Electricity - Grades 3-5

Nebraska Science Standards
5.2.3.d Identify ways to generate heat (friction, burning, incandescent light bulb)
5.2.3.e Identify materials that act as thermal conductors or insulators
5.2.3.f Recognize that the transfer of electricity in an electrical circuit requires a closed loop

Objective: The objective of this activity is to teach students about static electricity and the two types of electric circuits.

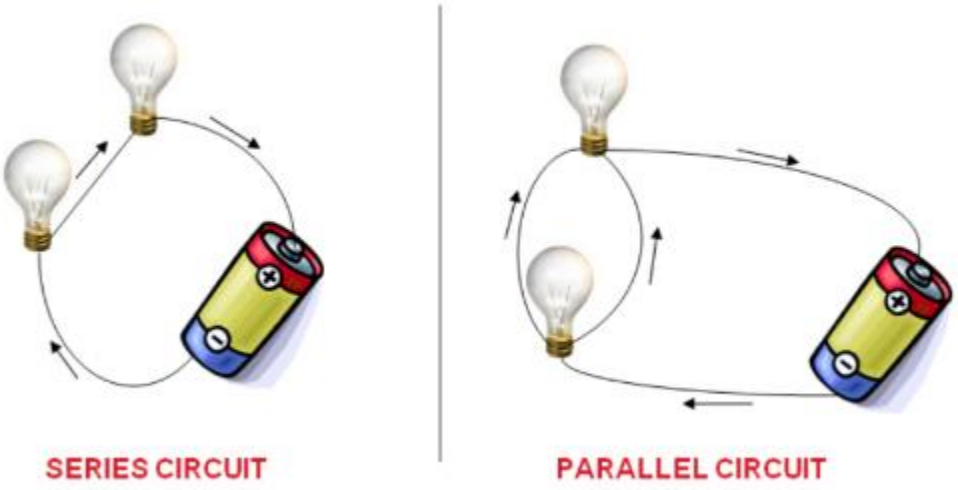
Materials (provided by CSM):

- Hard rubber, or plastic comb, or a balloon
- thread
- Small pieces of dry cereal (O-shapes, or puffed rice)
- Sink and water faucet.
- Salt,
- Pepper,
- Cloth or material that can create a strong static charge(preferably wool)
- String of Christmas lights
- Scissors or wire cutters (scissors work fine),
- 9V Batteries

Discussion:

- What are electrons
    - negative charge (attracted to positive charges)
- What is electricity?
    - Flow of electrons or negative charge
- What is an electric current?
    - Electrons that flows through a wire. To make the electrons flow an electric current needs a battery(source of power).
- What is an circuit
    - A path through which electrical current can flow.
- What are conductors and insulators
    - Insulators- in circuit more resistant materials that make it hard for electrons to pass through…example: plastic, rubber, glass, oil
    - Conductors-in circuit nonresistant materials that allow electrons to pass through easily…example:silver, gold, copper, iron
- What are the two types of circuits

- Series - the load, wires and battery or power source are in a single loop and there is only one path for the electrons to take back to the battery.
- Parallel- the elements are arranged in such a way as to provide multiple paths back to the battery.



- What is static electricity
    - imbalance of positive and negative charges due to friction. Static electricity is noticed usually in the winter months when the air tends to be very dry. During the summer, the air is more humid. The moisture in the air tends to move electrons off of us more quickly, so we cannot build up as big a static charge.
- What forms does electricity come in?
    - Nature-lighting (friction within rain clouds), shuffling shoes and shocking someone (bulds up a negative charge)
    - Conversion(transferring one type of stored energy into another type) CAUSES electricity – burning coal creates heat

Activity Description:

Students will conduct an experiment to visual learn about static electricity

EXPERIMENT 1 – Swinging Cereal

You Need:
hard rubber, or plastic comb, or a balloon
thread, small pieces of dry cereal (O-shapes, or puffed rice)

What to do:

1. Tie a piece of the cereal to one end of a 12 inch piece of thread. Find a place to attach the other end of the thread so that the cereal does not hand close to anything else. (You can tape the thread to the edge of a table but ask permission rst.)
2. Wash the comb to remove any oils and dry it well.
3. Charge the comb by running it through long, dry hair several times, or vigorously rub the comb on a wool sweater.
4. Slowly bring the comb near the cereal. It will swing to touch the comb. Hold it still until the cereal jumps away by itself.
5. Now try to touch the comb to the cereal again. It will move away as the comb approaches.
6. This project can also be done by substituting a balloon for the comb.

What happened: Combing your hair moved electrons from your hair to the comb. The comb had a negative static charge. The neutral cereal was attracted to it. When they touched, electrons slowly moved from the comb to the cereal. Now both objects had the same negative charge, and the cereal was repelled.

EXPERIMENT 2 – Bending Water

You need:
A hard rubber or plastic comb, or a balloon, sink and water faucet.

What to do:

1. Turn on the faucet so that the water runs out in a small, steady stream, about 1/8 inches thick.
2. Charge the comb or balloon by running it over long dry hair several times or rub it vigorously on a wool sweater.
3. Slowly bring the comb or balloon near the water and watch the water “bend.”

What happened:
The positive protons in the water molecules were attracted to the negatively charged comb or balloon and moved toward it.

EXPERIMENT 3 – Salt and Pepper

You need:
A Comb, Salt, Pepper, Cloth or material that can create a strong static charge, preferably wool, Inflated balloon (optional)

What to do:

1. Shake some salt onto a flat surface with a table cloth.

2. Shake some pepper over the salt.
3. Mix the salt and pepper together with your fingertips until there is an even mixture of salt and pepper.
4. Set your comb with a static charge by rubbing it against some cloth or your inflated balloon (if you have one).
5. With your comb charged slowly lower it above the salt and pepper mixture, teeth side down until it's about 1 inch away.
6. Like magic the pepper particles separate from the salt particles and cling to the comb!

What happened:
When the comb is rubbed against the cloth or balloon, it becomes negatively charged. The salt and pepper are both positively charged, which means they will form a natural attraction to the static from the comb. When the comb is slowly placed above the mixture, the pepper particles fly up and attract. Why do the pepper particles attract while the salt doesn't? Pepper particles are much lighter than the salt, so they're quicker to attract to the comb. If you were to bring the comb closer to the mixture, the heavier salt would eventually cling to it as well.

EXPERIMENT 3 – Christmas Lights

You Need:
String of Christmas lights, Scissors or wire cutters (scissors work fine), 9V Batteries

What to do:

1. Place one wire from the bulb holder at one end of the battery holder underneath the rubber band and tape the wire in place
2. Do the same thing with the other end of the battery holder

What Happened:
The wires, bulb and battery were all connected together in a single continuous loop. This allowed electricity to begin to flow through the wires from the battery, causing the bulb to light. Notice that there had to be a continuous loop for the electricity to flow. If you broke the loop at any point by separating the wires anywhere on the loop, electricity no longer flowed, and the light went go out.