STEM 101
Powered by THE STEM ACADEMY

Name: _____
Period: _____

UNIT: ELECTRICAL CIRCUITS

LIGHT TRACKER BEACON

OBJECTIVE:

Build a working LED circuit that lights the way for your jungle rescue team at night! You'll model how electrical energy from a battery is transferred to light energy—and even reflect it across the terrain.

MATERIALS:

- ✓ Breadboard or small cardboard base
- ✓ 2 LED lights (any color)
- ✓ 1 battery (AA or 9V) + holder
- ✓ 2 resistors (330Ω or 100Ω)
- ✓ Jumper wires or foil strips
- ✓ Switch (or a homemade pressure switch using foil)
- ✓ Small mirror or aluminum foil sheet

STUDENT DIRECTIONS:

Step 1: Understand the Flow
Look at your battery. It stores chemical potential energy. When you connect it to a circuit, that energy turns into electrical energy, which powers your LED (which emits light energy).

Step 2: Set Up Your Power

1. Place your battery into the holder.
2. Connect a red wire from the positive terminal of the battery holder to your breadboard or foil path.
3. Connect a black wire from the negative terminal to a different area on your board (or second foil strip). This sets your circuit's main power path.

Step 3: Place the LEDs

1. Look at each LED. One leg is longer (positive or anode), and one is shorter (negative or cathode).
2. Place the LEDs into the breadboard (or tape them onto cardboard with foil). Make sure:
    a. The positive leg connects toward the red wire/power.
    b. The negative leg connects toward the black wire/ground.

Name: _____
Period: _____

Step 4: Add the Resistors

1. Connect a resistor in front of each LED to prevent it from burning out.
2. Resistors can go between the power wire and the LED's positive leg, or between the LED's negative leg and the ground wire.
    a. Example: Battery (+) → Resistor → LED → Wire → Battery (–)

Step 5: Add a Switch

1. You can use a push-button switch or make your own with two foil pieces and a sponge.
2. Put the switch between the battery and the rest of the circuit. This way, when the switch is pressed or touched, the circuit closes and turns on the LEDs.

Step 6: Aim and Reflect

1. Use a mirror or piece of foil to reflect the LED light across your "rescue zone."
2. Try angling the mirror to flash light in specific directions—like an SOS signal.

Test & Record:

1. Do both LEDs light up?
2. What happens when you cover one LED?
3. Try using a stronger resistor (like 1,000Ω). What changes about the brightness?

Write your answers below:

→ _____

→ _____

→ _____

Reflection Prompts:

1. How does energy travel from the battery to the light? Think about each part the energy flows through.

    _____

    _____

2. Why is resistance important in a circuit? What would happen without a resistor?

    _____

    _____

3. In a real jungle rescue, how would a system like this help your team?

_____

_____

Optional Challenge:

- Can you modify your circuit to make only one LED light at a time? *(Hint: Try adding a second switch!)*

STANDARDS ALIGNMENT

NGSS: MS-PS3-2 **STEL:** STEL 1B, STEL 2B, STEL 3B, STEL 4B, STEL 6B, STEL 7B **CCSS:** CCSS.MATH.CONTENT.6.EE.A.2, CCSS.MATH.CONTENT.6.RP.A.1, CCSS.MATH.CONTENT.7.EE.B.3, CCSS.MATH.CONTENT.6.SP.B.5, CCSS.MATH.PRACTICE.MP2, CCSS.MATH.PRACTICE.MP4, CCSS.MATH.PRACTICE.MP5