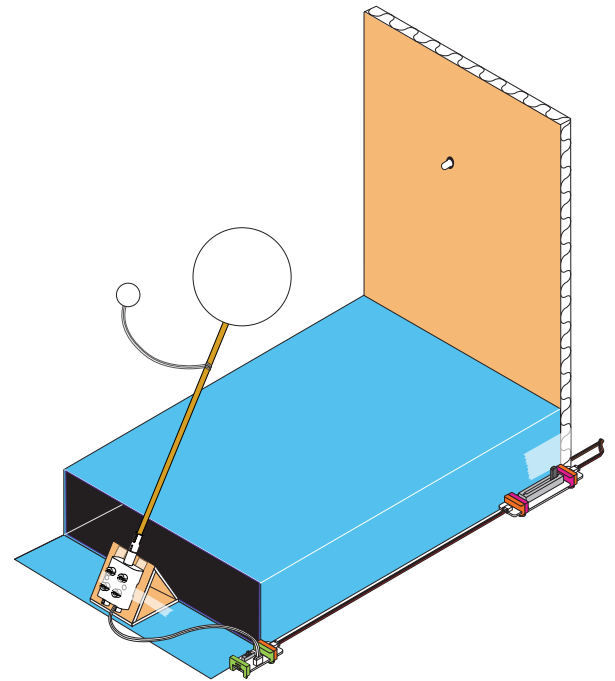


LUNAR PHASES



GUIDED

DESIGN CHALLENGE

Design a theater to model the sun-moon-Earth relationship.

EXPLORE

- Discuss with your group the following questions:
 - Why does the moon appear to be full or crescent at certain times?
 - What is the relationship between the sun and the moon during the month?
 - How could we design a model to show the cycle of the moon?

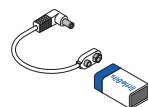
CREATE



CREATE

Let's build the circuit

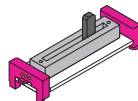
1. Gather your invention tools.



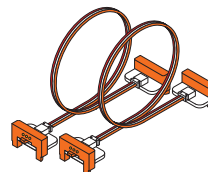
a1 battery & cable



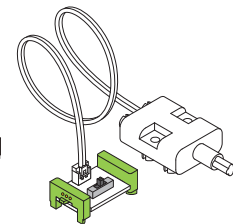
p4 power



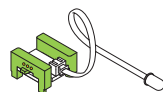
i5 slide dimmer



w1 wire (x2)



o25 DC motor



o2 long LED

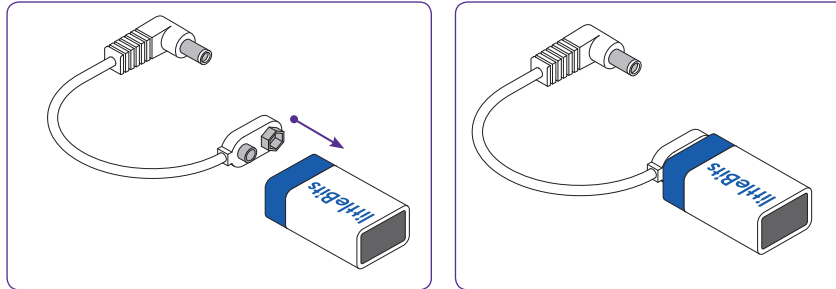


a10 motorMate

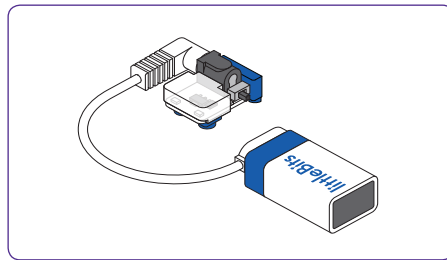
Other materials:

- 1 styrofoam ball "Earth" (3 inch diameter)
- 1 styrofoam ball "Moon" (1 inch diameter)
- 1 wood BBQ skewer
- 1 twist tie
- Scissors
- Corrugated cardboard cut to the size of a cereal box
- Masking tape
- Ruler
- Cereal boxes
- Optional: colored paper or paint

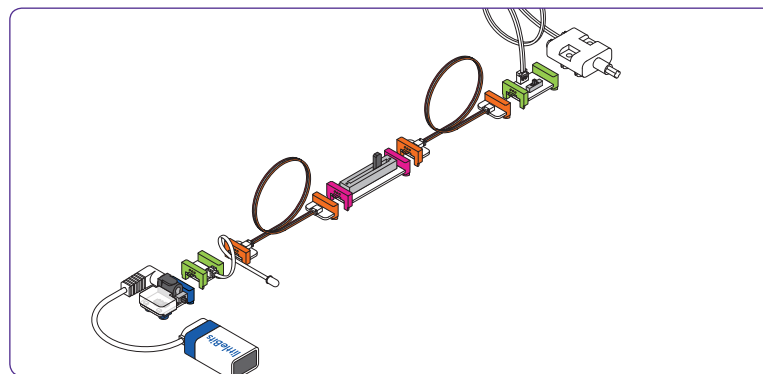
2. Attach the battery cable to the battery.



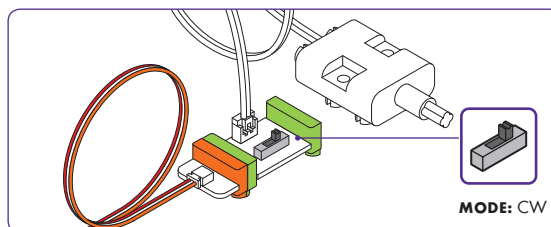
3. Attach the p4 power Bit to the battery cable assembly.



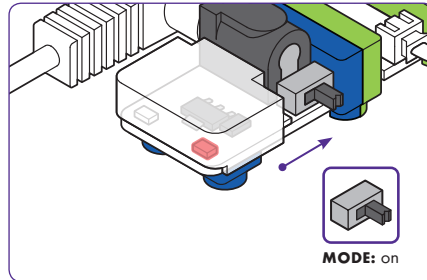
4. Snap this circuit together (power + long LED + wire + slide dimmer + wire + DC motor).



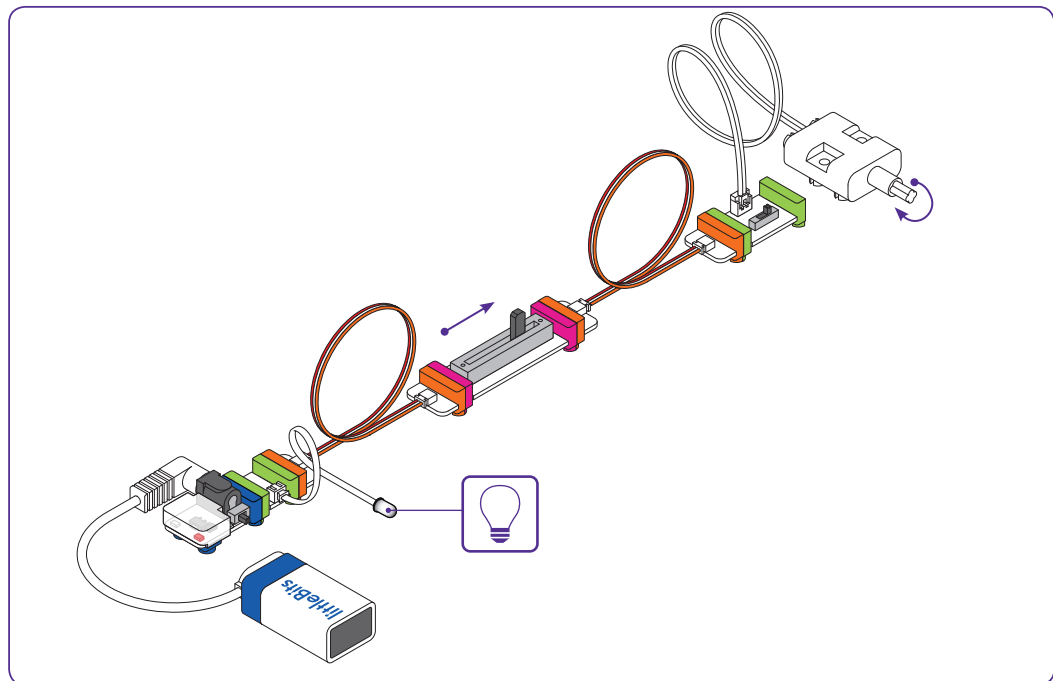
5. Set the DC motor to CW (clockwise).



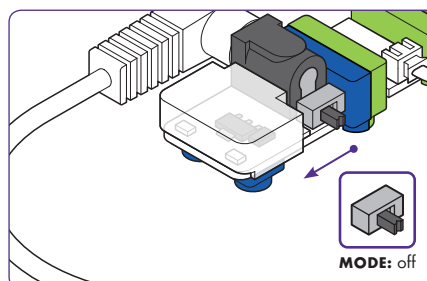
6. Let's test that your circuit works! Power on your circuit.



7. The long LED should light up. Slide the dimmer to the right and the DC motor shaft should spin.

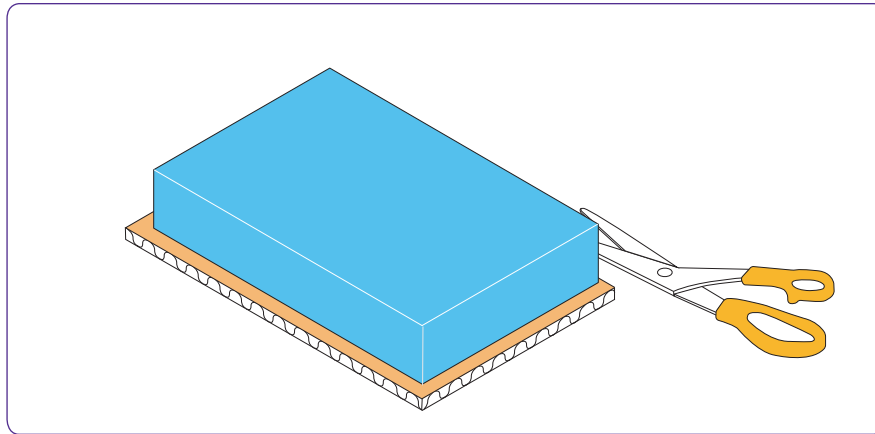


8. Power off your circuit.

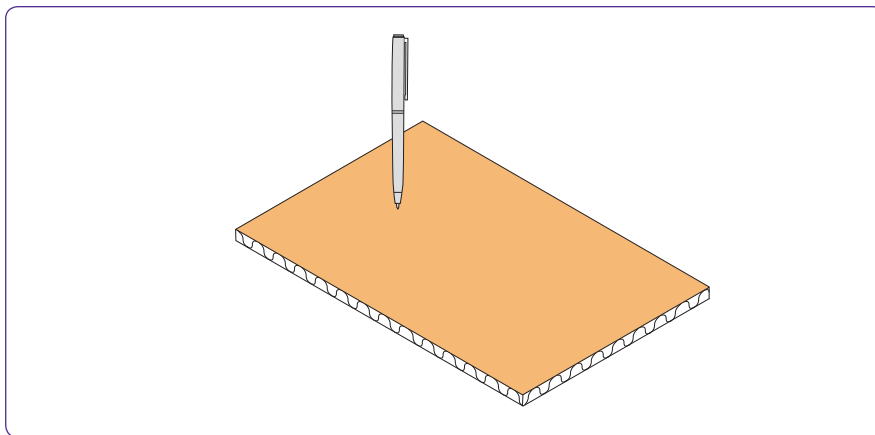


Let's build the theater

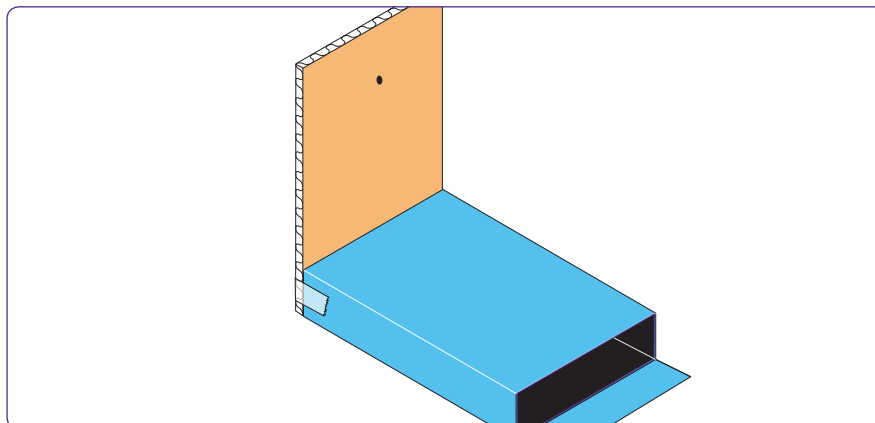
9. Cut out a piece of cardboard to the same size as the cereal box. This step can be done beforehand for student groups, if necessary.



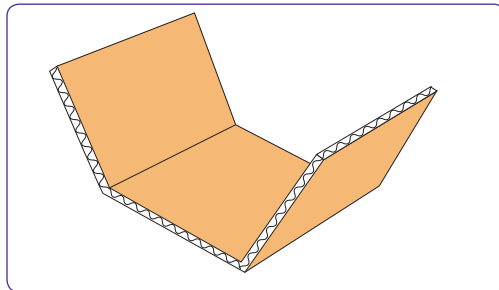
10. Poke a small hole in a cardboard backdrop, centered near the top.



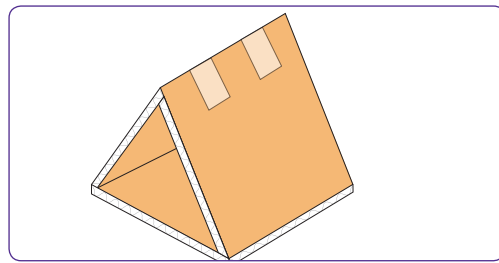
11. Using a cereal box as the base for your project, attach the closed end to the backdrop with tape.



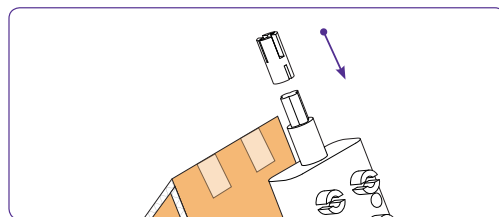
- 12.** Next we will build the mechanism that the Earth and moon models will spin on. First, we need to create a triangular piece of cardboard for the motor to rest on. Use a ruler to measure out a 6-inch x 2-inch piece of cardboard and cut it to size.



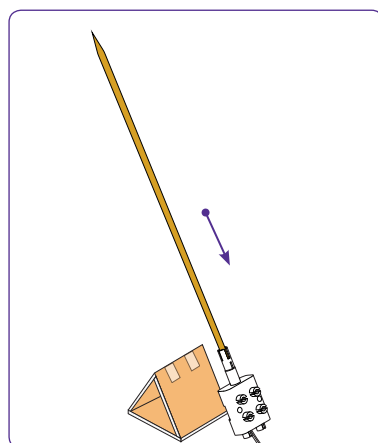
- 13.** Tape the 2 ends of the cardboard together.



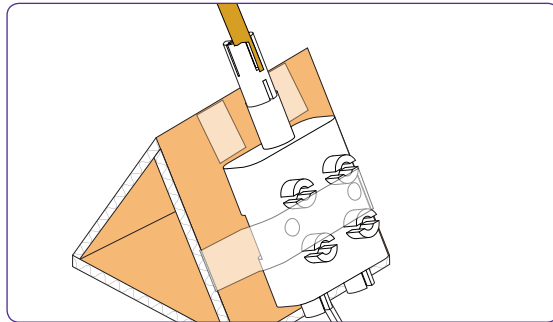
- 14.** Attach the motormate to the DC motor shaft. Be sure to gently line up the cross axle shaft with the cross shape on the motorMate.



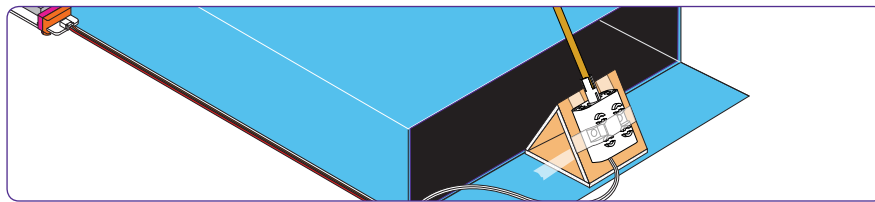
- 15.** Insert the skewer into the motorMate. The skewer should be sticking up at an angle to mimic the Earth's tilt. This is where your Earth model will sit.



- 16.** Attach the DC motor to one face of the triangle. Tape it in place.



- 17.** Open the free end of the cereal box and tape down the cardboard triangle at the end of the box on the open lid.

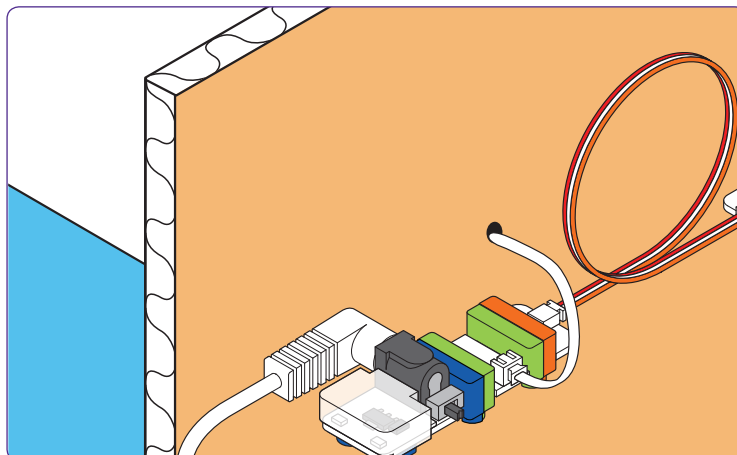


- 18.** In front of you, you have an LED Bit, a smaller ball, and a larger ball. What do you think each material represents? Based on what you know about the position of the sun, Earth, and moon, where do you think each item should be placed?

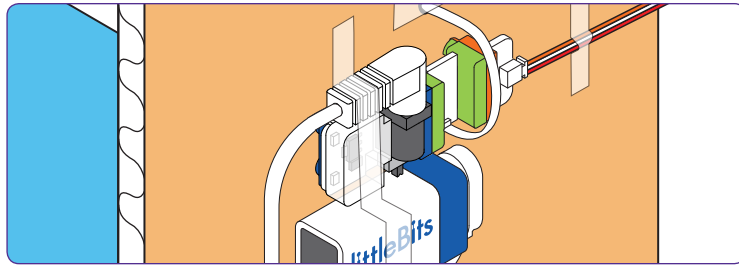


WRITE

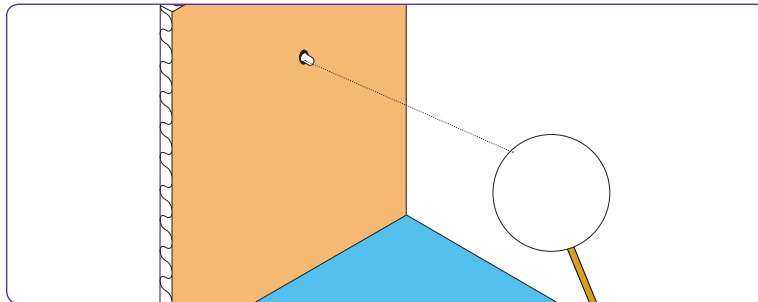
- 19.** Complete Writing Box #1 in your guided handout.
- 20.** Place the long LED Bit through the hole in the cardboard backdrop.



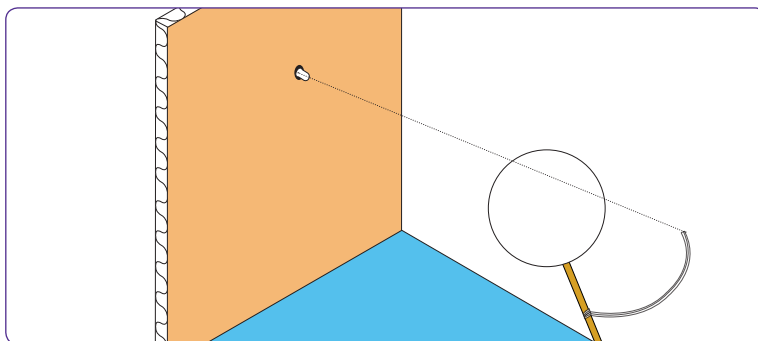
- 21.** Tape the Bits and battery to the back of the cardboard to stay in place.



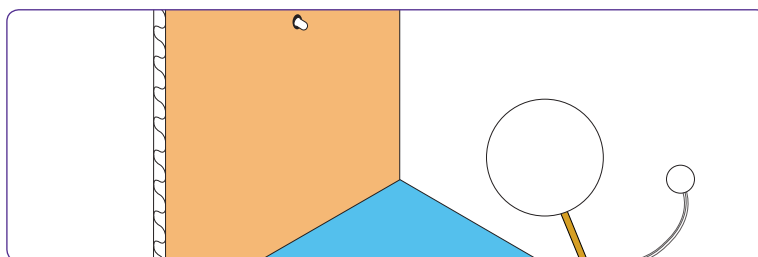
- 22.** Stick the 3 inch styrofoam ball on the skewer, making sure that the ball is at the same height as the long LED. You may have to cut the skewer to adjust the size.



- 23.** Then, attach a twist tie onto to the skewer. Make sure to align it with the height of the LED on the other end of the box. Tape the twist tie in place if needed.



- 24.** Press the smaller ball into the end of the twist tie. Add tape for extra support if needed.

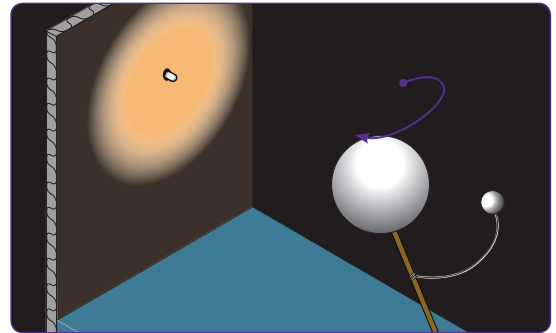
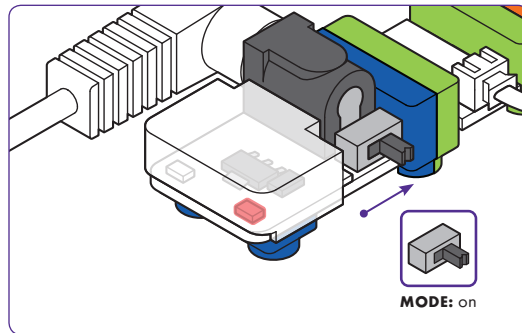




PLAY

PLAY

- 25.** Let's test it! Power up your circuit and explore the phases of the moon! Turn off the lights or travel to a darker location to view the full effect. Use your slide dimmer to control how fast or slow the moon revolves around the earth.



WRITE

- 26.** Use your model to complete Writing Box #2 in your guided handout.
- 27.** Rotate your model to illustrate the current position of the moon and draw the moon we'll see tonight. Use your model as a visual aid to complete Writing Box #3 in your guided handout



SHARE



WRITE

SHARE

- Complete Writing Box #4 in your guided handout.



CLEAN

CLEAN UP

- **Until next time, littleBits!** Place the Bits gently back in the box according to the diagram on the back of the Bit Index; return classroom materials to their proper place and check the area around your workstation.

littleBits

LUNAR PHASES

Name: _____

CHALLENGE OVERVIEW

Let's model the lunar cycle in order to visualize the phases of the moon.

GUIDING QUESTIONS TO REACH LEARNING OBJECTIVES

Why does the moon appear differently in the sky throughout the month? What is the recurring pattern?



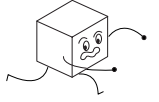
1. What do our materials represent? Based on your knowledge of the solar system, how should we arrange them?

draw here!



2. What happens during a lunar eclipse? What about a solar eclipse? Use your lunar model to create a solar or lunar eclipse. Below, sketch the position of the sun, the moon, and the Earth during the type of eclipse you choose.





3. Rotate your model to illustrate the current position of the moon and draw the moon we'll see tonight. Use your model as a visual aid.



SHARE

4. In what ways is our model imperfect? Record your group's ideas below.

