

Have you ever made a circuit to light something up? Channel your inner electrical engineer to create your own light up circuit bug! Using a coin battery, copper wire, and LED lights, build your circuit on a clothespin; then decorate your clothespin with pipe cleaners to look like your favorite insect.

# TEKS:

4.3D: Connect grade-level appropriate science concepts with the history of science, science careers, and contributions of scientists.

4.6B: Differentiate between conductors and insulators.

4.6C: Demonstrate that electricity travels in a closed path, creating an electrical circuit, and explore an electromagnetic field.

5.3D: Connect grade-level appropriate science concepts with the history of science, science careers, and contributions of scientists.

5.5A: Classify matter based on physical properties, including mass, magnetism, physical state (solid, liquid, and gas), relative density (sinking and floating), solubility in water, and the ability to conduct or insulate thermal energy or electric energy.

5.6A: Explore the uses of energy, including mechanical, light, thermal, electrical, and sound energy. 5.6B: Demonstrate that the flow of electricity in circuits requires a complete path through which an electric current can pass and can produce light, heat, and sound.

# Materials:

- 1 clothespin
- 1 coin battery (CR2032 3V)
- Electrical tape
- 2 LED lights
- 4 pieces (6-8" each) insulated copper magnet wire
- 5 pipe cleaners
- Scissors or wire strippers (Adult supervision is needed to strip wires!)



www.destember.org | #deSTEMber | © 2016 by Girlstart www.girlstart.org

DeSTEMber is a trademark of Girlstart

#### How To:

- 1. Test your LED lights and battery to make sure they work. The LEDs should light up when you insert the battery between their legs/pins. If not, try turning the battery around. If the LEDS still won't light up, try a different battery. You may also have to try a new LED. You need to be sure everything works before creating your circuit bug!
- Take two pieces of wire and have an adult help you strip 2-3" off both ends of each wire. The longer leg of the LED is the positive leg. Take one wire and wrap it around the positive leg of one of the LEDs. Take the second wire and wrap it around the positive leg of the other LED. (The *stripped* part of the wires must be touching the positive legs of the LEDs.) Then twist the 2 wires together.
- 3. Repeat Step 2 with two more pieces of wire and the negative legs (the shorter legs) on both LEDS.
- 4. Take your two sets of twisted wires (one set of positive wires and one set of negative wires) and test them on the battery to be sure your circuit is working. If the LEDS don't light up, try rewrapping the wires on the positive and negative legs.
- 5. Attach the LEDs to the legs of the clothespin by positioning each leg of the LED on either side of the wood. This prevents the positive and negative wires from touching, which could cause a short circuit (a disruption to the circuit). Wrap the LED legs onto the clothespin with electrical tape.



- 6. Run the wires from the LEDs down the sides of the clothespin and tape them to the clothespin with electrical tape. There should be extra wire dangling from the end of the clothespin. Before creating your bug design, check that the circuit is working by touching the wires to the battery. This creates a closed circuit that will make the LEDs light up if the circuit is okay!
- 7. Create a design for your bug using pipe cleaners. Wrap the pipe cleaners around the clothespin to make wings and a body. Be creative, but be careful—the pipe cleaners should not get twisted with the circuit wires because they can interfere with the circuit. When you've created your bug design, once again touch the wires to the battery to make sure your circuit is still working.
- 8. When you have finished your design, wrap the negative wire around one half/side of the clothespin clamp (the part that closes tightly shut) and then wrap the other half/side of the clothespin clamp with the positive wire. Make sure the stripped part of the wire is on the inside of the clamp! If your wires are too long and bulky, you can trim them before wrapping them around the clamp of the clothespin. *If you do trim the wires, you will have to strip the ends again.* The stripped part of the wires needs to get tucked into the clamping part of the clothespin because that's where the battery will go. The stripped wires need to touch the battery to complete the circuit that will light the LEDs.



www.destember.org | #deSTEMber | © 2016 by Girlstart www.girlstart.org DeSTEMber is a trademark of Girlstart 9. Place the battery in the clamp of the clothespin to bring your circuit bug to life! The positive wire should be touching the positive side of the battery and the negative wire should be touching the negative side of the battery. If your bug is not working, try turning the battery around. If this doesn't fix the problem, you will need to disassemble your bug to find what is interrupting your circuit! To turn your bug off, simply remove the battery.

### **STEM Explanation:**

The components of a circuit in this activity include a battery, wires, and LED bulbs. Power travels from the battery through the wires to turn on the LED light. Electricity flows from the battery and through the bulbs. When the circuit is incomplete, or open, the wires are not connected to the battery source and therefore there is no flow of electricity. To make the LED lights turn on, the battery must be connected to the circuit. This makes a closed circuit in which the electric current is able to pass through the circuit and make the LED lights work.

## **Career Connection:**

*Electrical engineers* design and build small and large scale electrical systems. In the circuit design area of electrical engineering, engineers use their knowledge of the conductivity of materials to design circuit boards that are used in cell phones, TVs, toaster ovens, computers, and many other devices. Understanding the dangers of mixing electricity and water helps engineers design for safety.

#### **Resource:**

http://www.steampoweredfamily.com/activities/circuit-bugs/



www.destember.org | #deSTEMber | © 2016 by Girlstart www.girlstart.org DeSTEMber is a trademark of Girlstart