



## STEM @ HOME GUIDE GLOWING ROBOT NAME TAGS

- **Aim:** To create a circuit on paper to light up the robot in the name tags.
- **Materials required:**
  - ✓ LED
  - ✓ Copper tape
  - ✓ 3V coin battery
  - ✓ Paper circuit template (if possible, print on thicker paper like cardstock for better results)
  - ✓ Paper clips
  - ✓ \*Tape
  - ✓ \*Scissors
  - ✓ \*Hole punch or pen

\*These materials are not provided in the kit. Gather these materials from home.

- **Questions to think about before you start:**
  - ✓ Do you think you can make an electrical circuit on paper?
  - ✓ Does copper tape conduct electricity?
- **Instructions:**

Make sure to perform the experiment as a team (parent and student). Please read the instructions out loud.

**Parents:** before you start make sure your LED is working simply slide the battery through the LED prongs, it should light up.

### A. Make the name tag

**Step 1 - Student:** Fold the paper from the center along the double dotted lines so that the circuit and the robot are on outer sides. The side with the robot is the front.

**Step 2 - Student:** Write your name in the bubble and color your robot.

### B. Add the LED

**Step 3 – Student:** On the circuit side fold the bottom of the sheet along the dashed line upward.

**Step 4 - Student:** Use a hole punch/ pen to make a small hole through the light on top of the robot and through the dotted circle.

**Step 5- Parent:** Bend the LED prongs so they sit flat along the paper with the longer one extending upward toward the “+” sign and the shorter one going down toward the “-” sign along the gray line.

**Step 6- Student:** Secure the legs of LED light using small pieces of copper tape (use scissors to cut it). Make sure the two pieces do NOT connect! Stick pieces of cut copper tape along the guidelines. [It works best to peel off one small piece of the backing at a time.] Make sure the pieces of tape are the same length as the guiding lines. Be sure the tape connects in each corner.

### HELPFUL TIPS

Adult supervision is required, batteries are dangerous if swallowed.

The longer leg of LED is “+” and shorter leg is “-”.

Make sure to place copper tape on the solid lines only.

Secure the paper clip properly, Copper tape should touch the battery on both sides.



### **C. Complete the circuit**

**Step 7 - Student** Stick pieces of cut copper tape along the guidelines. [It works best to peel off one small piece of the backing at a time.] Make sure the pieces of tape are the same length as the guiding lines. Be sure the tape connects in each corner.

**Step 8 - Parent:** Place the battery on the circle with the “-” side facing down. It should sit on the copper tape that’s inside the battery circle. You can use some clear tape to hold the battery to the paper

**Step 9 - Student:** Fold the sheet over the battery and clip it with a paper clip. This completes the circuit and lights up the robot’s light.

**Troubleshooting:** Make sure the battery is resting on the copper tape on both sides of the circuit. It may help to use clear tape to attach the flap covering the battery to the name tag. Make sure the positive and negative ends of the battery and LED are in the right places. Remember the long end of the LED is positive and the shorter end is negative. Your battery should indicate which side is positive and negative.

- **The science behind the fun:**

Copper is a good conductor of electricity; this means electricity can easily move through copper. The copper tape connects the “+” side of the battery to the positive leg of the LED light, and the negative leg of the LED light to the “-” side of the battery. This forms a complete circuit and the electricity flows from battery to the LED and the LED turns on.

- **Real world application:**

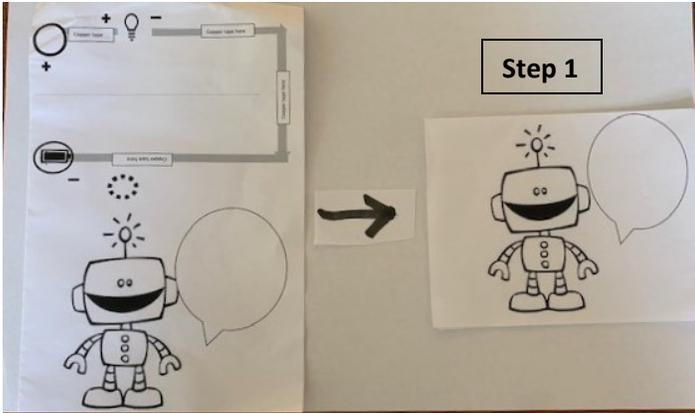
Many devices that we use every day require electricity. All of these contain electrical circuits. LEDs are also commonly used in decorative string lights, smartphone backlighting, parking garage lighting, walkway display boards in stores and roads. They are widely used in residential homes too because they are energy efficient, meaning they use less electricity than traditional lights.

- **Extension Questions:**

- ✓ What happens if you replace copper tape with clear tape?
- ✓ What happens if you flip over the battery? Do the same with the LED and find out what happens.
- ✓ Take some extra materials and try to make your own circuit!

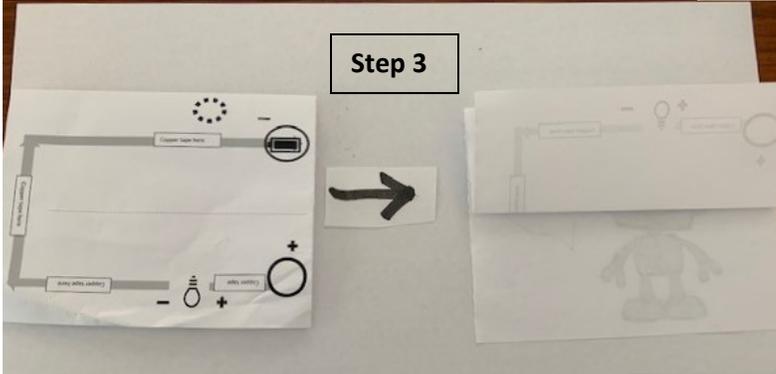
**Did you know?**

- Pure copper is a reddish orange, soft metal. Copper is used for making cooking utensils, wirings, motors, etc. in cars and trucks.
- LED stands for Light Emitting Diode.
- LEDs can be very small (smaller than 2 mm) and can be easily attached to circuit

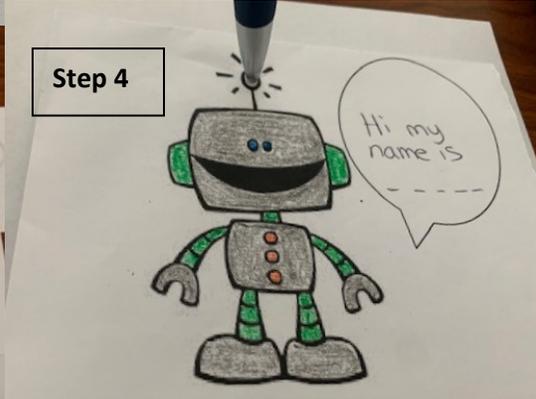


Step 1

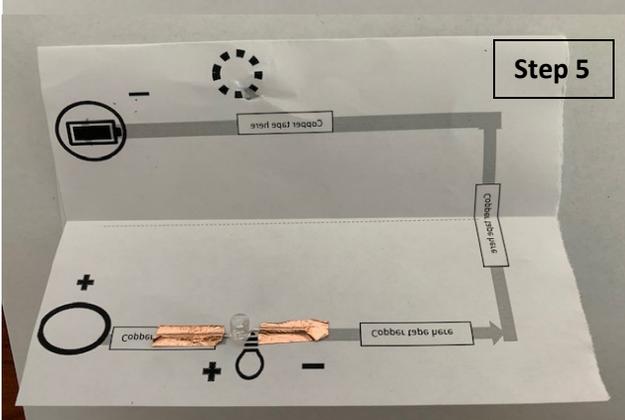
Step 2



Step 3



Step 4



Step 5

Step 6



Step 7



Step 8

