TRY FIVE +

WORKSHOP 3

Stars and Electronics

1. ELECTRICITY

1.1. What is Electricity?

Electricity is produced by the flow of electrical charges. It can also mean the energy you get when electrons flow from place to place.

Atoms missing electrons or having extra electrons become positively or negatively charged because the charges are not balanced.

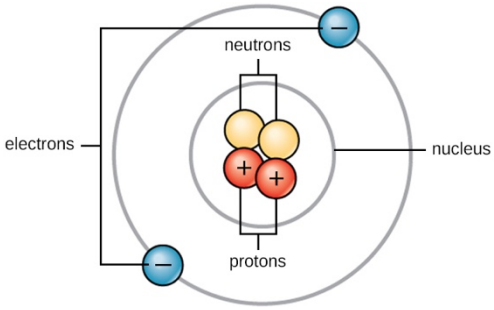
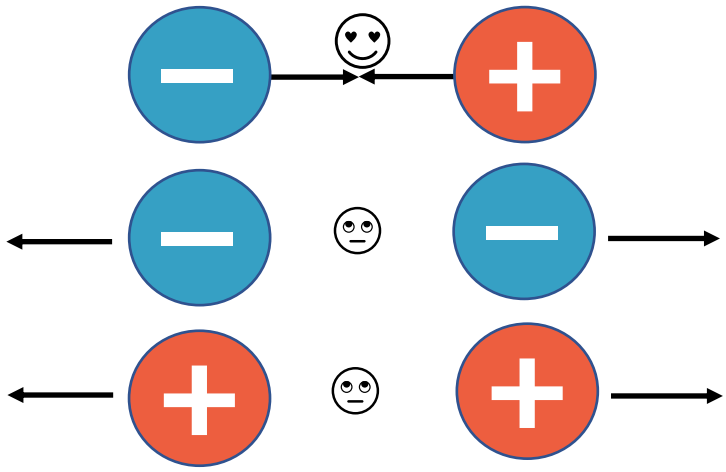


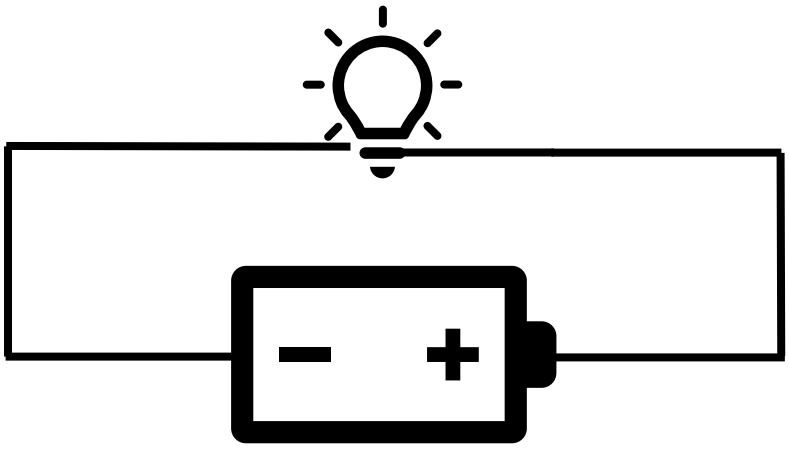
Figure 1: Atom parts by CNX OpenStax.

- **Positive and negative electrical charges are attracted to each other like good friends.**
- **When separated, negatively charged and positively charged particles will do like friends do: Flow to try and reunite with each other. This flow is electricity.**



Batteries:

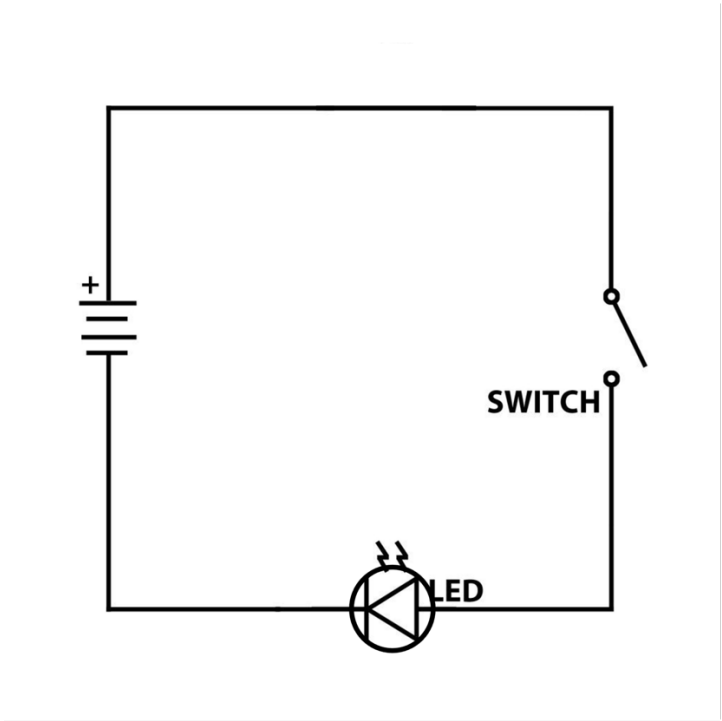
- **Batteries keep positive and negative charges separated until both sides are connected. This is useful because electricity that is generated can be controlled and sent through metal wires. It can then power such things as heaters, light bulbs, and computers!**



1.2. What is a circuit?

A circuit is closed loop that electrons can travel in. It is usually made with copper, copper cables or other conductive materials.

Circuits have a power source (our battery) and some components that may use or transform the electricity, such as our LED light and a switch.



KEEP IN MIND!

- **LEDs are fussy little lamps that always like to receive the current in a particular way, so pay attention to the polarity. LEDs like to be connected with their positive side towards the positive side of the battery!**

- **Often red is used to designate positive and black to designate negative when using electronic components.**

2. Activity: BUILDING YOUR STAR PROJECTOR.

2.1. Materials:

- 2x AA batteries
- 1x LED
- 1x Battery holder
- 3x spring connectors
- 1x button switch
- 2x paper cups
- 1x hole puncher

2.2. BUILD THE CIRCUIT:

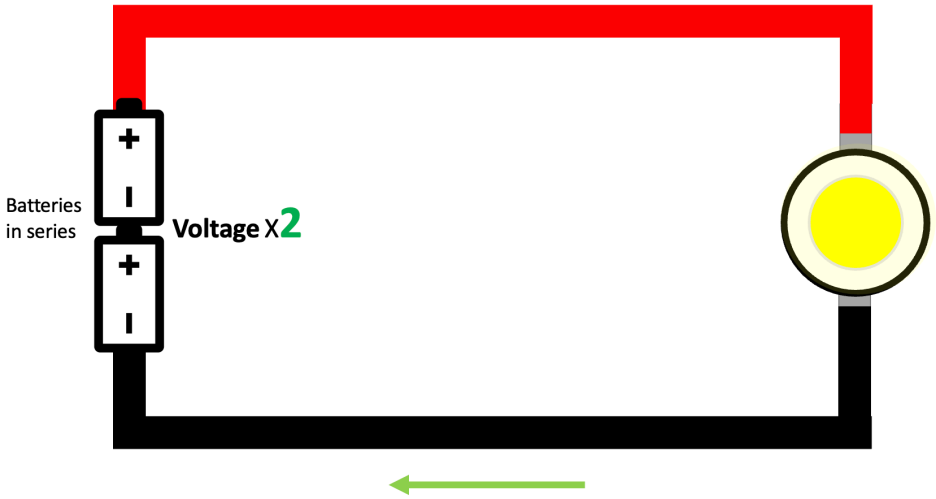
1) EXPERIMENT!

Try and connect your batteries together like in the picture below. This is called connecting batteries in series. When connected in series, the voltage of the batteries is added. Around 3 volts are needed to light an LED. Can you try and touch the ends of the LED cables to the positive and negative poles of the batteries?

REMEMBER:

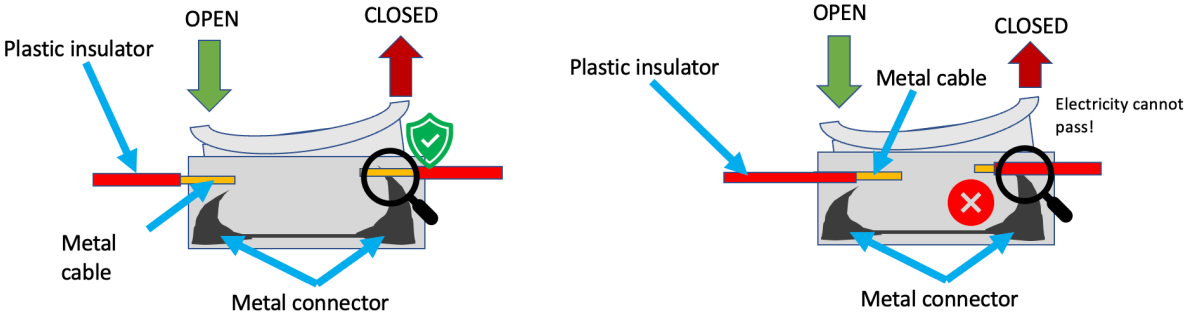
Plastic is an insulator! If plastic from the cable and not metal is touching the metal connectors in the batteries, the LED will not light up!

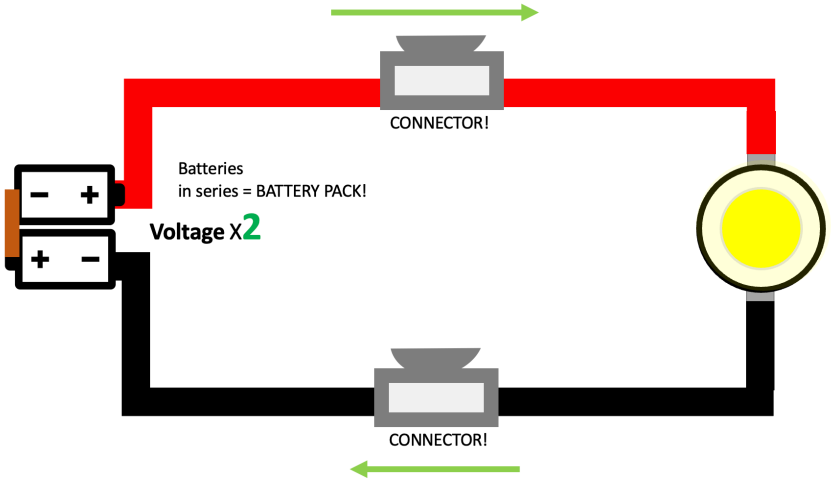
LEDs like to be connected with their positive leg facing the positive pole of the battery!



2) Let's use spring connectors and a battery pack to make our life easier!

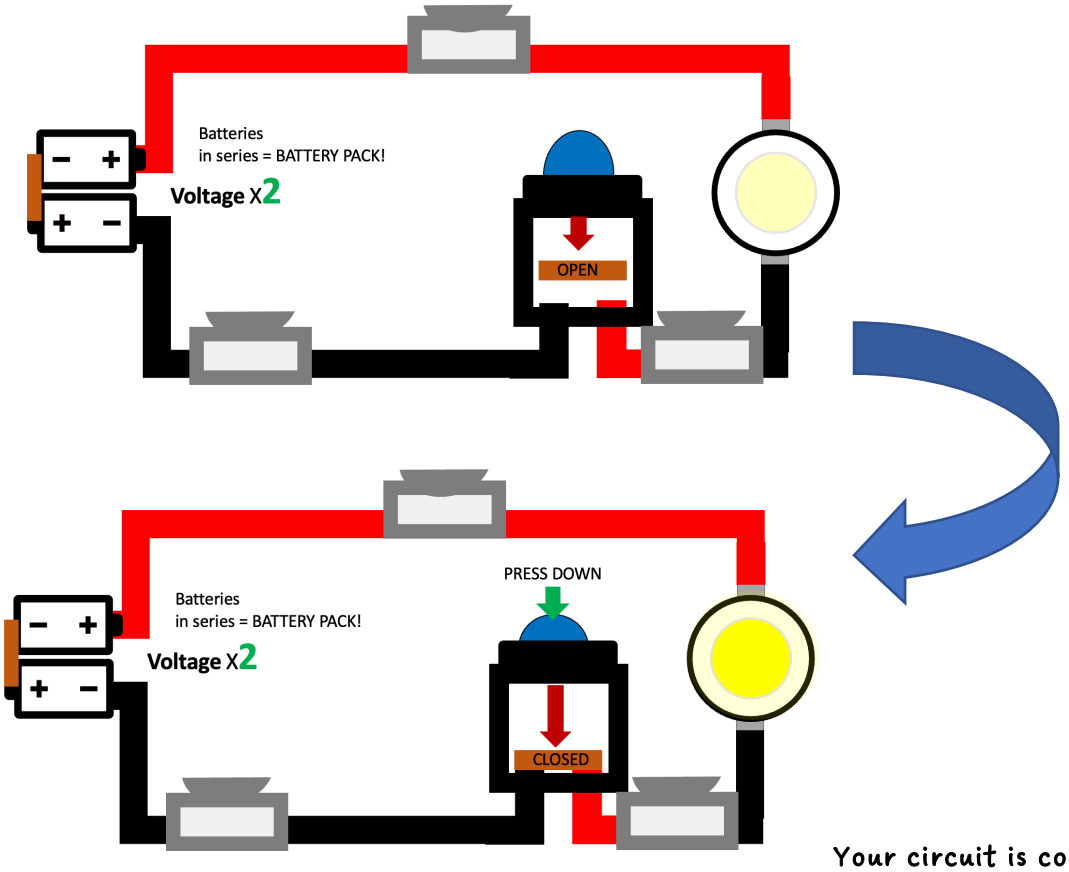
Press the same side of the connector to open it. Insert the cable and release! Make sure the metal plate in the connector is touching the metal of the cable and not the plastic or it won't work.





3) Add a switch:

Switches allow us to control the passing of electricity by opening and closing the circuit!



Your circuit is complete!

2.3. INTEGRATE THE CIRCUIT IN THE PROJECTOR:

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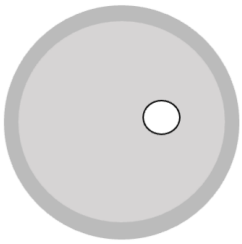
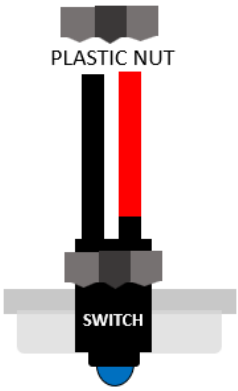
STEP 1

Find the cup lid with a hole.



STEP 2

Attach the switch to the hole.

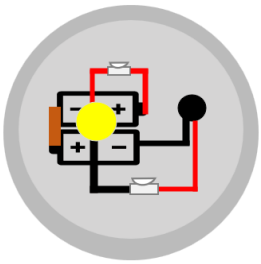


STEP 3

Finish reconnecting your circuit!

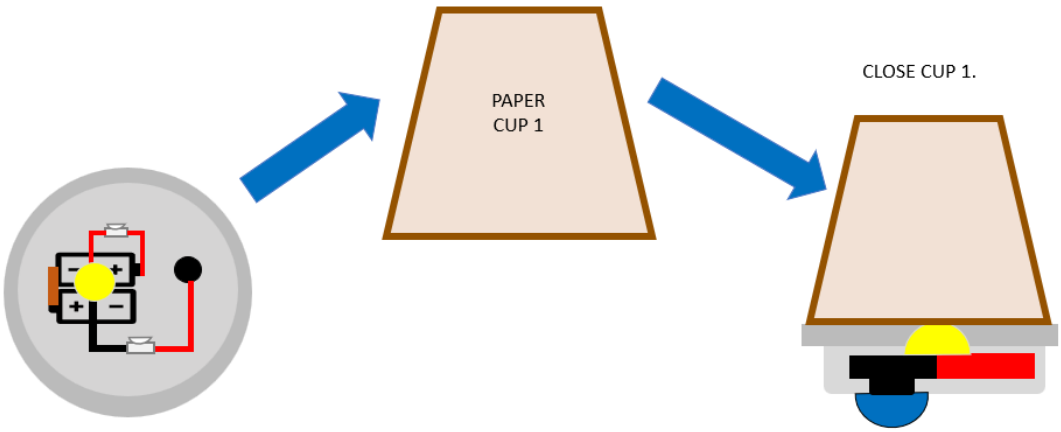
STEP 4

Tape the battery holder to the inside of the lid. Use tape to secure the LED facing up.



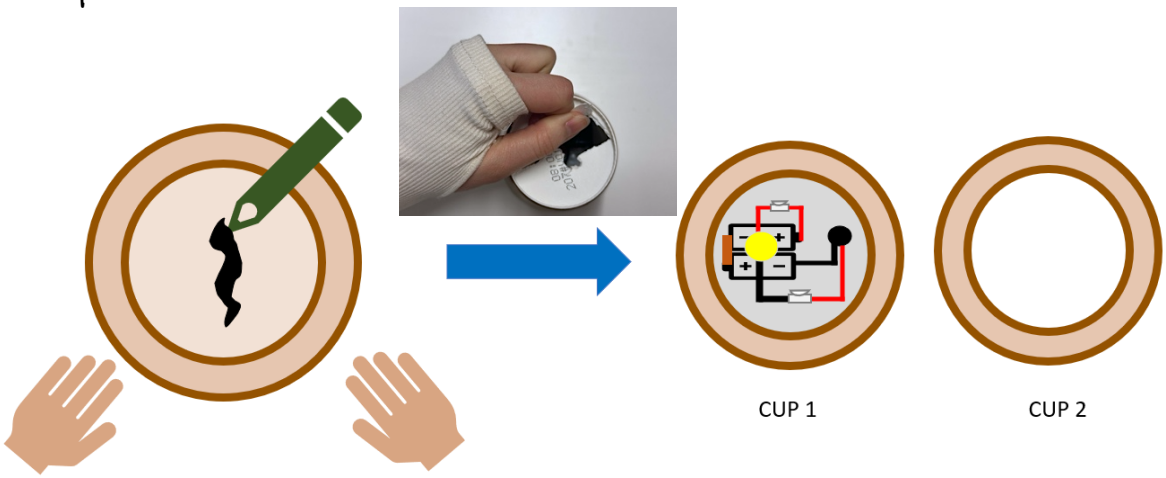
STEP 5

Check that everything works and then tidy all your cables inside the lid. Close cup 1.



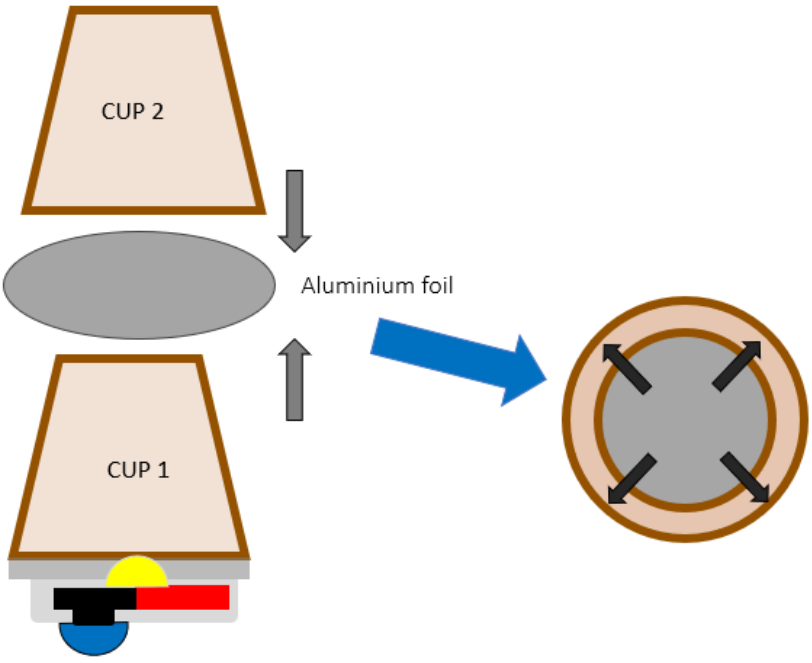
STEP 6

Take Cup 2. Use a pencil to poke holes in the bottoms and remove both of the cup bases.



STEP 7

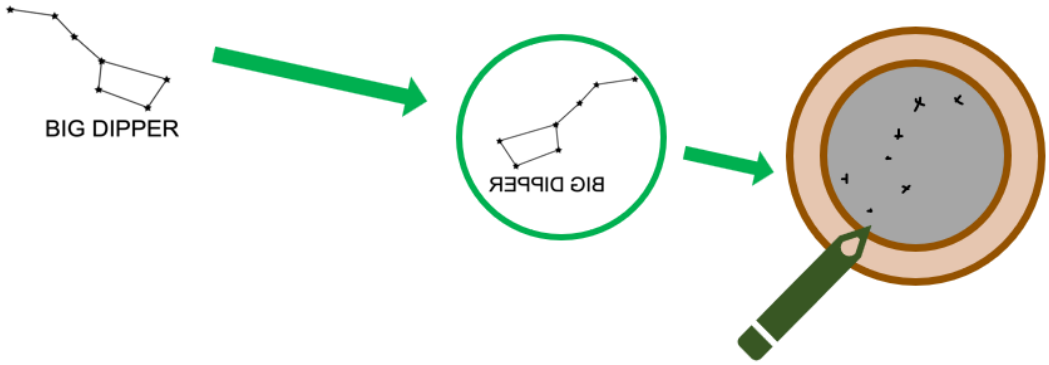
Cut a piece of aluminium foil to fit. Flip one cup upside down and cover it with the foil. Place the other cup on top to make the foil smooth.



STEP 8

TRY FIVE +

Select your favourite constellation. The projector will project a mirror image of what you design, so you will need draw the mirror image of the constellation to see them as you would see them in the night sky! Use a pencil to poke constellations in the aluminium foil.



STEP 9

Turn on the switch and test the star projector in a dark room.

SAFETY NOTES!

1) Do not attempt to do electronics on your own without the supervision of a knowledgeable adult.

2) There is a risk of fire and burns associated with electricity. DO NOT leave the projector on for long periods of time or unattended. Do not fall asleep with the projector on.

3) The LED used is very bright. Do not look directly at the light as to do so can damage your eyes. Do not touch the LED lamp when is on.