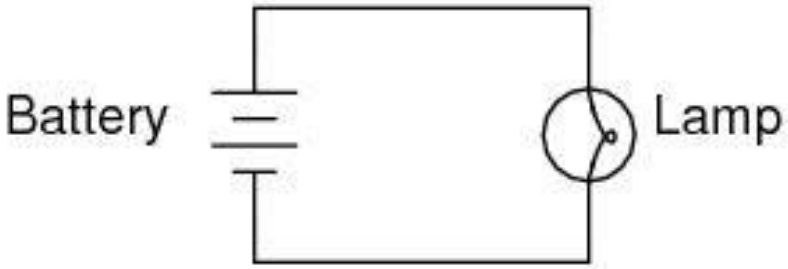
# Snap Circuits

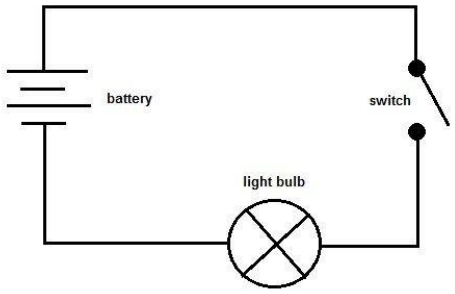
## Key Concepts:

*Energy can be transformed from one form to another or can be transferred from one location to another. - 4-PS3-2 Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electrical currents.*

- Electricity is the flow of **elections**
    - A subatomic particle (can be attached or free of an atom)
- Electricity can be naturally occurring (static electricity/lighting), or can be generated (wind and water turbines).
    - Electricity was not invented.
- An electric circuit is a path in which **electrons** from a voltage or current source flow.
- **Simple Circuit:**




- **Circuits must include:**
    - **Energy source:** The source of the energy that will power the load (battery, or power plant).
    - **Energy pathway:** This is the path on which the energy will travel (wire, or power cables).
    - **Load:** The item that is to be powered by the flow of electrons (lamp, fan, television).
- Switches can be added to a circuit to control the flow of electrons.




- Items are either **conductors** or **insulators**
    - **Conductors:** allow for the free flow of electrons, electricity can flow through conductors (most metals, salt water).
    - **Insulators:** do not allow electrons to flow freely, electricity is resisted (rubber, plastic).

# Snap Circuits:

**OVERVIEW:** Snap Circuits are easy to use, easy to construct circuits that allow for free exploration, direct instruction, or a combination of the two. Snap circuits come with an instruction book of various builds, and various loads (objects powered by the batteries), such as fans, lights, and sound chips. Snap circuits can be used in small group, or individual settings and are great to use as a station within the classroom. In addition to teaching simple circuit building concepts, Snap Circuits are an effective tool for teaching the **transformation of energy** (chemical-battery to electrical, electrical to sound/light/motion).

**Materials:** Per partner group

- Snap Circuit kit

(purchased at Amazon)

- Optional supplies:
    - items for testing conductivity (ex: paper clips, plastic spoon, foil, etc.)
    - blank peg board handout

**Introduction:**

- Introduce the Snap Circuits by going over the following.
    - How the pieces snap together
        - Allow students to practice with sample pieces before handing out the complete set.
    - The different pieces of equipment.
        - Fan, motor, sound chips, speaker, lights, switches, etc.
- The depth of this explanation should be dependent on the lesson's goals, in depth or basic

**NOTE:** The follow are some example lesson structures as to how Snap Circuits can be used in the classroom. These lessons can be used individually, in combination, and in no specific order.

**Lesson: Free build (Exploration)**

- The students are encouraged to use what they have previously learned, or what they understand of circuits to use the Snap Circuit kit to build on their own.

- **No specific task or instructions are given** other than to build a functioning circuit.

- This will allow the students to think creatively as they make a complete circuit.
    - Troubleshooting why their plan has not worked
    - Communicating how they were able to complete the circuit
- Once the students have made a complete circuit (ex. The light has lit, or the fan/motor are working) they can draw a diagram of what they have put together.
    - Using either technical symbols, or their own illustrations.
- Allow time for groups to share and discuss what they built and their thought process while doing so.

**<u>Lesson:</u> Free Choice of Directions (Exploration and Explanation)**

- Similar to the free build lesson, this allows the students the freedom to explore the Snap Circuit kits without any direct/ specific instructions, the difference being that they can **free build using the instruction booklet**.
    - This will give the students the opportunity to practice reading diagrams (illustrations from booklet) in order to build a functioning circuit.
- Allow time for groups to share and discuss what they built (challenges of following directions, etc.)

- Have students apply what they have learned about circuits to explain each part of the circuit, and how it works.

**<u>Lesson:</u> Assigned Directions (Explanation)**

- In this case the students are given a **specific set of instructions** to follow and build from. Ex. "Build Project number 23."
  - This allows for a common experience/build of which to discuss as a class (challenges of following directions, the parts of the circuit, etc.)

**<u>Lesson:</u> Problem Solving (Evaluation)**

- The teacher will set up a circuit (own design, or from instruction booklet) but with a flaw, or flaws that do not allow for the circuit to operate correctly.
  - For example: missing part of the pathway, dead batteries, batteries in incorrectly, or a switch placed incorrectly ( ON is *off*, OFF is *on*)
- Students are then given the task to find the flaw, and make the circuit operational.
  - Students will then write up how they found and corrected the issue.
    - Allow time for groups to share and discuss.
    - **<u>A variation of this plan.</u>**
  - Students build flawed circuits, and exchange with other groups to find/correct the issue.

**<u>Lesson:</u> Free build with an Assigned Task (Exploration, Explanation, Evaluation)**

- Students will be tasked to build a circuit (without using the instruction book) that meets certain requirements.
    - "Build a circuit with a fan that is controlled by a switch."
    - "Build an open circuit that can be used to test the conductivity of an item." *see attached plan outline for more specifics*
- This will allow the students to think creatively as they make a complete circuit.
    - Troubleshooting why their plan has not worked
    - Communicating how they were able to complete the circuit
- Once the students have made a complete circuit (ex. The light has lit, or the fan/motor are working) they can draw a diagram of what they have put together.

- Using either technical symbols, or their own illustrations.

- Allow time for groups to share and discuss what they built and their thought process while doing so.
    - Evaluate if their build meets the stated requirements.

**Lesson:** A closer look at **conductors** and **insulators**.

**Materials:**

- Snap circuits
- Various materials (insulators and conductors)

**Introduction:**

- Students will work with either a partner or in a small group.
- Today's lesson will help us understand that electricity cannot flow through all objects. Some allow electricity to flow through, others don't.

**Lesson:**

- Using either the snap circuits or the wires and bulb holders, students will build the following circuit.
- **Conductor vs. Insulator Investigation:**
    - Students will place various objects within the test material area of the diagram.
        - ■ Touch the wires to the test material. ■

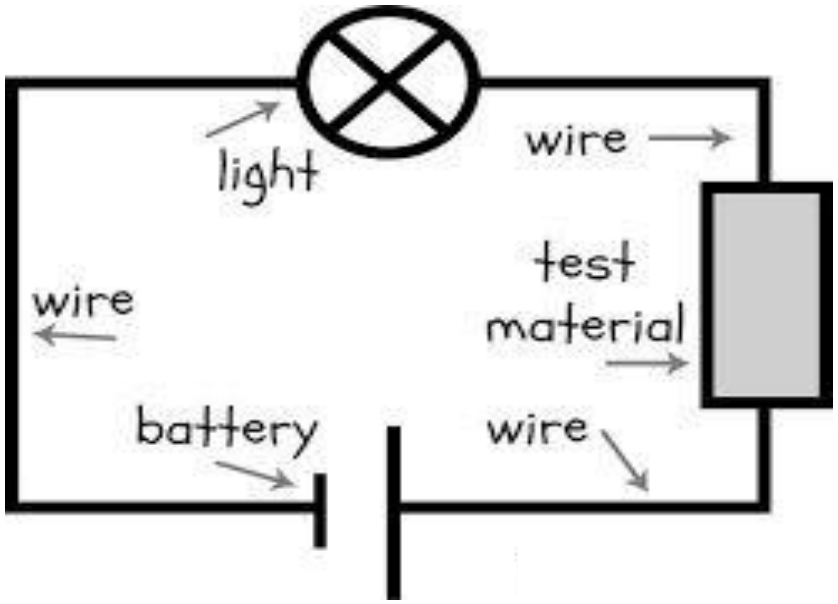
        Observe the result

        - **For example:** Did the bulb light when we placed a paperclip in the test area? Did the bulb light when we placed a rubber eraser in the test area?
- Predictions and Results are recorded on the investigation log.
    - Expectations:
        - Not everyone in the group has to have the same objects, All results must be recorded, Positive teamwork, etc.
    - Students then record one item on the "worked" and "didn't work" poster.

These posters will be used when introducing the vocabulary words: **conductors** and **insulators**.

*-Energy can be transformed from one form to another or can be transferred from one location to another.*
*-4-PS3-2 Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electrical currents.*

**Simple Instructions:**


light
wire
test
material
wire
battery
wire