

Thank you to the Mid-Valley STEM-CTE Hub (<http://www.midvalleystem.org/>) for their on-going generous support of Linn County Maker programming.

Want to watch an example in action?

[www.midvalleystem.org/take-it-make-it-december](http://www.midvalleystem.org/take-it-make-it-december)

Hello! Welcome to our December Maker Kit. This month is all about open and closed circuits. Make sure you have a grown-up with you as this activity does involve (very weak) electricity and materials that should NOT be handled by little ones (the batteries and LEDs can be quite dangerous if swallowed).

There's a lot in here to play around with: you have enough supplies to try out a few small cards (with short tape lines) or one big project. The biggest piece of advice that I also mention other places is to unpeel the tape slowly and carefully so that it does not roll up and become unusable. Otherwise, just dive in and see what happens when you close a circuit and allow electricity to run through your copper tape!

### **Getting Ready**

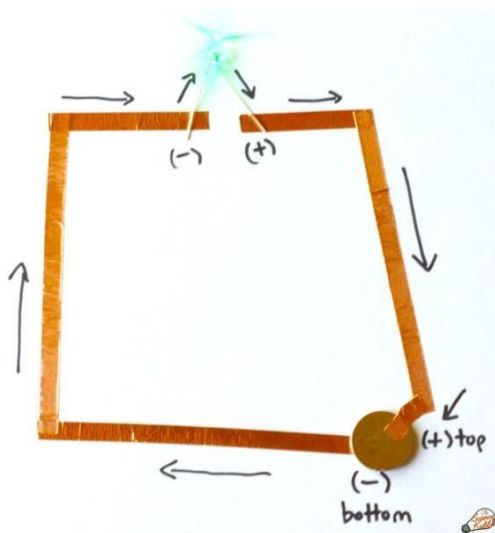
- Paper
- Copper tape, ¼ inch wide and double-sided conductive (available online for about \$6 or in hardware stores as “slug tape”)
- Scissors
- 3V lithium button battery
- Double sided tape, regular tape, or foam tape
- 5mm LEDs of assorted colors

## General Tips

- There's nothing too complicated about making a circuit that actually works. All you have to remember is that there must be a direct path from the negative end of the battery, through the light, and back to the positive end of the battery.
- On a 3V button battery, the negative side is usually the bottom of the battery while the positive side is the top. It will be labeled on the battery.
- If you look at the 5mm LED you will notice that it has two pins. One pin is slightly longer than the other one. The longer pin is the positive end and the shorter pin is the negative end. This matters!

You can use the enclosed template to try to make your own open/closed circuit. There should be enough copper tape to do that and still make your own card, no problem. Or you can just look at these images to understand the open/closed circuit concept and save your tape for tinkering.

Electrons must flow from the negative end of the battery to the negative end of the LED. If the LED is oriented incorrectly it will not light up.

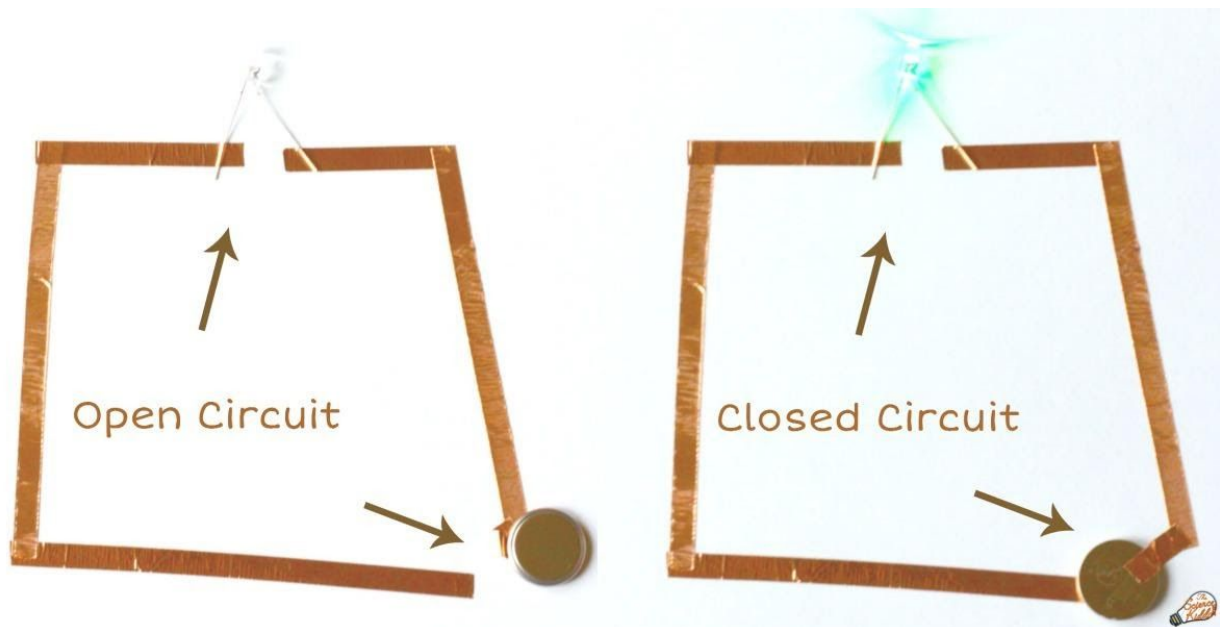


I placed copper tape on some card stock in the shape of a rectangle, leaving one small gap along one of the sides. Three of the corners of the tape were connected while I left a gap between the ends of the tape in the fourth corner.

I used copper tape to attach each pin of the LED to either side of the gap. It's really important that the two pins don't touch each other and that there is a gap in the tape so that the light doesn't get short circuited.

I placed a coin cell battery in the open corner so that it touched only one end of the copper tape. Using another piece of copper tape, I connected the top of the coin cell battery to the other end of the tape in the corner.

The LED lit right up!



If the LED doesn't light up when you try this, simply flip the battery over and try again. Check all the connections to make sure there is a continuous path from the negative end of the battery, through the negative pin of the LED, out the positive pin of the LED, and back to the positive end of the battery.

Once you know the basics of how to construct a simple paper circuit you can try your own.

# IDEAS

1. You can choose to expose your copper wires as part of the decoration (wires of lights on a tree, part of branches, sci-fi vibe) or you can hide all of it under a second sheet of paper and just have the LED light out. Experiment – you can cover it with just a small decorative box, or you can use a full extra sheet.
2. You can have a card that lights up all the time but it will only last a day or so. Better to arrange it so that something has to be pushed in order to make the wire touch the LED leg.
3. Key elements – make sure your LED legs don't touch each other. Make sure they each touch the copper wire. Make sure your battery touches the copper wire on both sides when it is time to light things up, but not all the time!
4. I know that times are tough for buying supplies, but for about \$10.00 you can have enough supplies to make 20 handmade, gorgeous, light-up cards.
  - a. Copper wire - \$2.00 per roll hardware store or Amazon
  - b. Card stock - \$1.80 per pack of 20 sheets Amazon (3.50 at Hobby Lobby)
  - c. Coin batteries (CR2032) – I found packs of 8 at the Dollar Tree. Amazon had a pack of 24 for \$6.00
  - d. LED lights – there are several in your bag, and you can get 100 or so for about \$4.00 in local hardware stores or online.
  - e. Markers, stickers, cut out magazines, etc.
5. It is best to use one single piece of copper wire so that you can be sure the circuit is closed. IT WILL ROLL UP AND BE ORNERY so unroll it slowly and tape it down as you go.
6. Make sure there is no tape on your battery where you want the copper wire to be connecting!

# Upcoming programs at the Albany Public Library (Linn County residents are welcome to participate):

## **Winter Reading Program**

Starting December 1<sup>st</sup>: Winter Reading Program at the library! Open to all ages, we invite you to earn some badges and read away the rainy, cold months of winter. All participants under Grade 6 will earn a spring-themed prize pack at the end of February, and teens can enter prize drawings for their participation. If you already have Beanstack, you can log into the app or webpage and the contest should appear. If you don't have it yet, it's easy to install the app or go to: [cityofalbany.beanstack.com](http://cityofalbany.beanstack.com) and register. Prefer a paper copy? Pick up a few bingo cards at the library curbside table.

## **Virtual Theater (one week only!)**

December 13-20<sup>th</sup>, folks can watch a prerecorded theater production of The Story of Ebenezer Scrooge. This adaptation of Dickens' work is performed by one of April's favorite theater companies. It's engaging and moving, and it's a great watch for the whole family.

<https://vimeo.com/479123758>

Passcode: Marley136TL

## **Short Film Watch Party!**

December 29<sup>th</sup> (4:00-6:00) and December 30<sup>th</sup> (12:00-2:00 p.m.) stop by the Main library for your film festival kit. It will include a couple of snacks, a small surprise, and a voting card for our short film end of year watch party on December 30<sup>th</sup> from 2:00-4:00. Register through our virtual calendar for your zoom link.

<http://library.cityofalbany.net/> (bottom left corner is our ongoing calendar)

