Turning Fruit into Power – Exploring Energy with a Lemon Battery

Florida State Standard: SC.4.P.10.1 - Observe and describe some basic forms of energy, including light, heat, sound, electrical, and the energy of motion.

Materials Required:

- Lemons (1 per group)
- Zinc-coated nails or galvanized nails
- Copper coins or copper wires
- Small LED lights
- Alligator clip wires
- Multimeter (optional, for voltage measurement)
- Safety goggles
- Gloves

Safety Precautions:

- Students must wear safety goggles and gloves during the experiment to avoid direct contact with the acidic lemon juice.
- Remind students not to consume the lemons after use, as they may be contaminated by the metals.
- Handle all materials carefully, especially when connecting wires to avoid accidental short circuits.
- Instruct students to avoid touching their faces or eyes during the experiment, and to wash hands thoroughly afterward.

Procedure:

1. **Set Up:** Divide students into small groups and provide each group with a lemon, a zinc-coated nail, a copper coin, and connecting wires.
2. **Inserting Electrodes:** Carefully insert the zinc-coated nail and the copper coin into the lemon, ensuring that the two metals do not touch inside the lemon.
3. **Connecting to LED:** Use alligator clip wires to connect the zinc nail to the negative side of the LED and the copper coin to the positive side of the LED. Observe if the LED lights up.
4. **Measuring Voltage (Optional):** If available, connect a multimeter to measure the voltage produced by the lemon battery. A reading of around 0.7–0.9 volts is typical.
5. **Series Connection for More Power:** If a single lemon does not light up the LED, instruct students to connect two or more lemons in series by connecting the zinc of one lemon to the copper of the next. This increases the voltage, making it possible to light the LED.

Note 1: Clean Up

After the experiment, dispose of any lemon remnants in the trash. Ensure all metals (nails and coins) are thoroughly rinsed and dried before storage to prevent corrosion. Remind students to wash their hands with soap and water to remove any residual lemon juice or metal traces. Check that all materials are accounted for and properly stored for future use.