is **COMPLETE**.



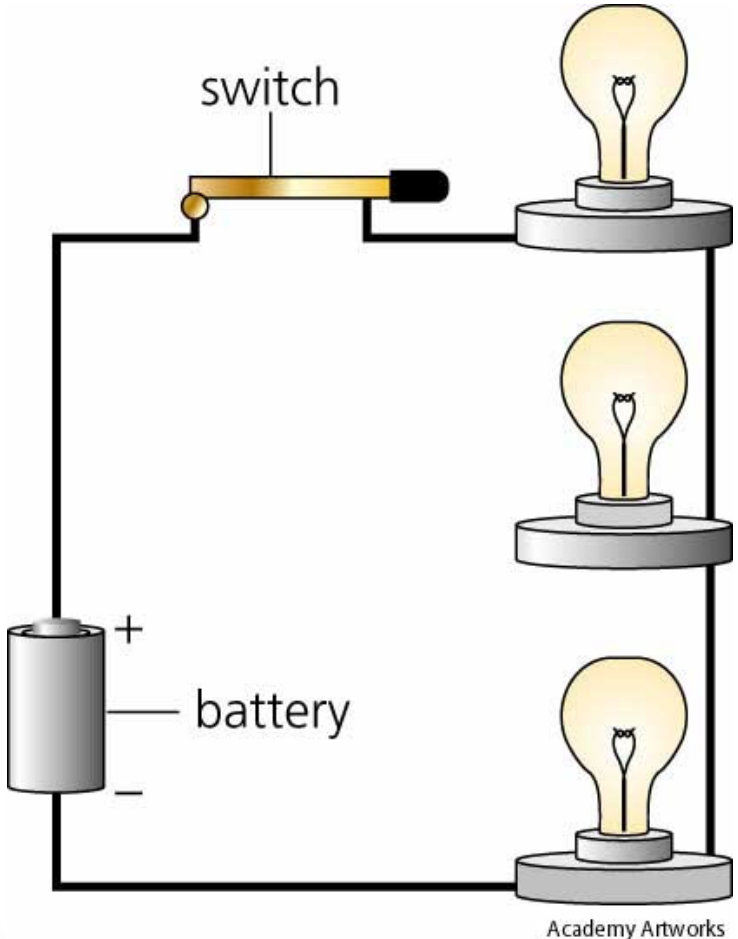
- **OPEN -** A circuit that is **NOT OPERATING**, the **PATHWAY** is **NOT COMPLETE**.



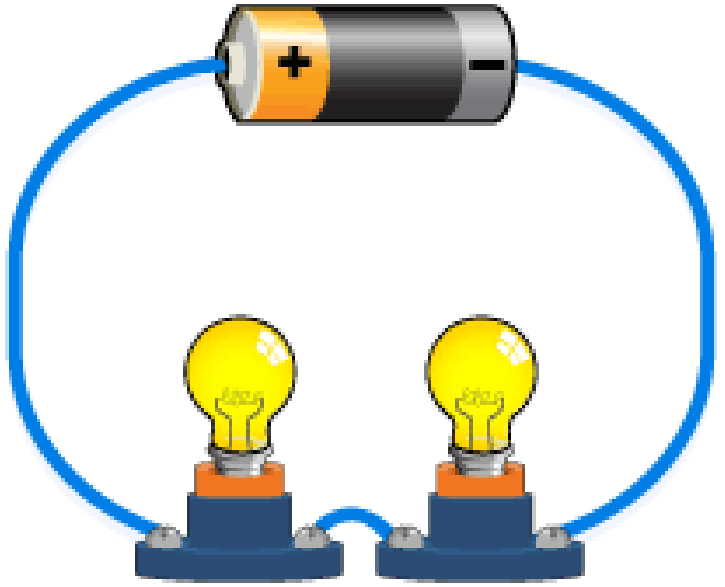
Types of Circuits…

There are two main types of circuits:

1. SERIES – Only **ONE PATHWAY** for electrons to flow.

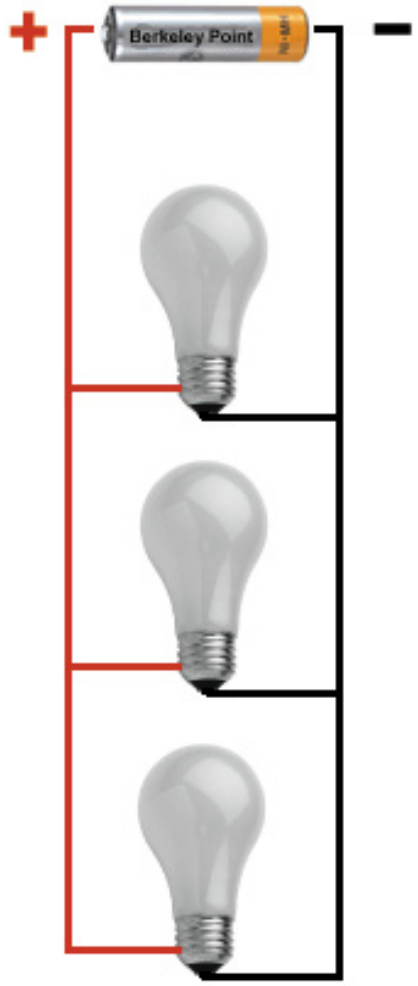


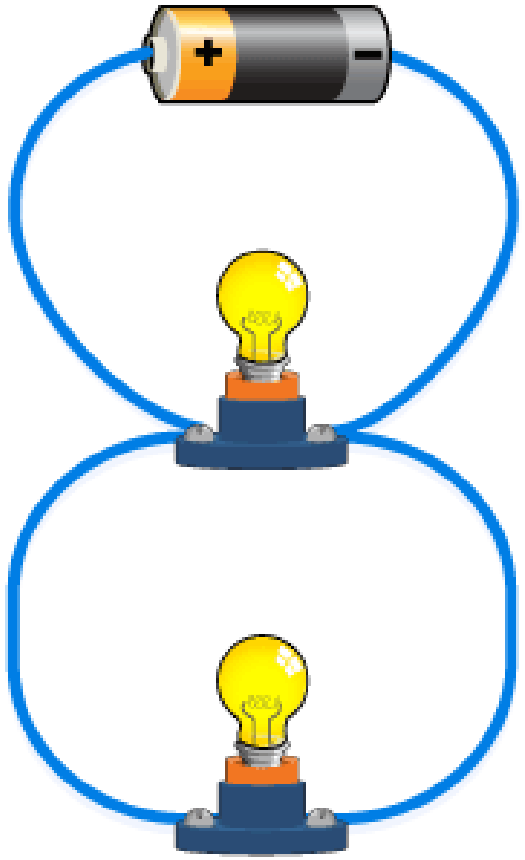
Academy Artworks



Types of Circuits…

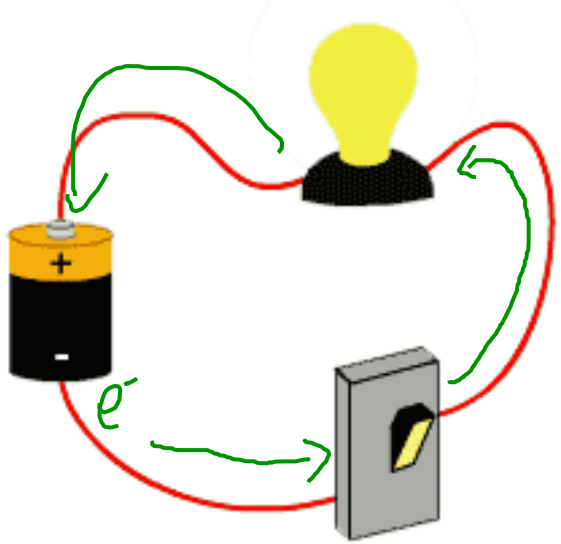
2. **PARALLEL** – **TWO** or **MORE PATHWAYS** for electrons to flow.

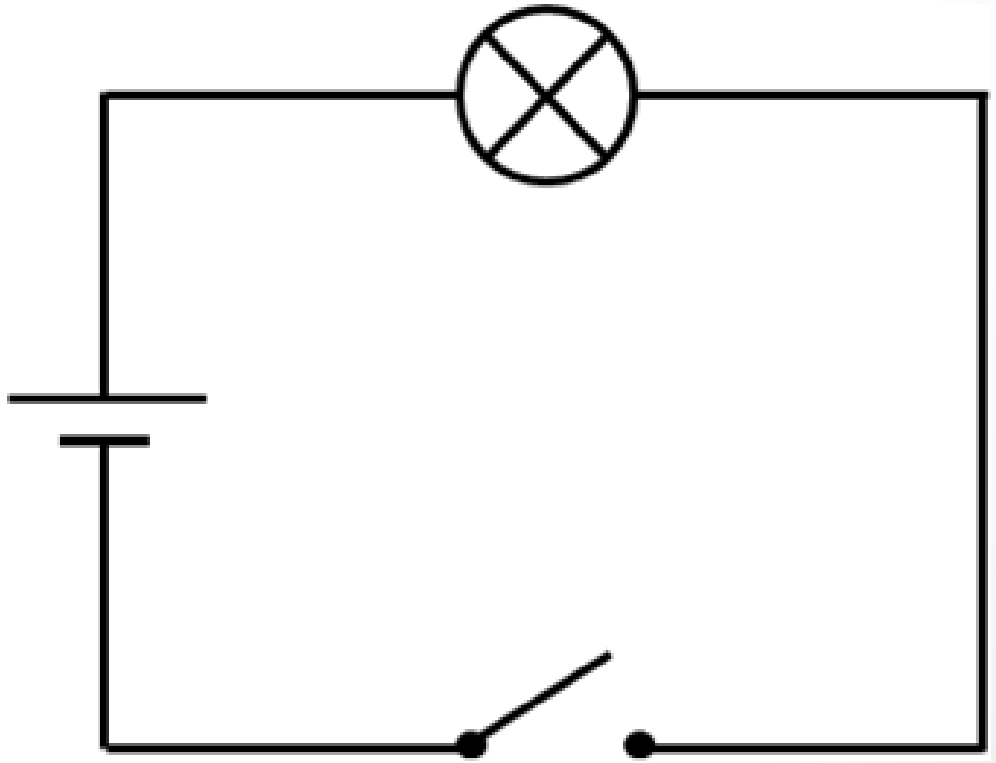




Rules for Drawing Circuit Diagrams…

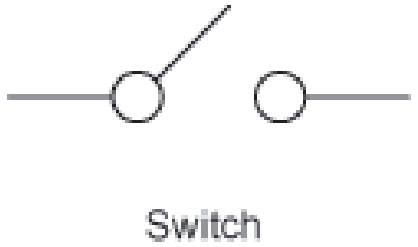
- Electrons **FLOW** from **NEGATIVE TO POSITIVE**.
- The **SWITCH** should be the **FIRST THING** that the electrons go through.
- **AMMETERS** (current) – are wired in **SERIES**.
- **VOLTMETERS** (pot. difference) – are wired in **PARALLEL**.
- **VOLTAGE RISE** = Voltage of the **CELL**,
- **VOLTAGE DROP** = Voltage across a **LOAD**



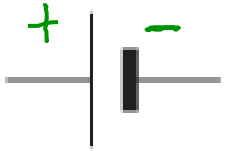


Circuit Schematic Diagrams…

Scientists and electricians have developed a standard method of drawing circuits using what are called **SCHEMATIC SYMBOLS**. The following are the major symbols you will encounter:

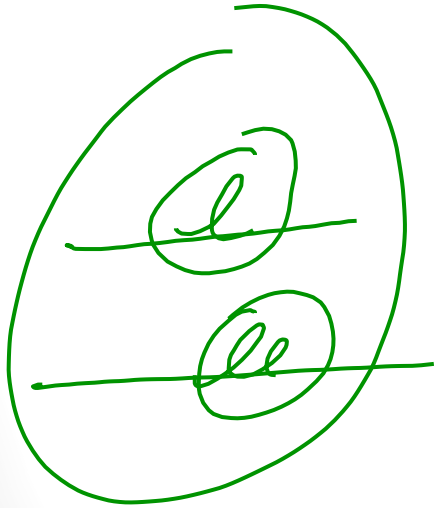


Switch

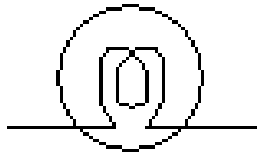


Cell

Battery



wire



Lamp

Voltmeter

Ammeter

Resistor

Motor

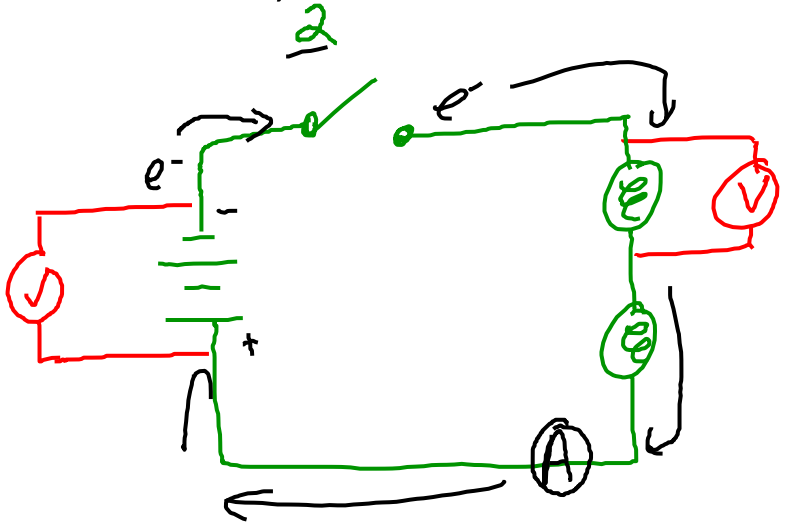
Circuits in Series…

- Electrons have only **ONE PATH** to flow (like a **RACE TRACK**).
- If there is a **BREAK** in the circuit, electrons will **NOT FLOW**.

Build and Draw the following circuit:

1 switch, 2 bulbs in series, ~~1~~ 2 cell.

4 wires



Now use a multimeter to measure the ***voltage rise***, ***voltage drop***, and the ***current*** of the circuit. Then draw the placement of the multimeter above.

V_{Rise} = 2.5 V

V_{Drop} = 1.1 V + V_{drop_2} = 1.34 V ≈ 2.44 V

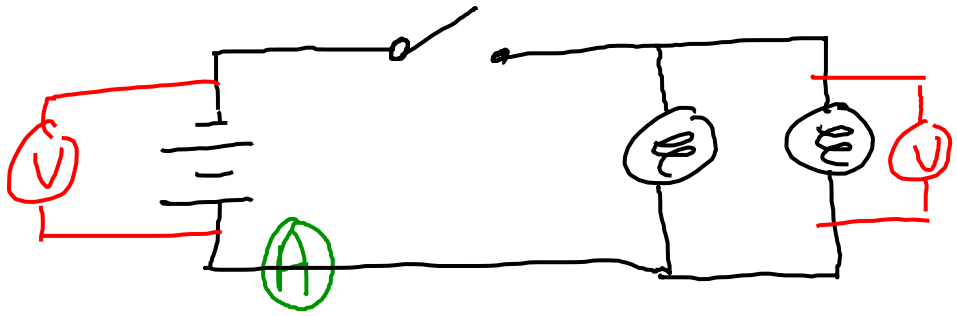
I = 0.2A

Circuits in Parallel…

- Electrons have **MORE THAN ONE** path to flow (like **CITY STREETS**).
- If there is a **BREAK** in the circuit, electrons **WILL CONTINUE** to **FLOW**.

Build and Draw the following circuit: 5 wires

1 switch, 2 bulbs in parallel, ~~1~~ 2 cell.



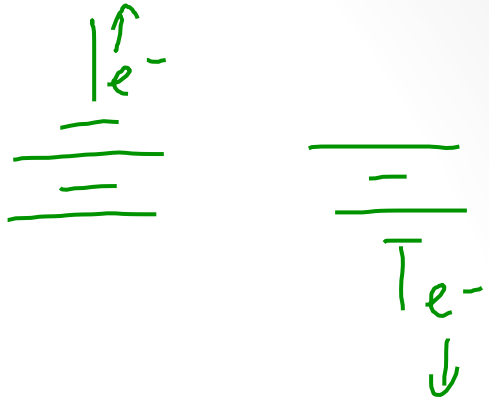
Now use a multimeter to measure the ***voltage rise***, ***voltage drop***, and the ***current*** of the circuit. Then draw the placement of the multimeter above.

V_{Rise} = 2.4 V

V_{Drop} = 2.11 V Vdrop₂ = 1.95 V

I = 0.59 A

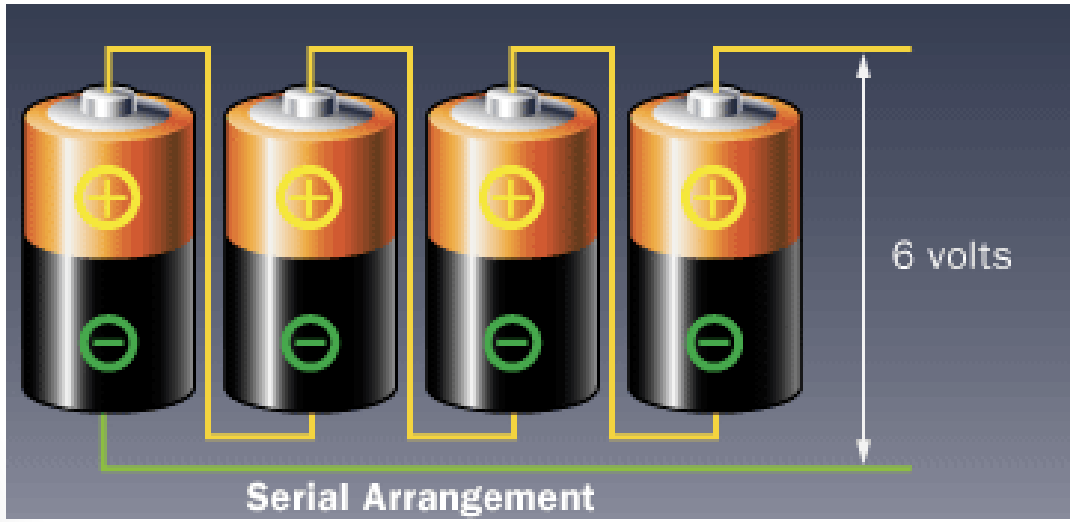
Cells in Series & Parallel…

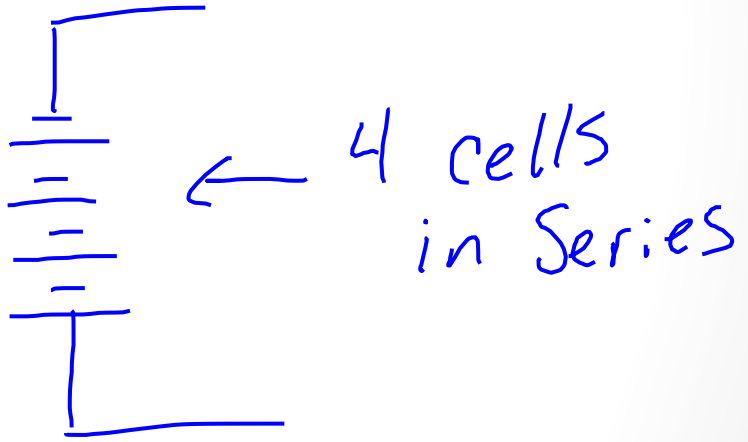


We can wire our **CELLS** in different ways.

Cells in Series:

- Cells wired in series gives an **INCREASED VOLTAGE**.
- **BATTERIES** are made of different cells wired together in series.





Cells in Series & Parallel…

Cells in Parallel:

- Cells in **PARALLEL DO NOT** increase voltage.
- Cells in parallel **LAST MUCH LONGER** because **VOLTAGE** is **DIVIDED** between the **TWO** (or more) cells.