COLLEGE OF SAINT MARY

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 types of electric circuits.

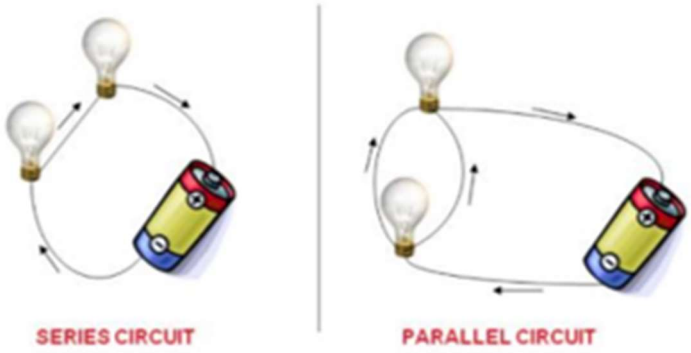
Materials (provided by CSM):

- Plastic comb or a balloon
- Thread
- Small pieces of dry cereal (O-shapes or puffed rice)
- Salt
- Pepper
- Wool or cloth that can create a strong static charge
- Scissors

Discussion:

- What are electrons?
  - Negatively charged particles that are attracted to positive charges
- What is electricity?
  - The flow of electrons or negatively charged particles
- What is an electric current?
  - Electrons that flow through a wire. To make the electrons flow, an electric current needs a battery or source of power
- What is a circuit?
  - A path through which electrical current can flow
- What are conductors and insulators?
  - Insulators that are in a circuit are more resistant to materials that make it hard for electrons to pass through (ie. Plastic, rubber, glass, oil)
  - Conductors that are in a circuit are not resistant to materials that allow electrons to pass through easily (ie. Silver, gold, copper, iron)
- What are the two types of circuits?
  - Series: the load, wires, and battery or power source 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?
  - An 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 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 (builds up a negative charge)
  - Conversion (transferring one type of stored energy into another type) – burning coal creates heat

Activity Description:

Students will conduct an experiment to visually observe and learn about static electricity

EXPERIMENT 1 – Swinging Cereal

You will need:

- Plastic comb or a balloon
- Wool or material that can create a strong static charge
- Thread
- Small pieces of dry cereal (O-shapes or puffed rice)

Procedure:

1. Tie a piece of 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 land close to anything else. (You can tape the thread to the edge of a table but ask permission first.)

2. Wash the comb to remove any oils and dry it well.

3. Charge the comb by vigorously rubbing the comb on a piece of wool.

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. *This project can also be done by substituting a balloon for the comb.

What happened: The electrons from the wool were able to move to the comb (balloon) which resulted in the comb having a negative static charge. The neutral cereal was attracted to it and 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 will need:

- A plastic comb or a balloon
- Wool or material that can create a strong static charge
- Sink and water faucet

Procedure:

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 rubbing it vigorously on a wool cloth

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 will need:

- A plastic comb
- Salt and pepper
- Wool or material that can create a strong static charge
- Paper plate
- Inflated balloon (optional)

Procedure:

1. Shake some salt onto a paper plate placed on a flat surface. Shake some pepper over the salt and mix the salt and pepper together with your fingertips until there is an even mixture of salt and pepper.

2. Set your comb with a static charge by rubbing it against wool cloth or your inflated balloon (if you have one).

3. With your comb charged, slowly lower it above the salt and pepper mixture, teeth side down until it's about 1 inch away.

4. 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.