

Title: Paper Circuit with Optional Light Saber Addition

Objective:

Students will learn how to create a simple circuit using copper tape, a coin cell battery, and an LED to understand basic electrical conductivity. They will also have the option to add a "light saber" by placing a milkshake straw over the LED.

Materials (Per Student/Group):

- 1 piece of cardstock or thick paper
 - Copper tape (with conductive adhesive)
 - 1 coin cell battery (3V, such as CR2032)
 - 1 LED (any color, preferably a diffused LED)
 - 1 binder clip or small piece of tape
 - Scissors
 - Pencil
 - Ruler
 - Clear tape
 - Optional: Milkshake straw (for light saber effect)
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Step-by-Step Instructions:

Step 1: Design the Circuit Path

1. Place the cardstock in front of you.
2. Using a pencil and ruler, draw a **rectangle or pathway** where your circuit will go. This will help plan the placement of the copper tape, LED, and battery.
3. Mark the **positive (+) and negative (-) sides** of the circuit where the LED and battery will connect.

Step 2: Apply the Copper Tape

4. Apply copper tape along the pencil-marked lines to create a complete circuit pathway.
5. Make sure the copper tape does not break. If you need to turn a corner, **fold the tape at a 45-degree angle** instead of cutting it to maintain conductivity.

Step 3: Attach the LED

6. Identify the **long leg** (positive) and **short leg** (negative) of the LED.

7. Position the LED so that its long leg touches the positive copper tape and the short leg touches the negative copper tape.
8. Secure the LED legs to the copper tape using small pieces of copper tape.

Step 4: Add the Battery

9. Place the **coin cell battery** on the circuit, ensuring that the **positive (+) side of the battery faces the positive copper tape** and the **negative (-) side faces the negative copper tape**.
10. Secure the battery with a binder clip or tape to hold it in place.

Step 5: Test the Circuit

11. Press down on the battery to complete the circuit. If everything is connected correctly, the LED should light up.
12. If the LED does not light up:
 - Ensure the LED legs are firmly attached to the copper tape.
 - Check for any breaks or gaps in the copper tape.
 - Make sure the battery is positioned correctly.

Optional: Add a Light Saber Effect

13. Slide a **milkshake straw** over the LED to diffuse the light and create a "light saber" effect.
14. If the straw is too loose, use a small piece of tape to secure it.

Step 6: Final Adjustments

15. Once the circuit is working, students can decorate their cardstock with drawings or themes related to their light saber or circuit design.