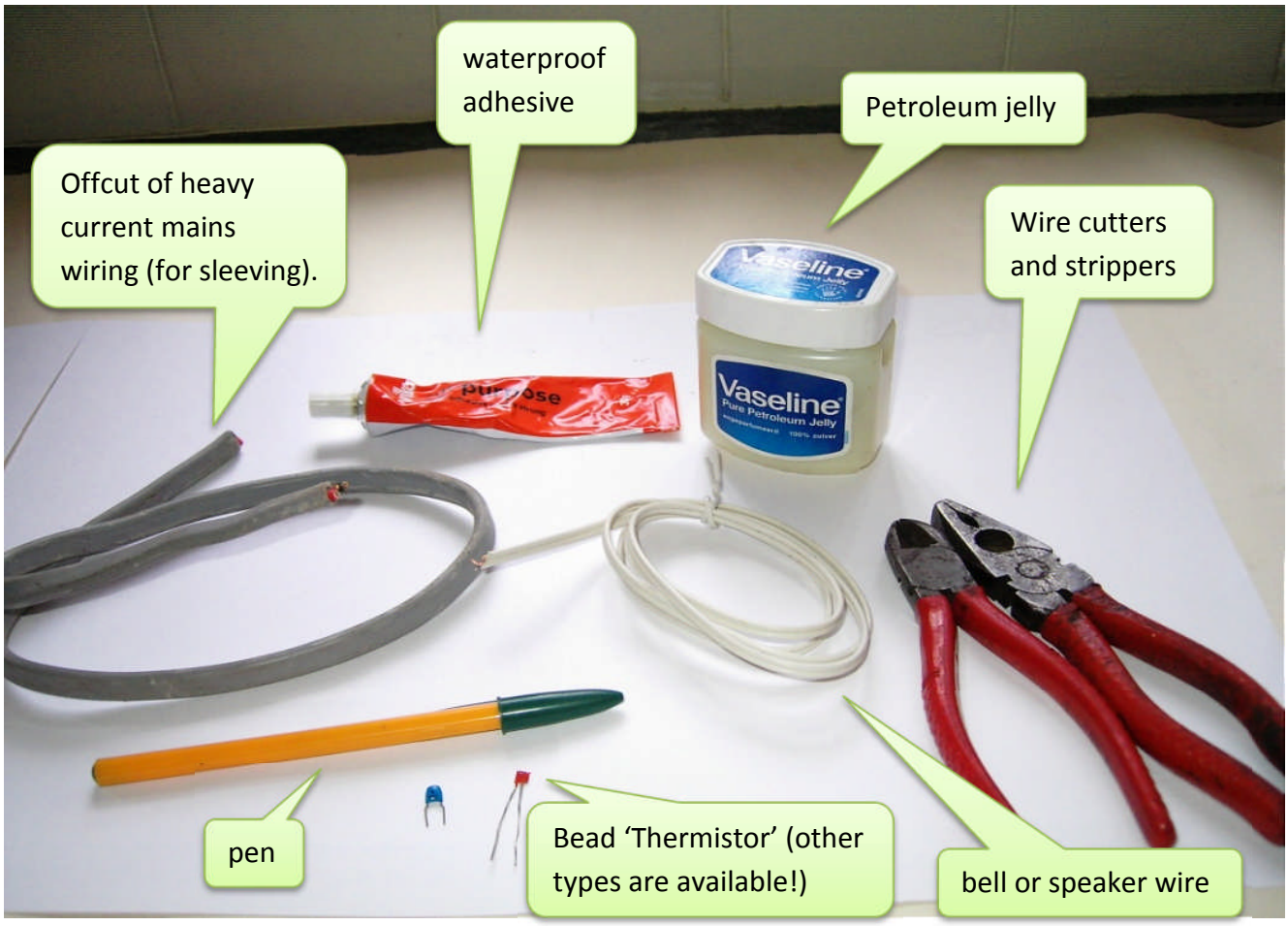
How to make your own Thermometer

This describes how to make a thermometer to measure temperature using a thermistor (temperature sensor). It is important that the thermistor and all connections are protected from contact with water.

Note: *When properly sealed this sensor can be used in warm and cold water – it is important that you* ***not use it in boiling water.***

Ingredients: Bead 'Thermistor', pen, bell or speaker wire, offcut of heavy current mains wiring, waterproof adhesive, wire cutters and strippers, petroleum jelly.

(Hint 1: choose the thinnest bell or speaker wire you can find; it will be threaded through the pen.)



Safety: Please note that you use these resources at your own risk. Correct use of some components requires care.

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Hardware funded by National HE STEM Programme (Engineering).

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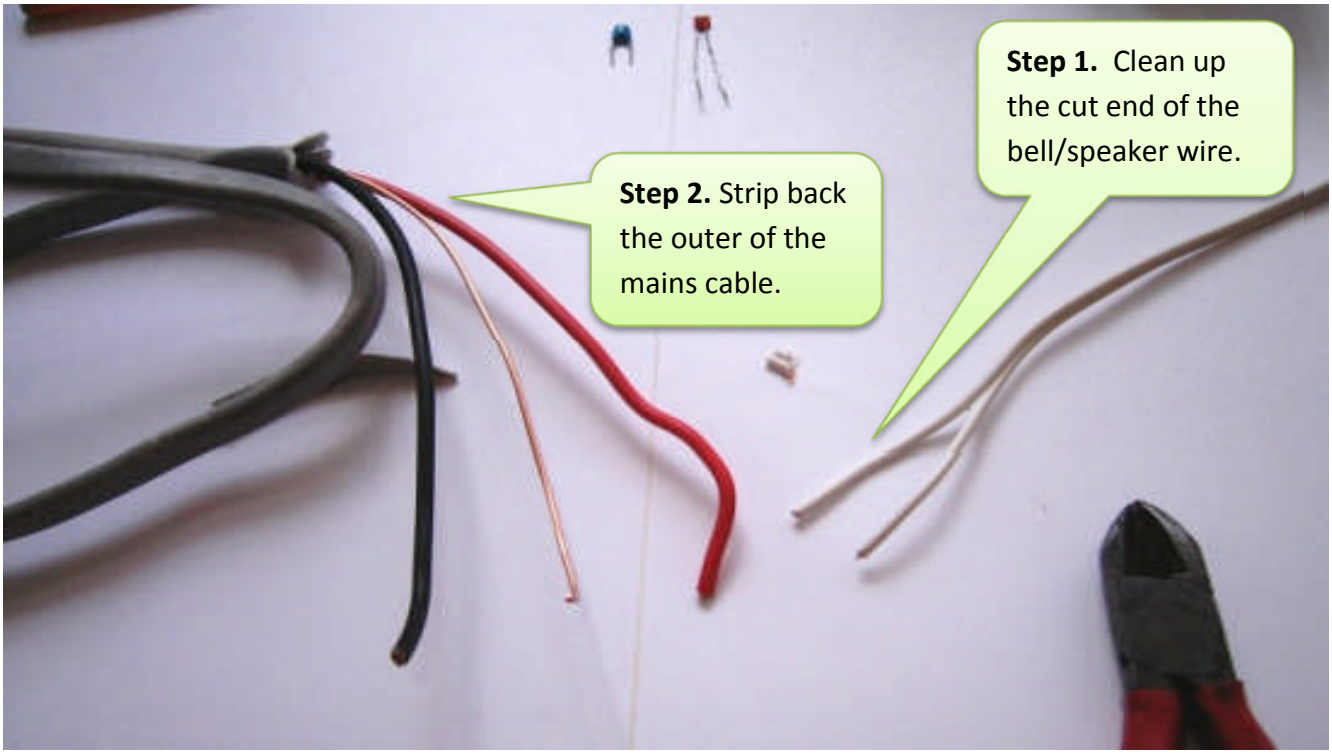

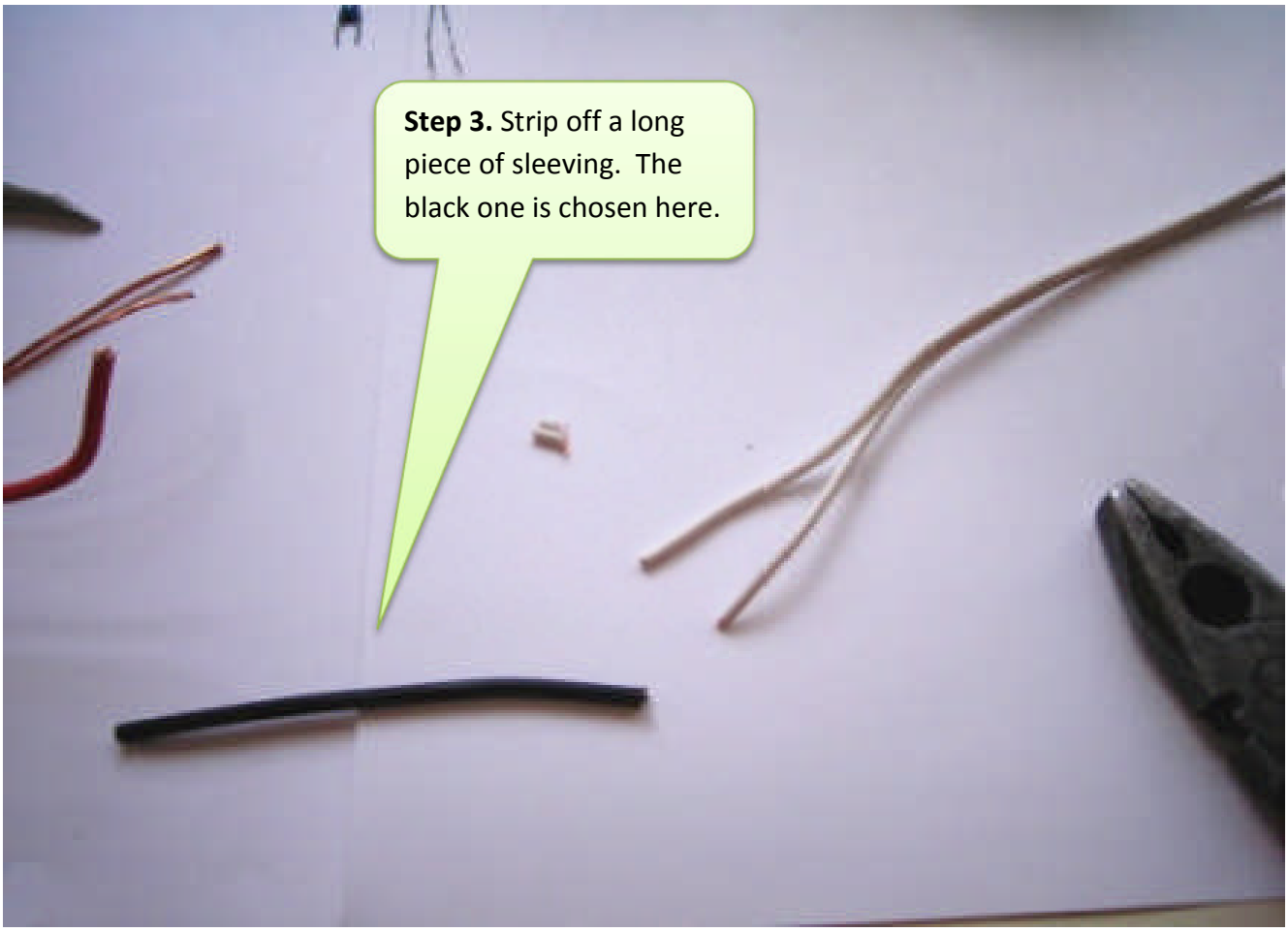

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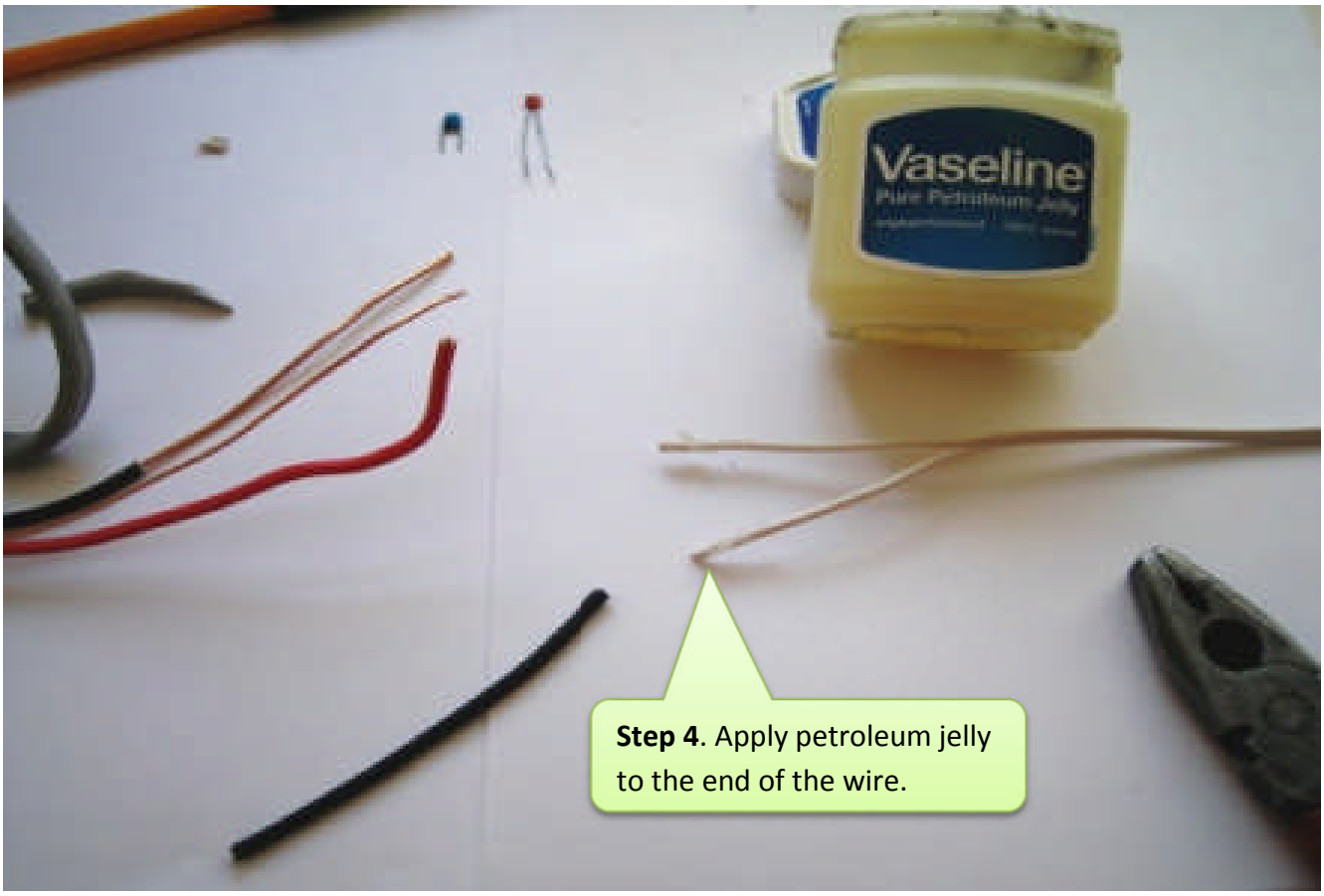

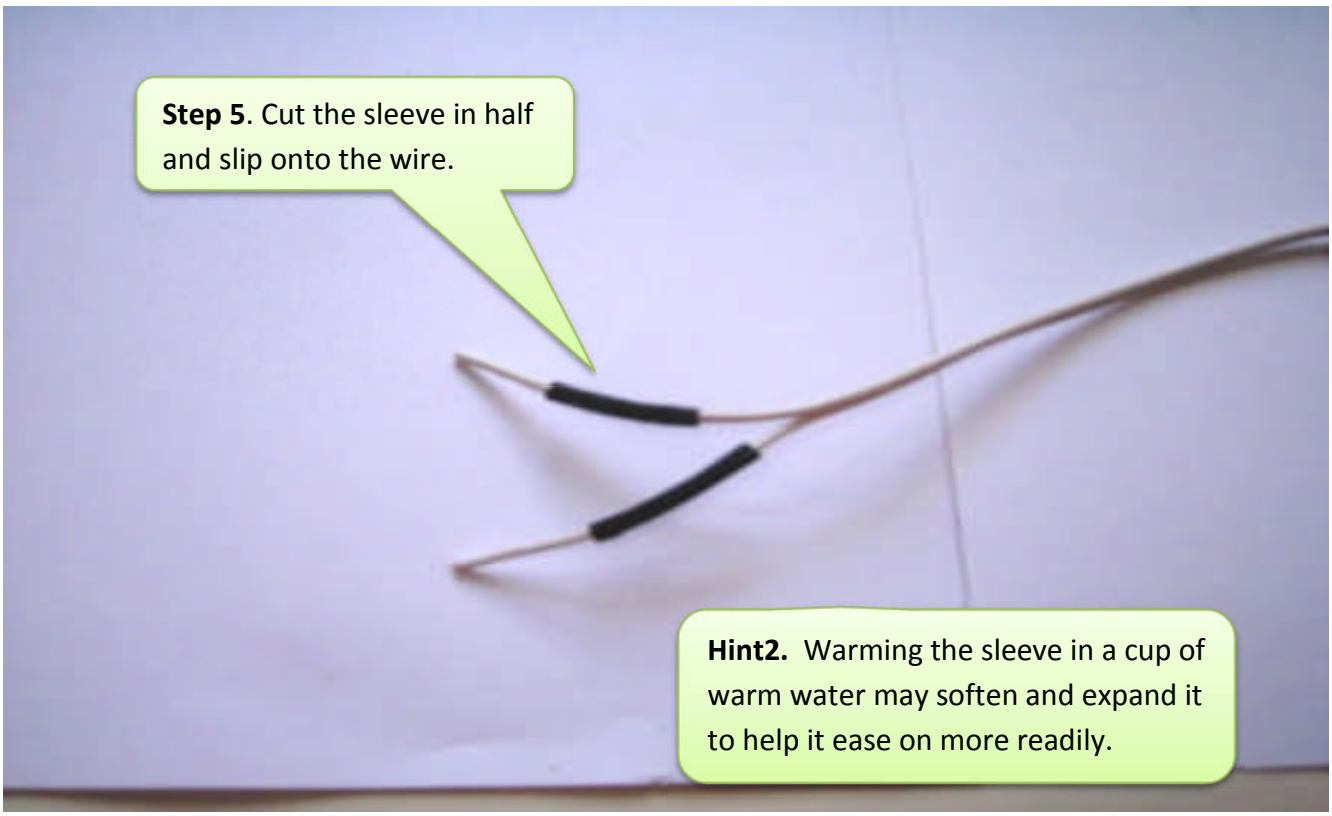

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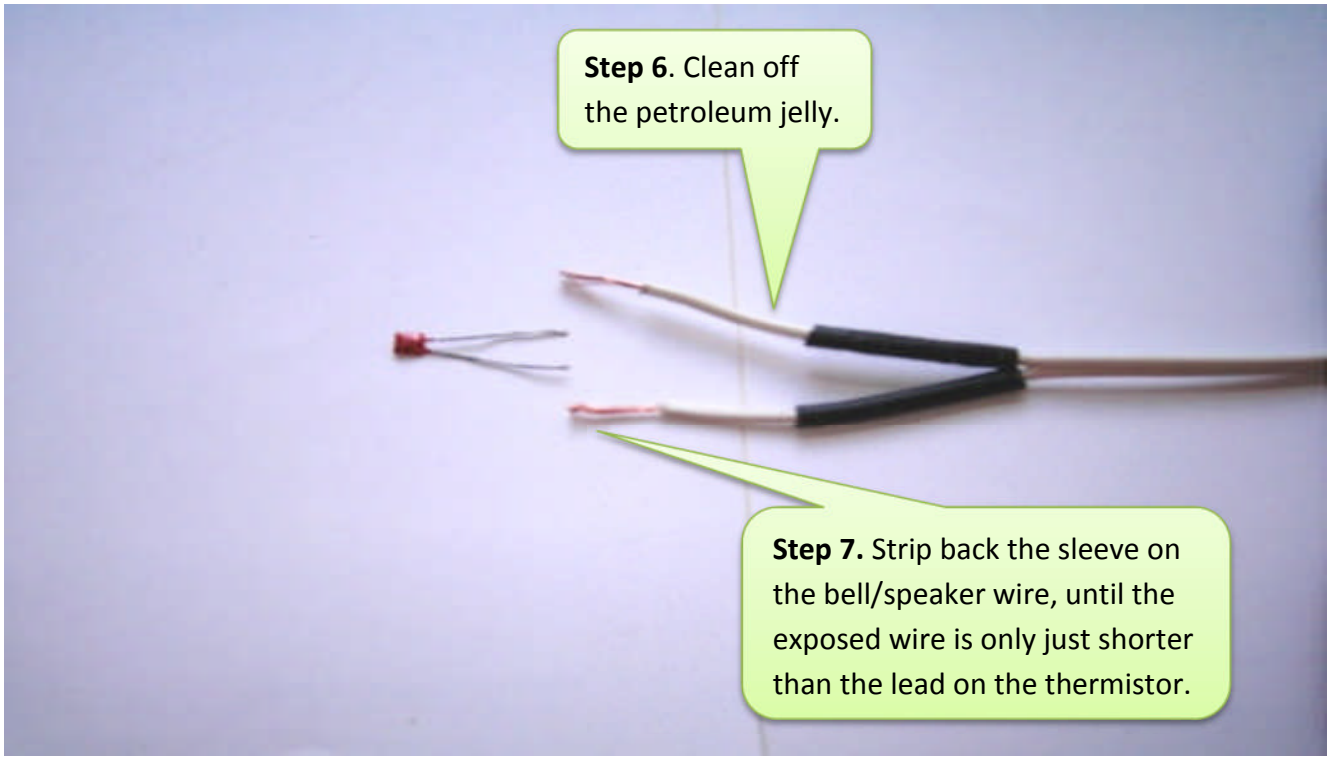

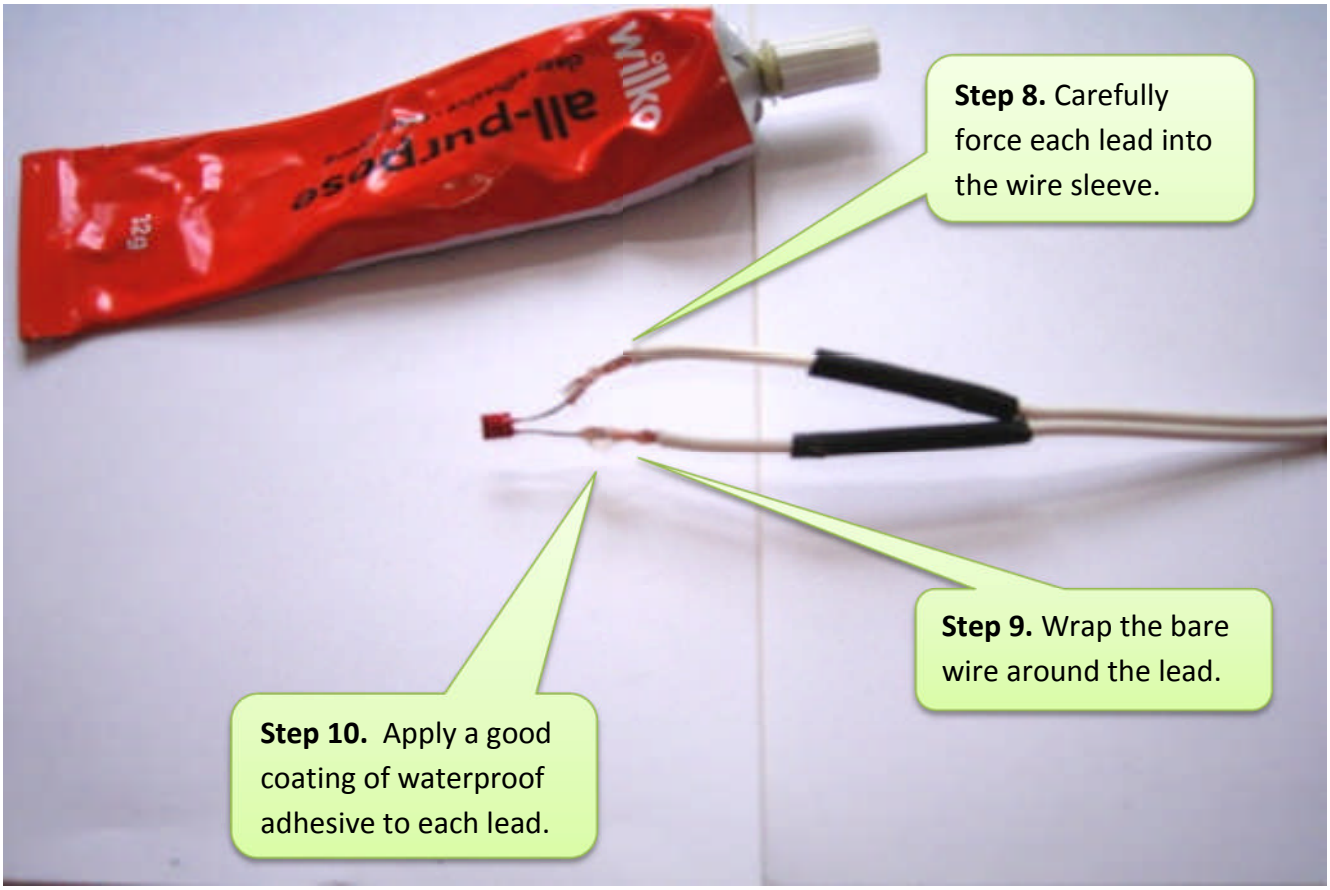

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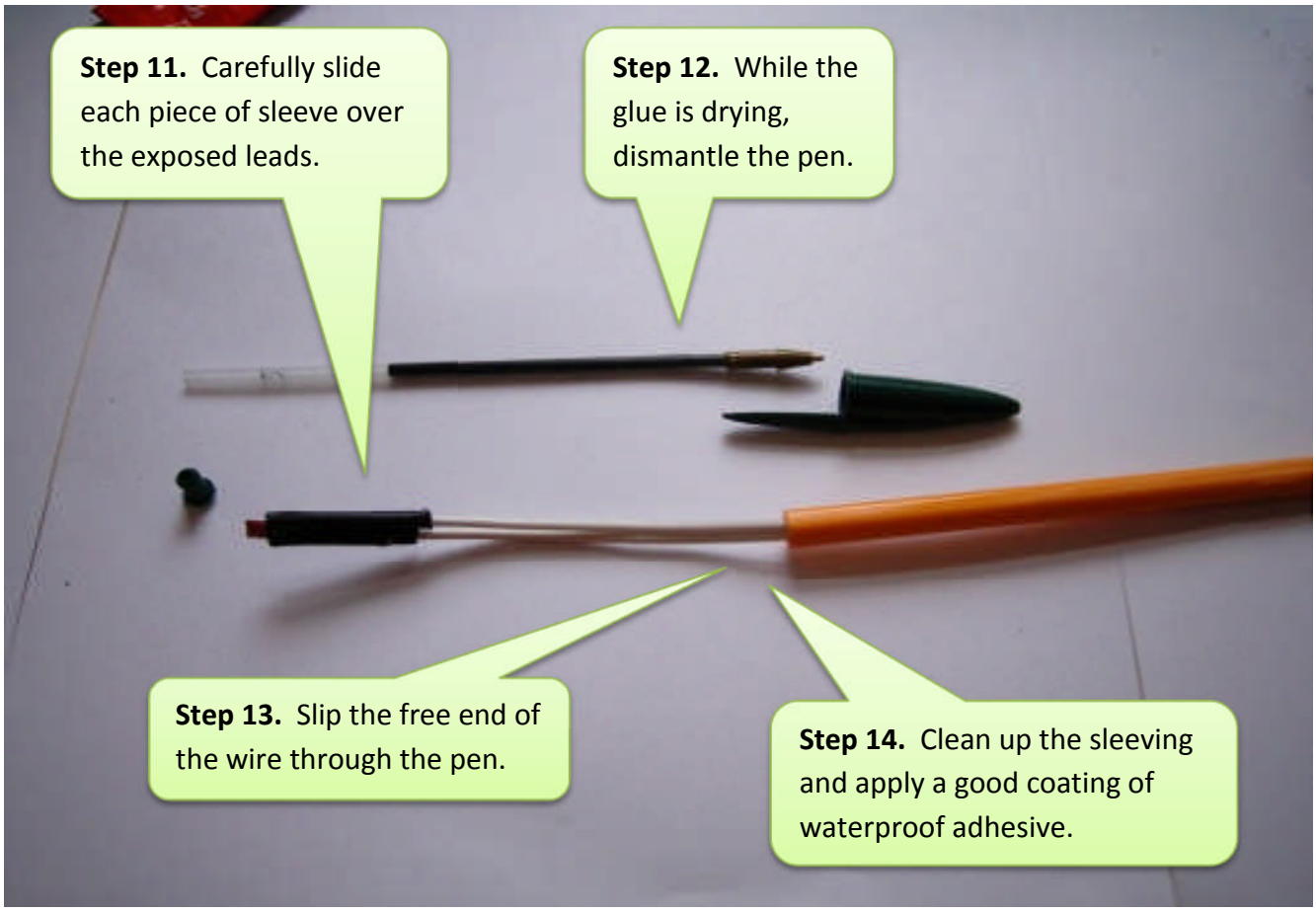

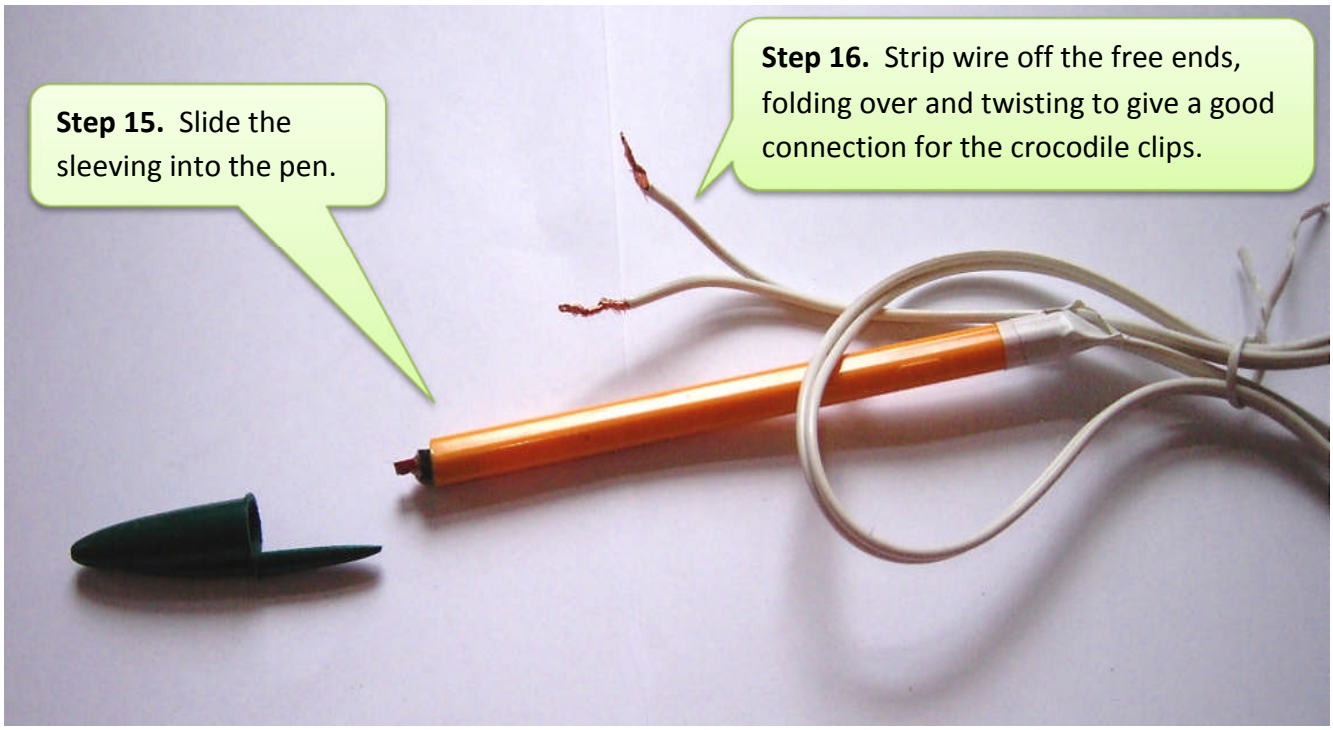

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The science bit.

A thermistor is a heat dependant resistor; its resistance varies indirectly with temperature: as it gets hotter its value gets lower. Manufacturers aim to get them as small as possible so they don't take too much heat from the thing you are trying to measure...which is why it is suggested you mount it in an old biro, with a nice long lead to keep your fingers away from the heat.

Using the temperature sensor

Now you need to calibrate your home made temperature sensor. It is unlikely that the scale will be linear (in a straight line), therefore in order to calibrate it, you need to take a range of readings from your temperature sensor, when its connected to the sensorboard, for the temperatures you want to work with. Plot these values on a graph (temperature on one axis and sensorboard readings on the other).

Use a normal thermometer to note the exact temperature of the water and make a note of the scratchboard readings for your home made sensor. Its suggested you start taking readings of water at 40^{O}C and use ice cubes to drop the temperature, giving a wider range of values. Take regular readings from the thermometer and your home made sensor, adding ice cubes to keep reducing the temperature.
NOTE: keep the sensorboard away from water!

Plotting these readings on a graph will give you a picture of how your home made sensor responds to changing temperatures.

Finally develop a scratch program that translates the home made sensor readings into temperatures.
Hint: start by getting your program to identify when the temperature is in ranges *cold, warm* or *hot*. You can define the boundary values for these ranges as you wish.

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