UNIT: CIRCUITRY GAME

ACT-Based Science: LED Circuit Brightness Experiment

### Here are ACT-aligned science activities for the **Build Your Own Circuitry Game** that help students engage in real-world scientific practices such as experimental analysis, data interpretation, and variable testing related to voltage, current, and resistance in circuit design.

### Objective:

Students analyze how resistance affects LED brightness.

MATERIALS NEEDED:

* LEDs
* Resistors
* Breadboard
* Worksheet

Student Directions:

**Goal:**  
You will build multiple LED circuits using different resistor values to investigate how resistance affects the brightness of an LED. This experiment will help you apply real-world scientific skills like controlling variables, collecting data, and interpreting patterns—just like on the ACT Science test.

**Step 1: Gather Materials and Prepare Your Workspace**

* Collect your **LEDs, resistors (use at least three values, such as 100Ω, 330Ω, 1kΩ), breadboard, and wires**.
* Make sure your power source is ready (e.g., a 9V battery or power supply).
* Use the worksheet to record your setup and results.

**Step 2: Build Your First LED Circuit**

* Insert an LED into the breadboard. Connect the longer leg (anode) to the positive rail.
* Add a **resistor in series** with the LED on the breadboard.
* Connect the circuit to the power source, completing the path from positive to negative.

**Step 3: Observe and Record LED Brightness**

* Turn on the power and observe the **brightness** of the LED.
* On the worksheet, describe the brightness level (e.g., bright, dim, very dim).
* Record the **resistor value** used in ohms (Ω).

| **Trial** | **Resistor (Ω)** | **Brightness Level** | **Notes** |
| --- | --- | --- | --- |
| 1 | 100 | Bright | LED shines clearly |
| 2 | 330 | Medium | Slightly dimmer |
| 3 | 1,000 | Dim | Barely lights up |

**Step 4: Repeat with Different Resistors**

* Remove the resistor and replace it with a new one of a different value.
* Keep all other circuit parts the same.
* Repeat steps 2 and 3 for each resistor.
* Record your observations on the worksheet.

**Step 5: Analyze and Explain**

* Review your data. What pattern do you notice between resistance and brightness?
* On your worksheet, answer:
  + What happens to the brightness when resistance increases?
  + Why does this happen in terms of **current flow**? (Hint: Ohm’s Law – more resistance = less current)

**Step 6: Reflect and Conclude**

* Write a short conclusion paragraph:
  + What did you learn about the relationship between resistance and LED performance?
  + How can this information help in designing a real circuit, such as a game board or warning light?

## ACT-Style Question:

## How does increasing resistance affect LED brightness?

## Increases brightness

## Decreases brightness

## No effect

## Random effect

## **Why These Activities and Questions Matter**

By engaging in science-based activities connected to the **Build Your Own Circuitry Game**, students:

✅ Practice interpreting experimental data from circuit tests, including voltage, current, and resistance readings.  
✅ Strengthen their ability to analyze variables, make predictions, and draw conclusions from electrical experiments.  
✅ Develop scientific reasoning skills by designing circuits, testing hypotheses, and troubleshooting system performance.

These skills reflect the ACT Science section’s emphasis on **data representation, experimental analysis, and scientific inquiry**—helping students become confident, analytical thinkers ready for college-level science and STEM careers.