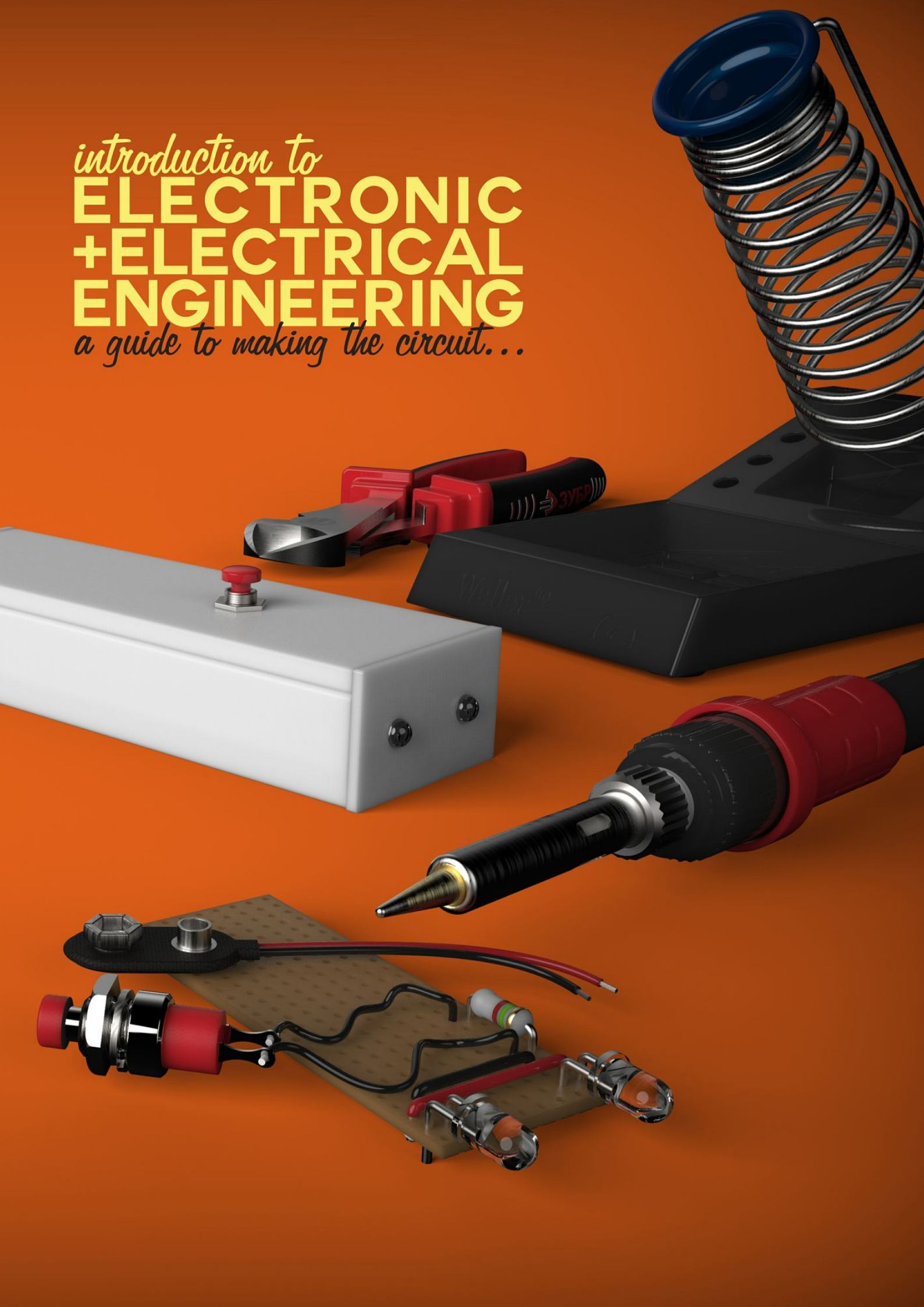
introduction to ELECTRONIC +ELECTRICAL ENGINEERING

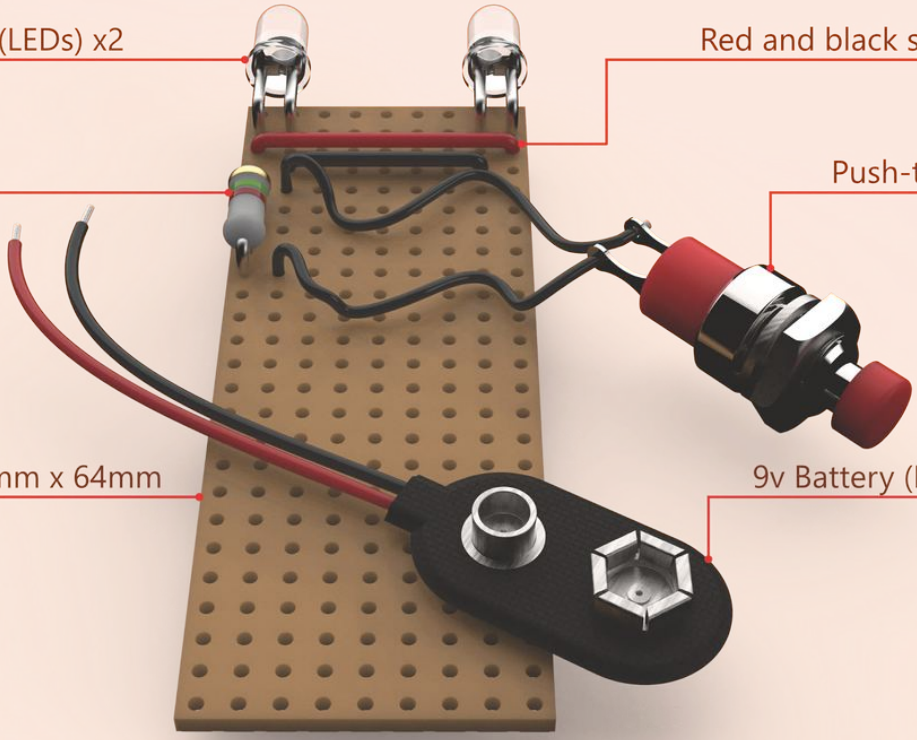
a guide to making the circuit...



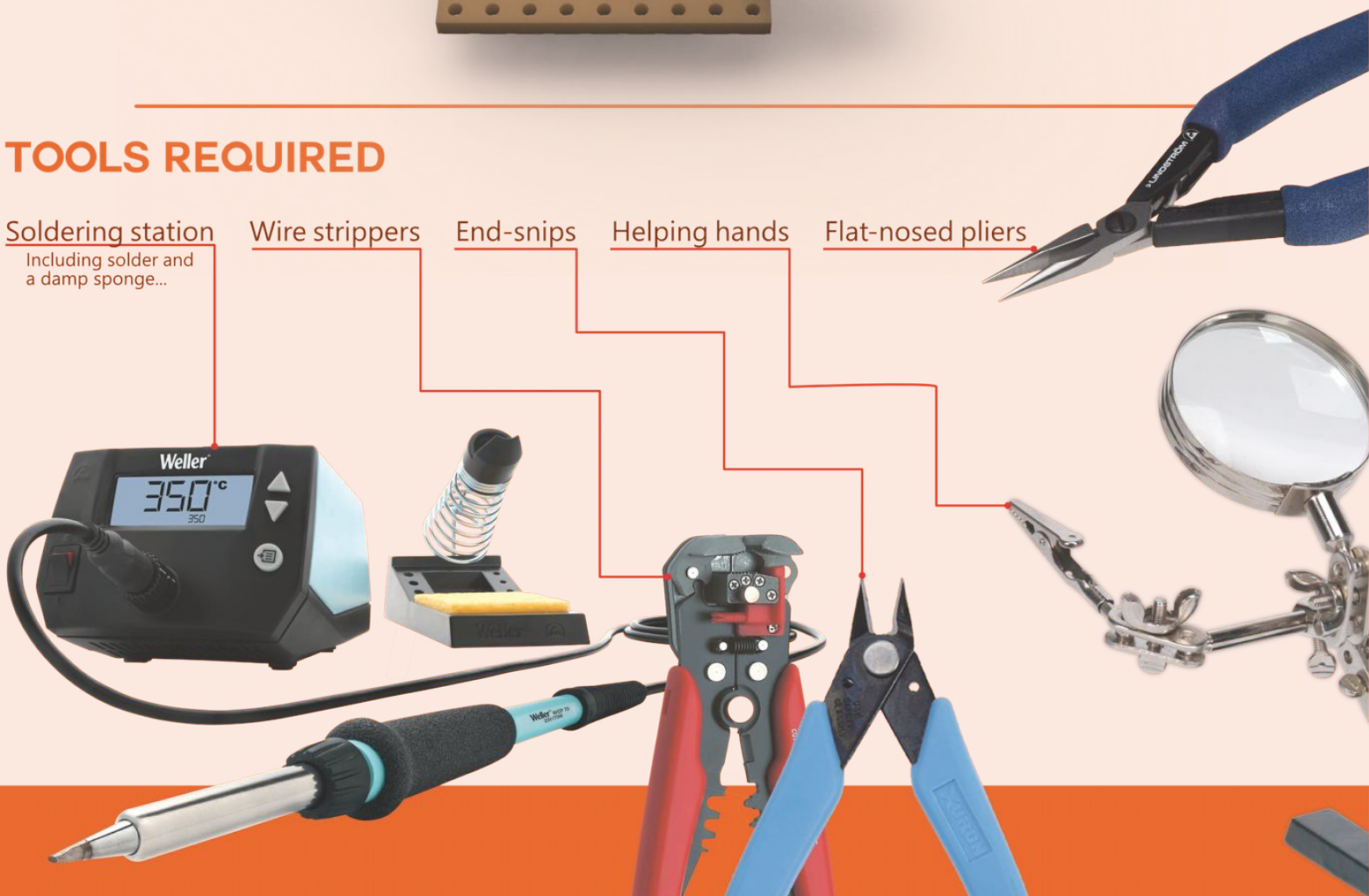
PROJECT OVERVIEW

In this practical project you will put your engineering science knowledge into action. You will be manufacturing a functioning torch from stock, industrial, components. You will cut wires, insert components and solder (a type of weld), everything in place. If you make a mistake, you will learn the joys of fault finding your circuit too. (Hint: this is not really a joy, so try not to make any mistakes).

COMPONENTS REQUIRED



TOOLS REQUIRED

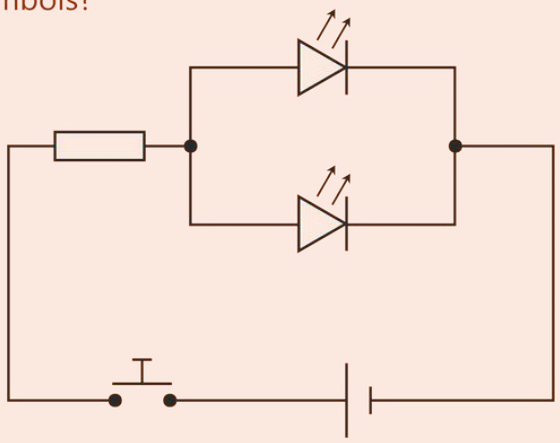


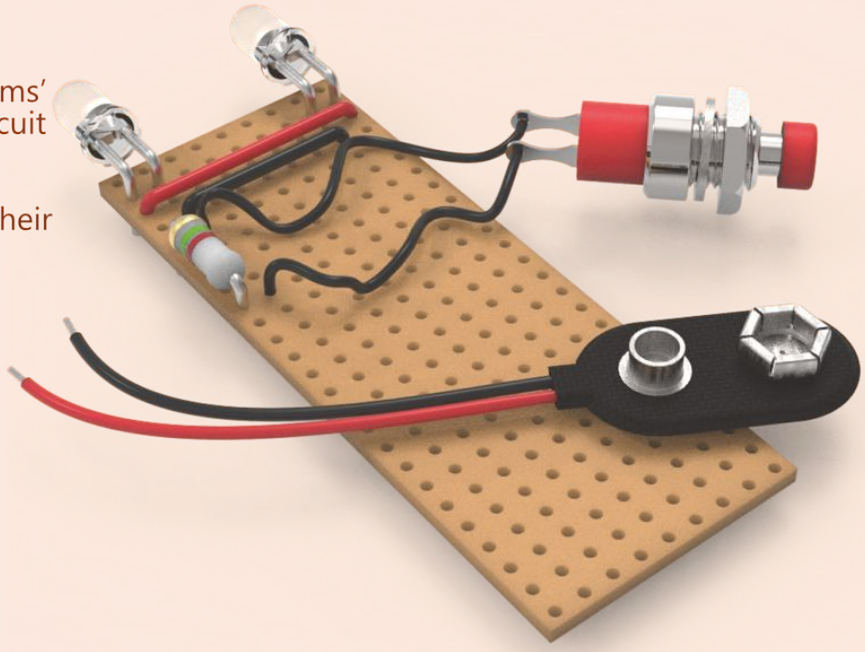
THE CIRCUIT WE ARE CONSTRUCTING

The circuit we are making is very simple.

Designers and engineers use 'circuit diagrams' to create electronic devices. The circuit diagram we are using is shown below.

Can you identify all the components from their symbols?





TASK

(a) Sketch the circuit diagram and label each of the components

(b) Model the components using simulation software.

SAFETY

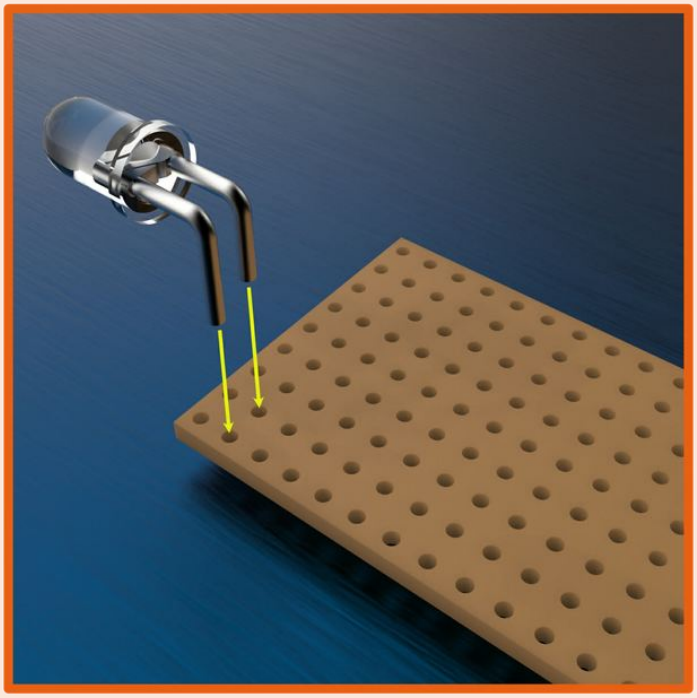
Soldering can be dangerous. Follow these safety rules to keep you and others safe!

1. Unplug the soldering iron after use.
2. Do not touch the tip of the soldering iron, its temperature can be as high as 400°C and can cause severe burns.
3. When soldering, always use helping hands and tweezers to hold the solder metal or component ends to be heated.
4. Keep the cleaning sponge wet when soldering. Dab the iron into the sponge occasionally if it is to be used for longer intervals.
5. Use eye protection when soldering as solder can spit.
6. In case, the hot soldering iron accidentally falls out your hand, don't try to catch it. Let it fall, and even break. Attempting to catch it may burn your hand, and you would drop it anyway .
7. Ensure that the tip of the soldering iron is clean
8. Heat the pad and the component end simultaneously, and take proper care that you do not burn the circuit board or any plastic parts.
9. Next, ensure that the joint is proper and connects the right terminals without bridging any connections.
10. Once done, place the soldering iron in its holder, and allow it to cool.

ATTACH THE L.E.D.

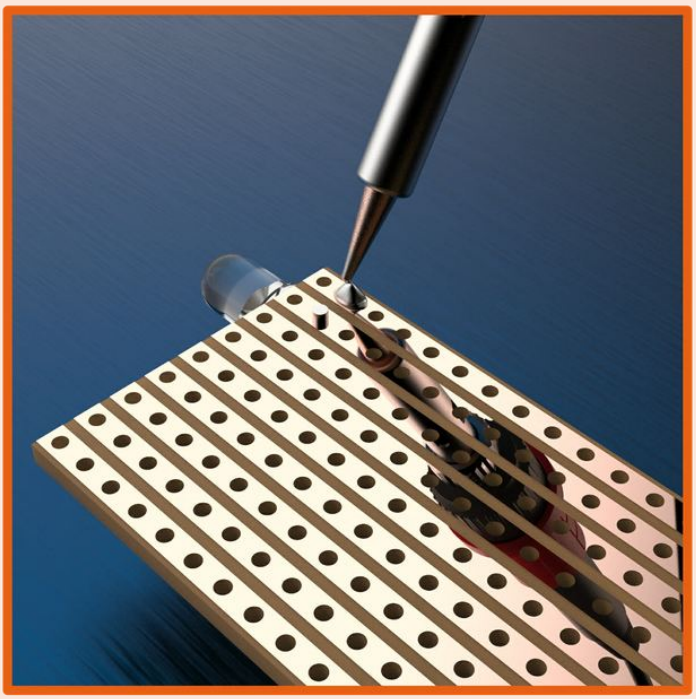


1. Grip your LED in a pair of needle-nosed pliers, leaving a small gap of a few millimetres. Bend the LED over 90°.

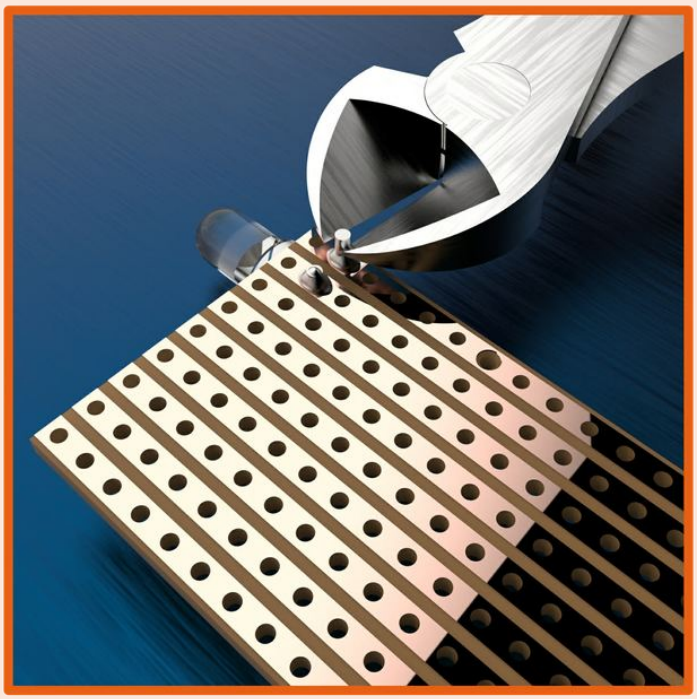


2. Fit the LED to the prototyping board.

THE LONGER LEG **MUST** BE TO THE OUTSIDE OF THE BOARD! (got that?)

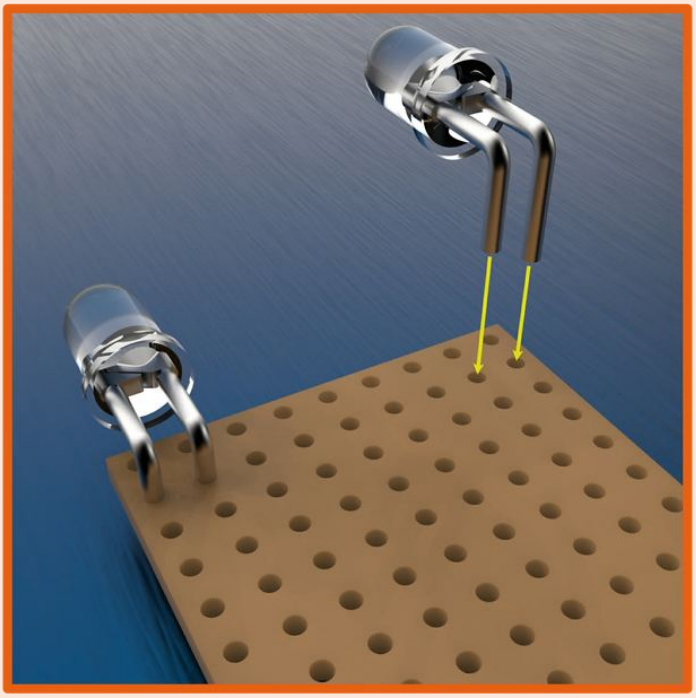


3. Grab your soldering iron (by the handle, not the hot bit) and solder the leg to the prototyping board. Make sure the solder doesn't 'bridge' between the two wires.

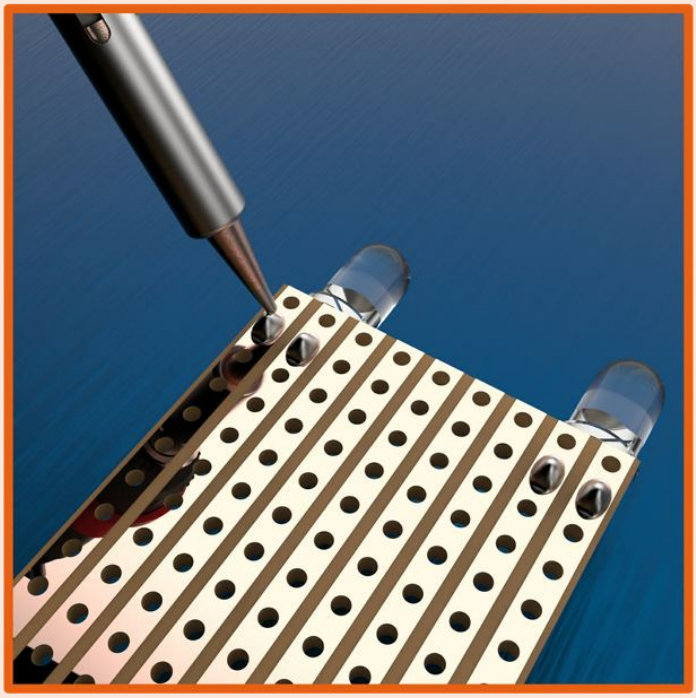


4. You should have excess wire sticking beyond the solder. This can cause a 'short circuit', so take your end-snip pliers and give your LED a hair-cut and remove the excess leg wire.

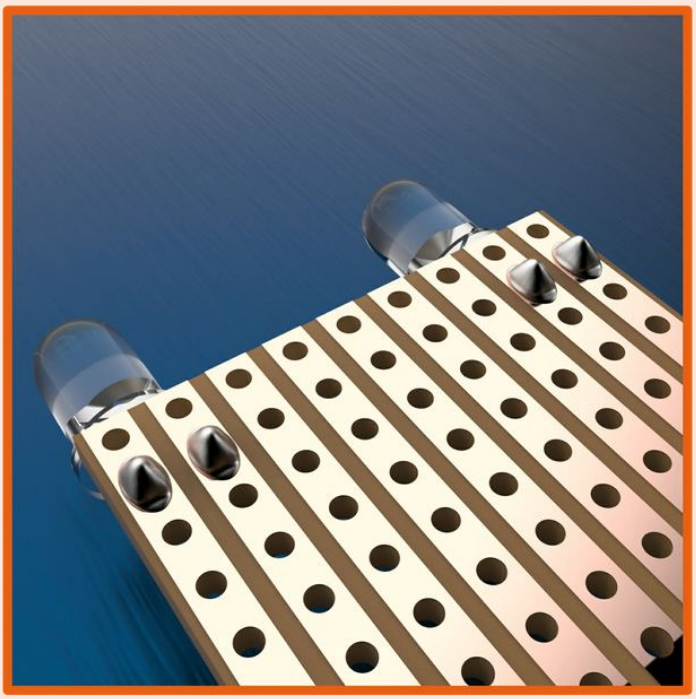
ATTACH THE L.E.D.



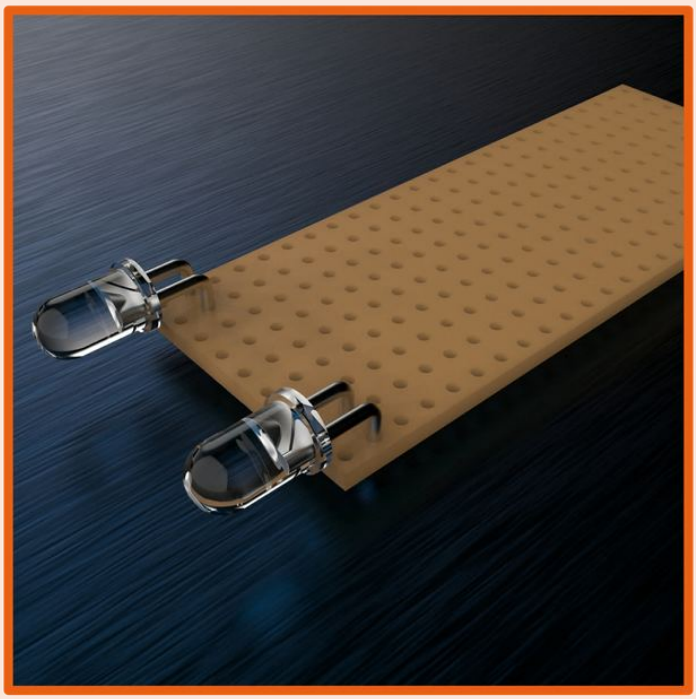
5. Take the second LED and use the needle-nose pliers to bend at 90°. THE LONGER LEG **MUST** ALSO BE TO THE OUTSIDE OF THE BOARD! (this is very important...)



6. The soldering iron is used again to solder the LED to the prototyping board. Again, make sure you don't bridge between the tracks and accidentally create a short circuit.

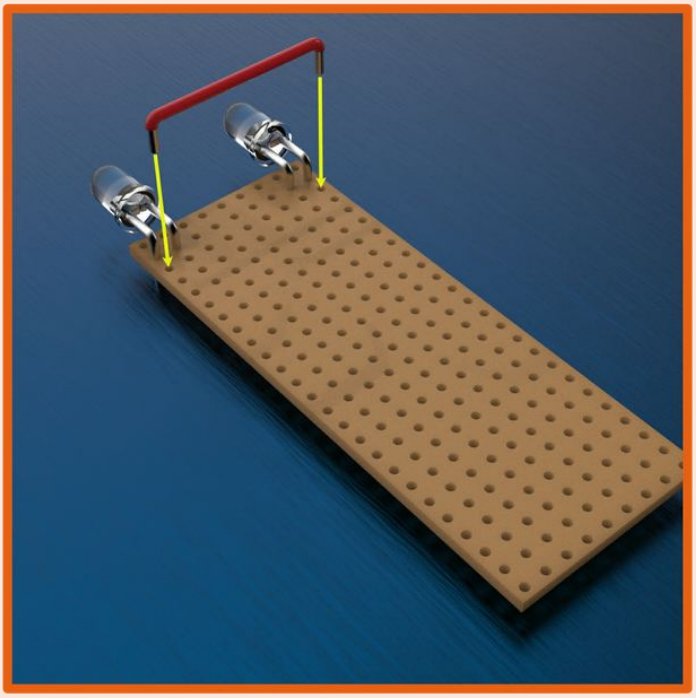


7. The end-snip pliers are used to trim the excess wire. Get the circuit looking nice and neat.



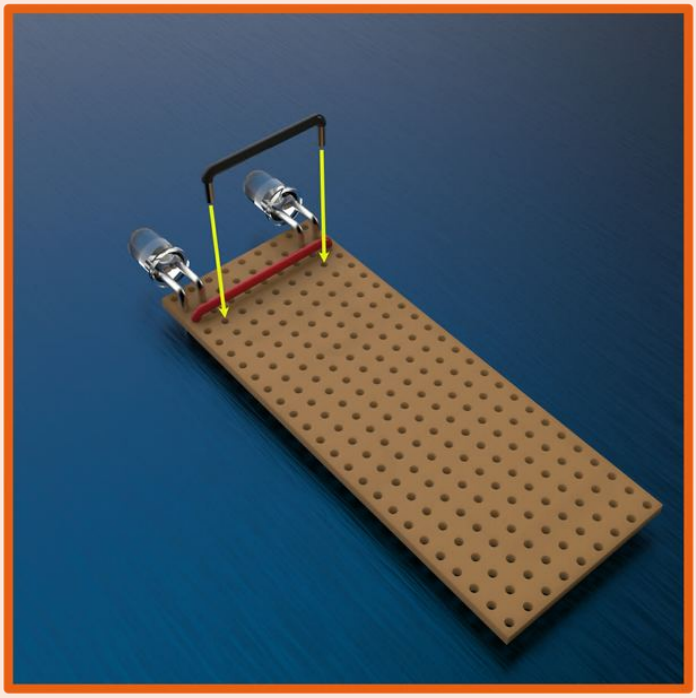
8. Okay, check the circuit with your teacher and then stand back and admire your work.
Well done...

ATTACH THE WIRES

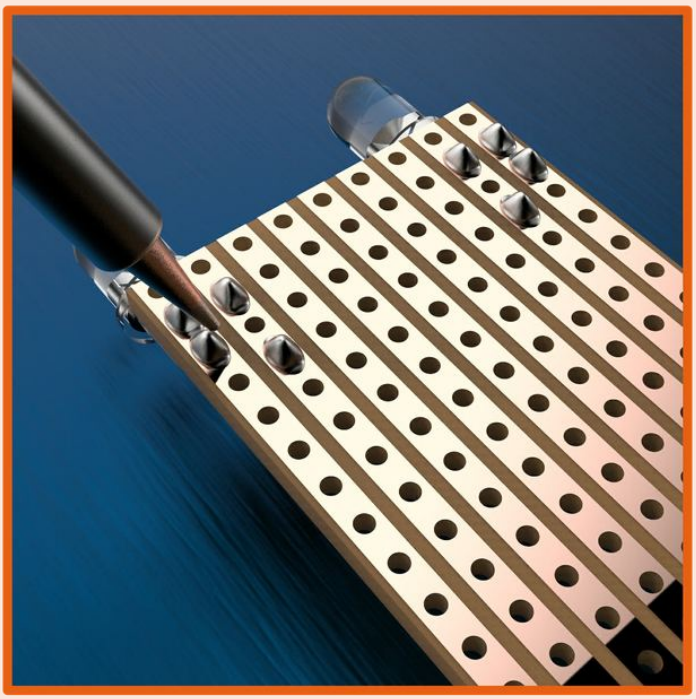


9. Time to wire things up. Take the RED wire and bend the ends over at 90° using the pliers.

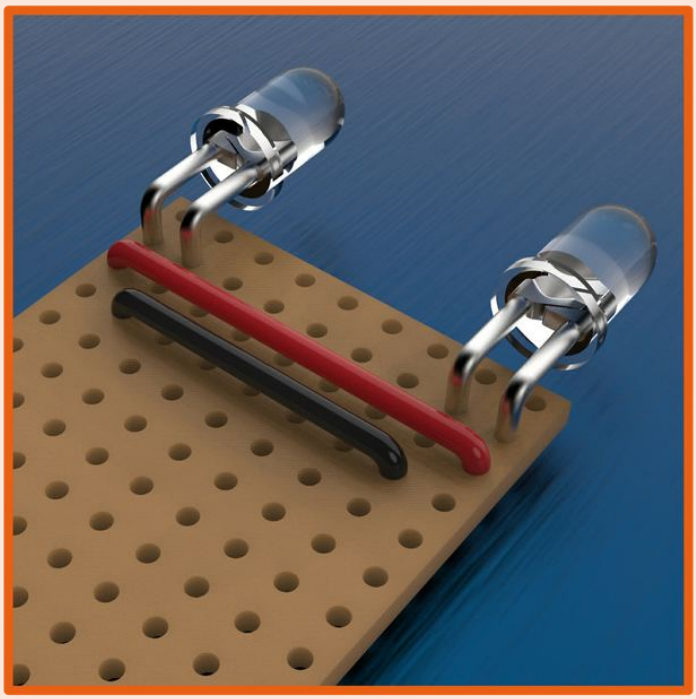
Fit this to the OUTER HOLES of the prototype board.



10. Next, the black wire. Bend over the ends at 90° using the pliers and insert into the inner holes.

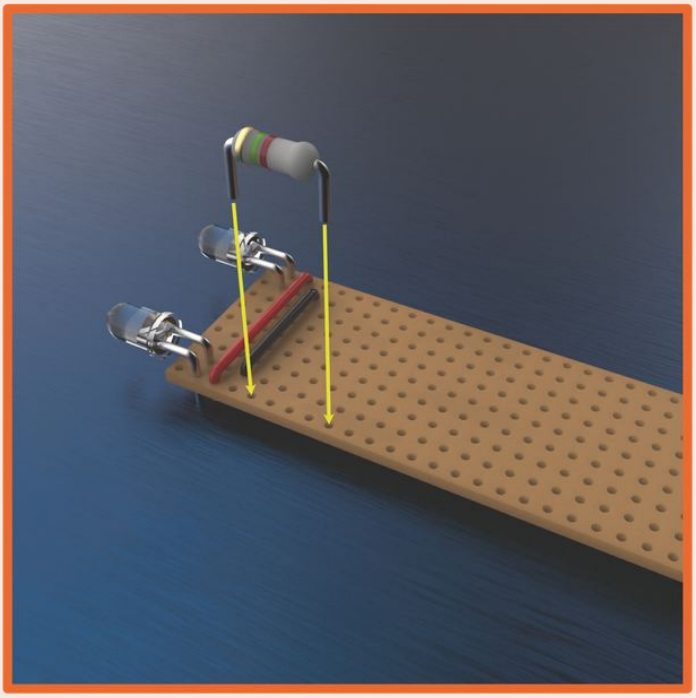


11. Flip your board over and solder the wires to the prototype board.

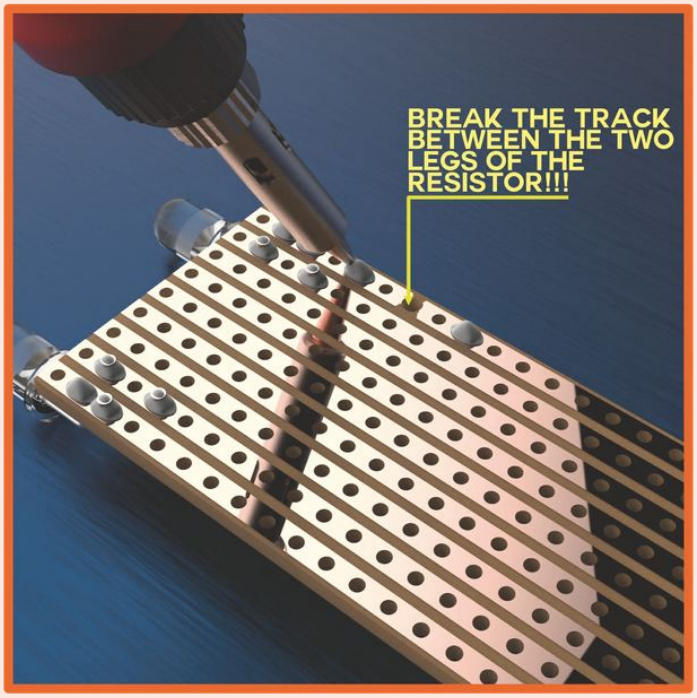


12. Check your wires are tidy and are secured to the prototype board.

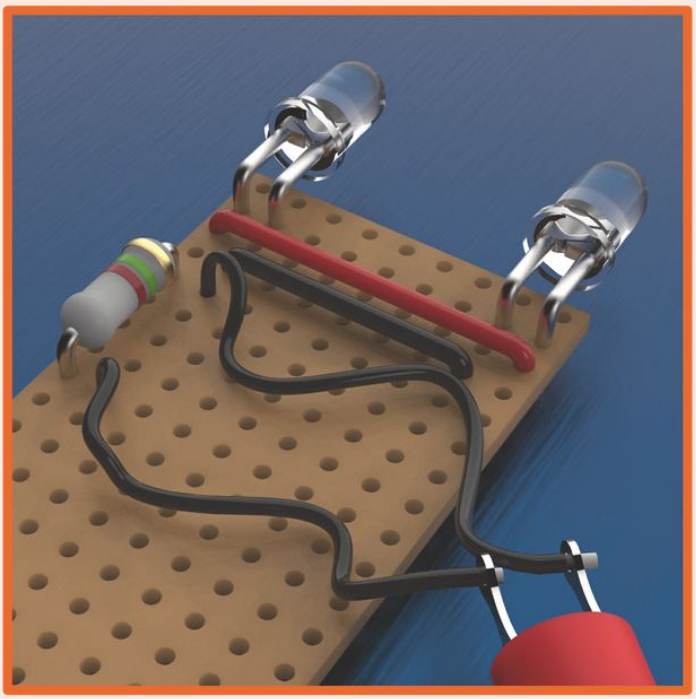
ATTACH THE RESISTOR & SWITCH



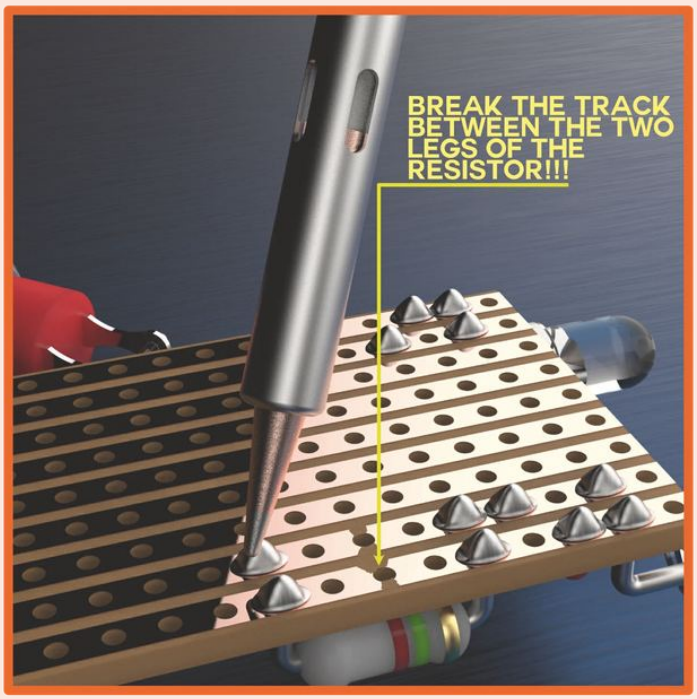
13. Time to stop the voltage frying those little LEDs. We do this by adding a resistor in series. Bend over the legs of the resistor and insert it into the holes. The direction of the resistor doesn't matter.



14. Okay, this is critical. Seriously. Stop.
Solder the resistor to the board. Easy.
Now... BREAK THE COPPER TRACK BETWEEN THE RESISTOR LEGS! OTHERWISE BAD THINGS HAPPEN TO THOSE LITTLE LEDs!



15. Insert in two BLACK wires for the switch, and solder these to your switch too. Solder these black wires to the board and again BREAK THE COPPER TRACK BETWEEN THESE WIRES!



16. Okay, now get your teacher to check your circuit. They will then show you how to connect your power supply wires. This is to stop you causing damage by rushing ahead... And to make sure you followed these instructions! :)



COURSE NOTES V1.1