Creating Science – Light a Light.

Robotic science begins with an understanding of electricity, and this is a good place to start.

Suggested outcomes

(NOTE: This is by no means an exhaustive list of possible outcomes, neither is it intended that ONLY these outcomes can or should be met. Science is a deeply interrelated activity, and you may find cross curriculum links you can and should use.)

Physical sciences 6: Electrical circuits provide a means of transferring and transforming electricity

Warning

- ELECTRONICS GET HOT! Hot enough to burn little fingers. Be wary, warn students, and have a first aid plan. Some electronic components are damaged or made imperfectly, and will short out on their own, becoming extremely hot and at times doing nothing else. Be careful.
- Exposed wires can be sharp. Warn students carefully to be sensible, and careful.

Preparation

- Buy some "Light Emitting Diodes", make sure they have clear metal 'legs' that you can attach the battery wires too (the new diodes in strings are much harder to set up). Search "5mm assorted Light Emitting LED Diode Kit", or similar. They're actually ridiculously cheep from overseas – if you leave a month or two for them to arrive.

Suggestions for other year levels

As always, more material is presented here than can be used by the average class during the average lesson time. However, since the students questions can and should guide student learning, more material is presented for you convenience. Remember, it is not uncommon for students to only remember those points which answered their personal questions.

Younger:

This activity is well suited to this age group.

Children at this age can have difficulty with focus. Avoid tangents into interesting side tracts if you're attempting to make a key point.

Middle:

This activity can get boring quickly – prepare to prevent, or to work with, uninhibited creativity. While attaching many lights to one battery is interesting and informative (they get dimmer with each addition), adding many batteries to one light bulb isn't (it will either burn out, or the wires will quickly become too hot for students to handle safely.)

Teen:

This activity might take 1 minute. Be prepared to move on.

Engage

- ⇨ Give students the batteries, the LED's, and any wires you might need, and challenge them to light up the light.

Explore

- ⇨ Ask: How does this work? What make the light, light up?

Note that:

- The –ve terminal has to go on the shorter leg of the diode.
- There can be no gaps or breaks in the circuit. Both wires have to be connected to the diode.

Explain

Explain: Electricity must run in a circle, out of the battery, through the circuit, and back into the battery. It's like blood flowing through our arteries and veins, beginning at our heart and ending up right back there. Yet if there's a break anywhere along this circuit, we might stop 'working'!

By convention, the electricity comes out of the negative terminal[1],

Elaborate

- ⇨ Ask students if they can design new ways to test this explanation, is it really sufficient? Can they think of further or better explanations, and the experiments needed to test them?
- ⇨ Challenge students to light up two lights, or maybe even more? What happens if the add more batteries?

Evaluate

Diagnostic:

Take time to focus on planned content material during the engage phase, for example,

Formative:

Summative:

Help students consider ways they can communicate their new understanding to others, just as scientists need to do.

Creating science

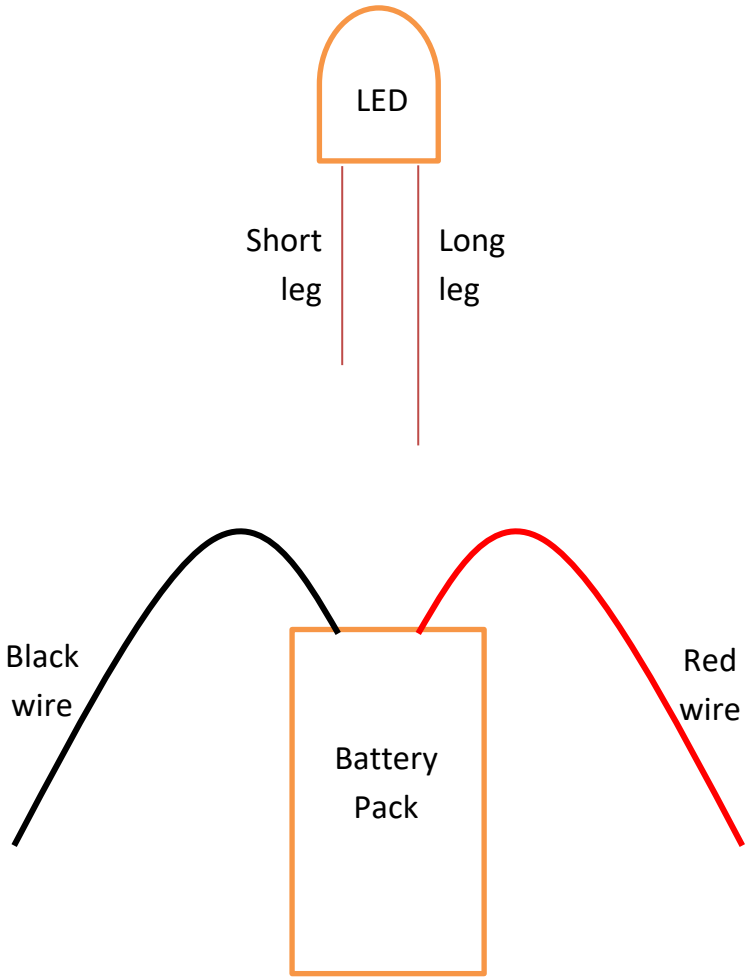
Electrical energy can be turned into glowing light

[1] When we first started to understand circuit electricity, we weren't sure which end the electricity came out of, but we knew it needed both ends to work. Benjamin Franklin labelled the different electrical poles and got it back to front, but the convention stuck till today! Now we think of electrons as 'negative', but it's not really what electricity is all about.

Electricity must flow in a circuit, from and then too, the battery in order to work.

Appendix: the current in a circuit diagram.

Help students to draw and understand the following diagram, one step at a time. 9not to scale)

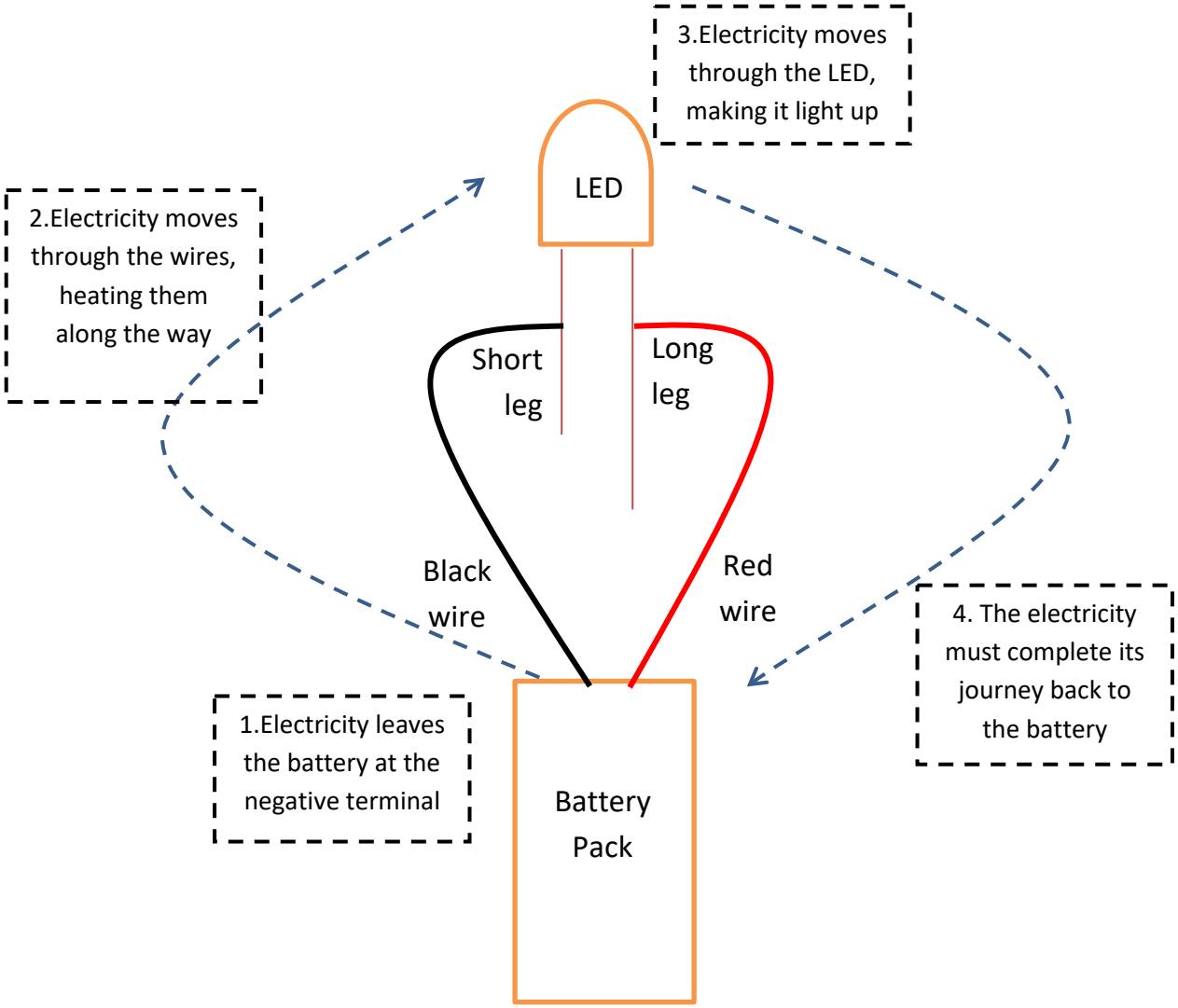


Which way do the wires go?

Which way does the electricity flow?

Appendix: the current in a circuit diagram.

Answer:



Which way do the wires go?

Which way does the electricity flow?

Appendix: How and LED works

If you could see inside a little LED, you'd see it has a tiny reflective cone that has, inside, a material known as a semi-conductor. As the electricity runs through the semiconductor it glows brightly, lighting up the light.

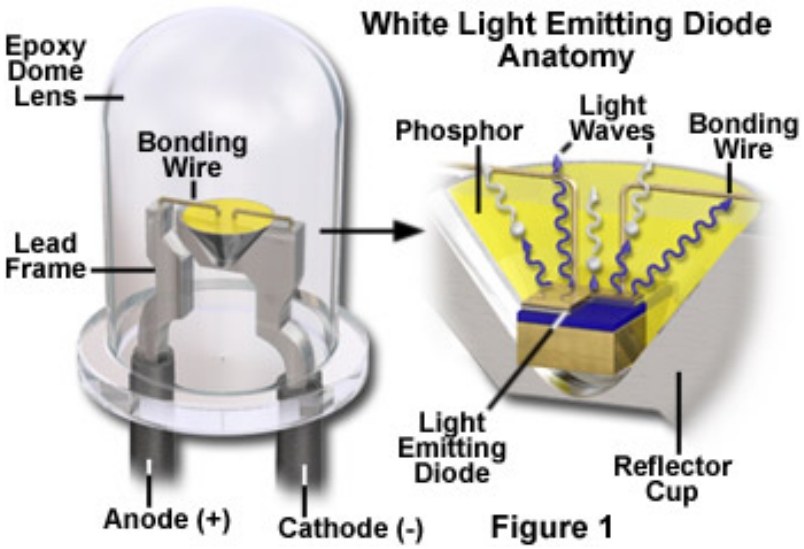


Figure 1

See also: