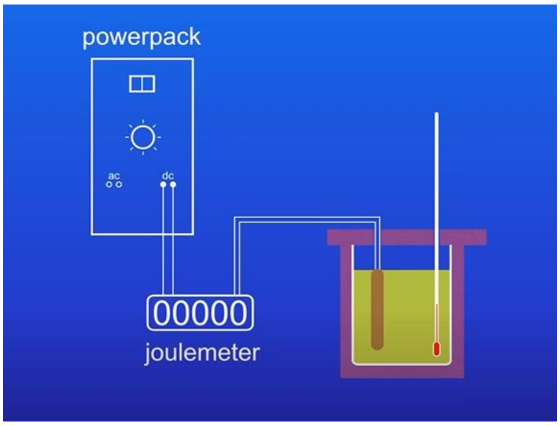
<u>Required practical – Specific heat capacity:</u>

How to perform for vegetable oil:

1. Place a beaker on a balance and set it to zero
2. Now add the vegetable oil and record the mass
3. Now place a thermometer and an immersion heater into the oil
4. Read the starting temperature
5. Wrap the beaker in insulating foam
6. Connect a joulemeter and a power pack to the immersion heater
7. Time for half an hour
8. Read the total joules on the joulemeter
9. Read the final temperature of the oil
10. Calculate the specific heat capacity using the equation rearranged



There may be inaccurate results:

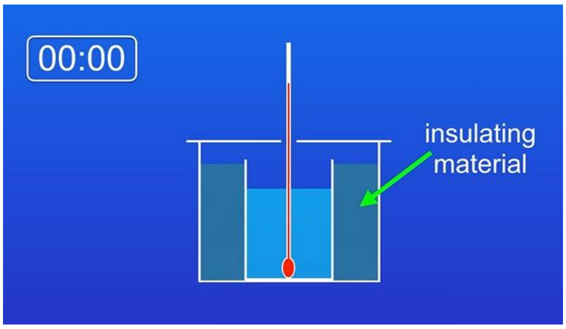
- Thermal energy has passed out of the beaker into the air, we can use an insulator with a much more lower thermal conductivity
- Not all thermal conductivity is passing into the oil, we can fully submerge the immersion heater

- We may misread the thermometer, we can use an electronic probe
- Thermal energy not being spread in oil, we can stir the oil

<u>Required practical – Thermal insulation:</u>

How to perform:

1. First we place a small beaker inside a larger beaker
2. We then use a kettle to boil water
3. Pour 80cm^3 of the hot water into the small beaker
4. We use a cardboard lid with a hole in the middle to place a thermometer
5. We record the initial temperature of the water and start the stopwatch
6. We need to record the temperature every three minutes for fifteen minutes
7. We repeat the experiment except that we use insulating material to fill the gap between the two beakers
8. We can use different insulating materials



Independent variable – The type of insulating material

Dependent variable – The temperature

Control variable – The volume of water in the beaker and the mass of the insulating material

We can record the results into the table

We can plot cooling graphs and see which one took the longest to cool down which makes it the most effective cooling down material

We can also the investigate the effect of thickness:

1. We can get a beaker and pour 80cm^3 of hot water
2. We can wrap the beaker with two layers of newspaper
3. We can double it each time

Required practical – Density:

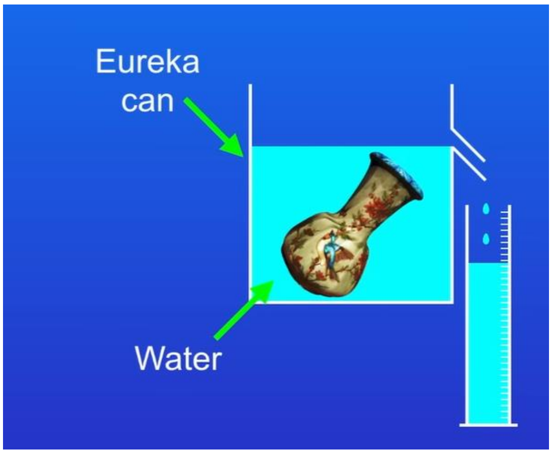
How to perform (regular objects):

1. Determine the mass of the cube
2. Find the volume of the cube
3. Calculate the density

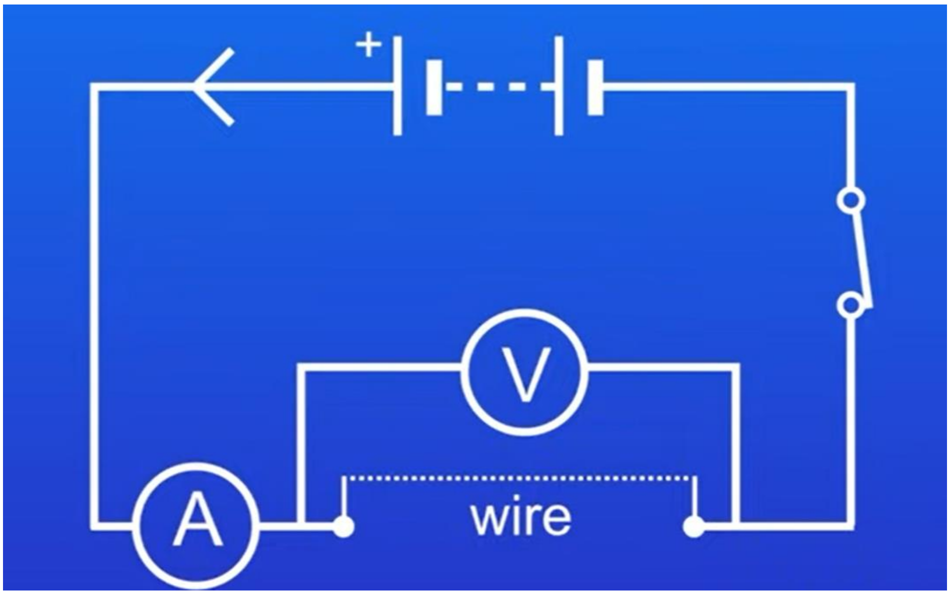
How to perform (irregular):

1. Find the mass of the object using a balance
2. Fill a eureka can with water until the water will flow out of the spout
3. Place a measuring cylinder below the spout

4. Place an object into the water very slowly. This will cause water to be displaced
5. Measure the volume of the water displaced
6. Calculate density



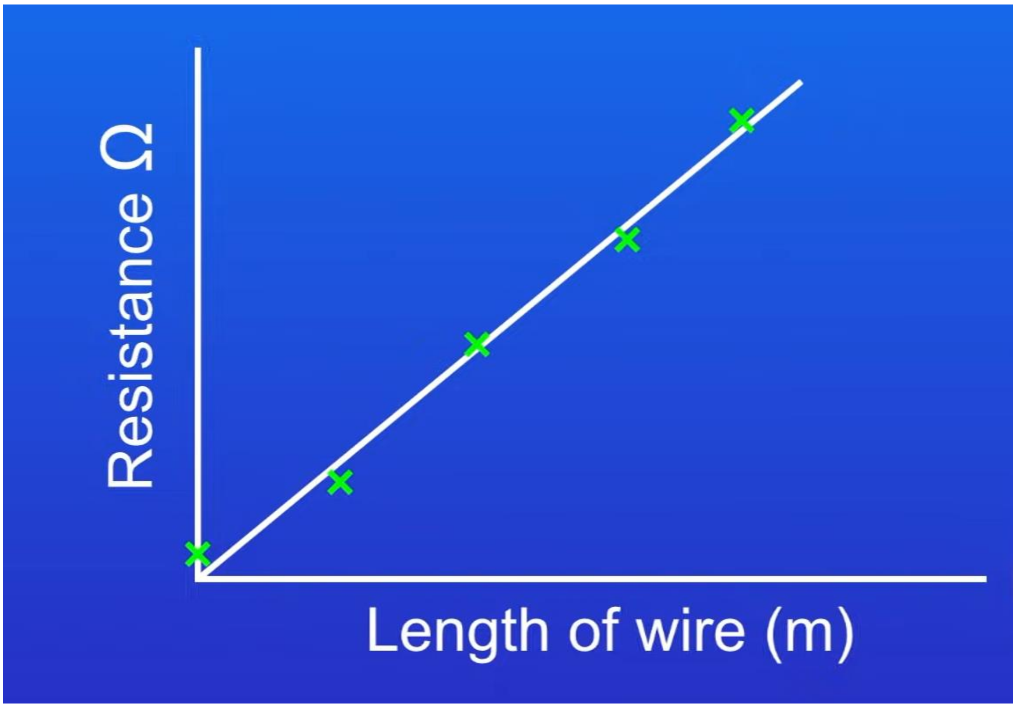
Required practical - resistance:



Steps:

1. Connect a battery pack to the circuit.
2. Connect an ammeter to measure the current.
3. Connect the voltmeter to measure the potential difference.
4. Attach a wire to a meter ruler using tape
5. Connect the wire to the circuit using two crocodile clips.
6. Turn off the circuit in between readings to stop the wire from overheating.
7. Move the crocodile clips further apart to increase the length of the wire.
8. Record the readings for each of the different lengths and write these results into a table.
9. Calculate the resistance using the equation – $R = V/I$
10. Plot a graph to show the relationship between the resistance and the length of the wire

This is what the graph should look like:



The resistance of the wire is directly proportional to the length of the wire

Problems with this practical:

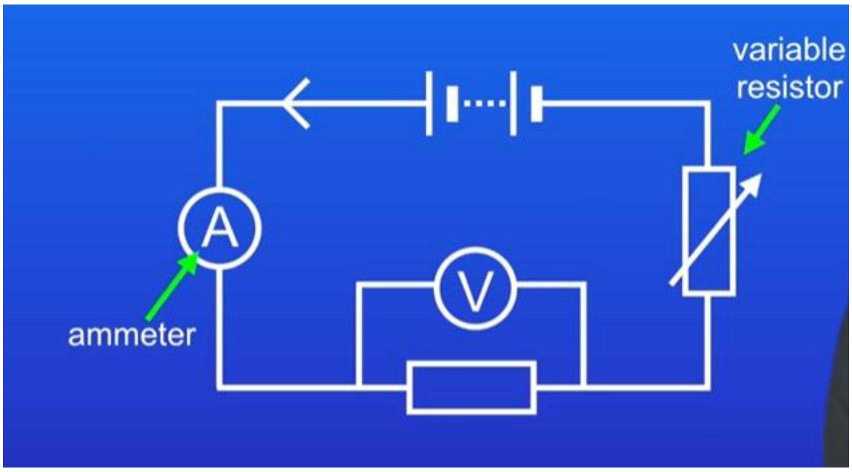
- There is a small resistance when the length of the wire is 0m (zero error – A value on the instruments that should be zero but isn't)

  Solution – Subtract amount from result
- The crocodile clip is not at zero on the meter ruler
- There is also resistance caused by the contact between the crocodile clip and the wire
- If the temperature of the wire increases, the resistance will also increase.

  Solution – Use a low potential difference which will help keep the current low and stop it from overheating

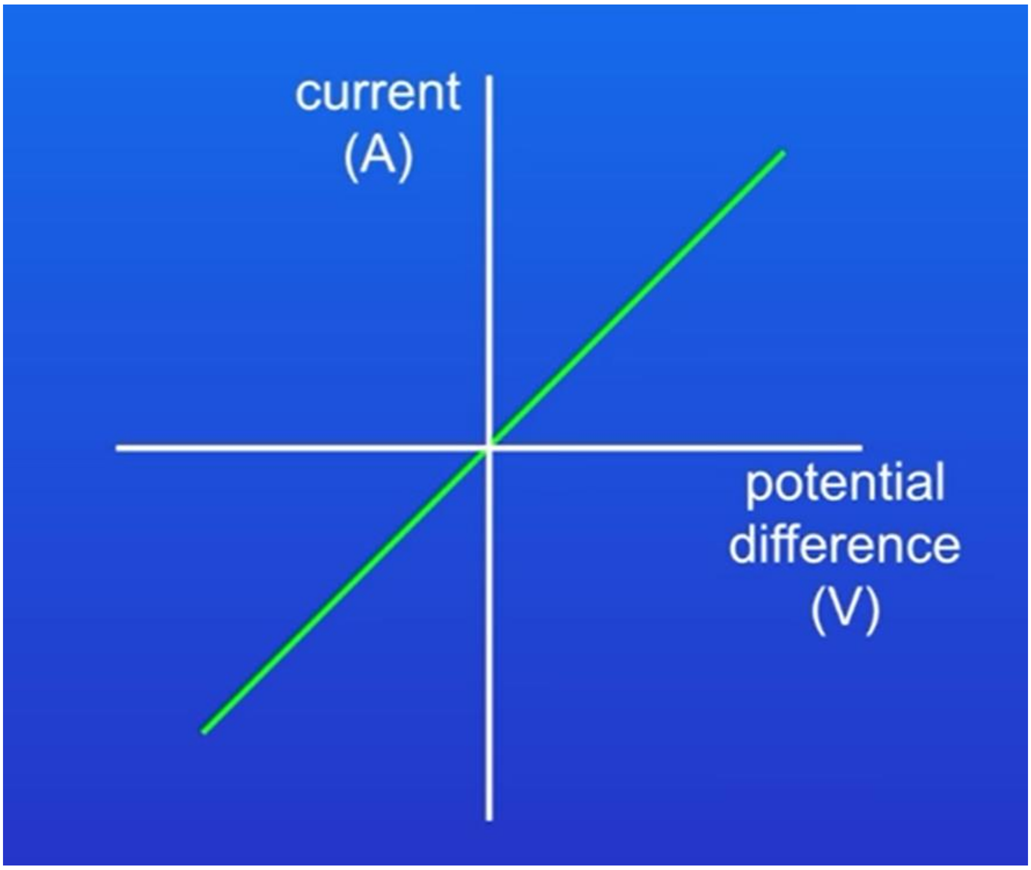
Solution – Turn off the circuit between readings.

Required practical – I/V characteristics of components:



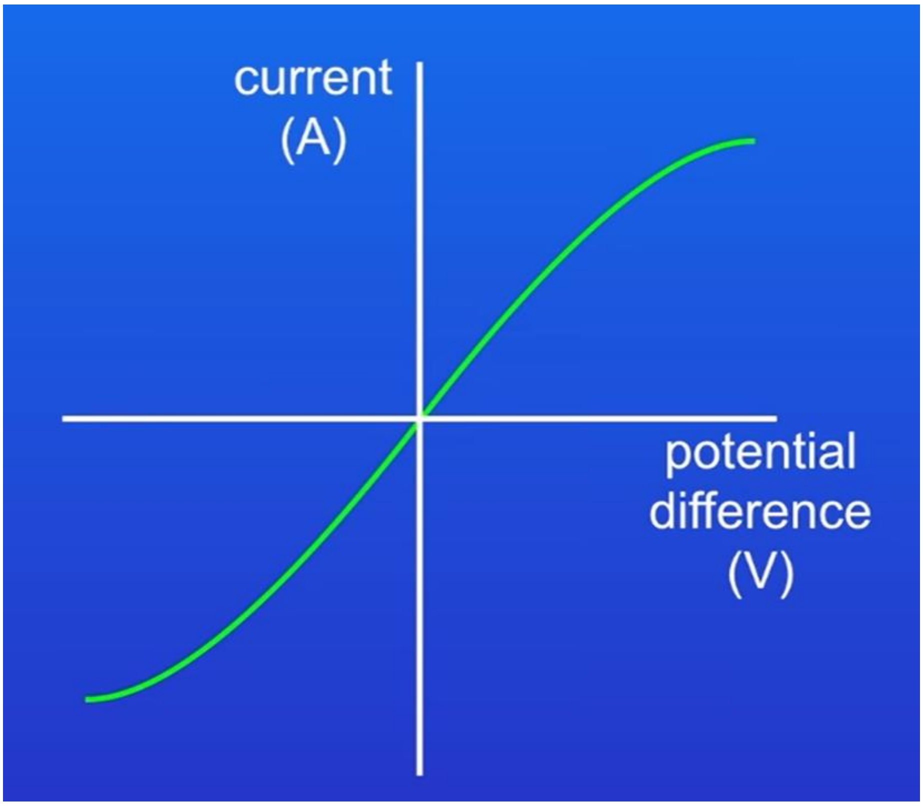
1. Connect a battery pack to the circuit.
2. Connect an ammeter to measure the current
3. Connect a resistor.
4. Connect a voltmeter which takes readings of the resistor.
5. Connect a variable resistor.
6. Use the voltmeter to read the potential difference across the resistor.
7. Use the ammeter to read the current through the resistor.
8. Record these results in a table
9. Adjust the variable resistor by sliding the slider and record the new readings
10. Do this several times to get a range of readings
11. Switch the direction of the battery
12. There should be negative values now
13. Take several readings of the negative values

14. Plot a graph using the data from the table showing the relationship of the current and the potential difference:



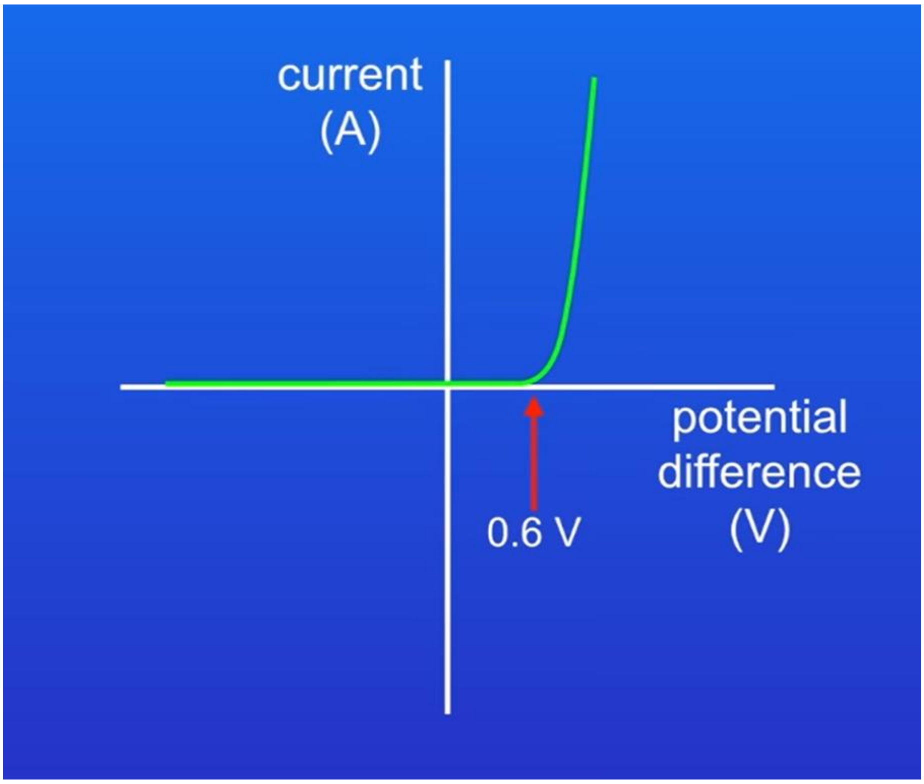
Now replace the resistor with the filament lamp and repeat these steps

The graph for the filament lamp in this practical:



1. Now repeat this experiment with a diode replacing the filament lamp.
2. Add an extra resistor to the circuit – This is because diodes are damaged by high currents. The extra resistor will keep the current low and protect the diode
3. Replace the ammeter with a milliammeter because of the sensitive results
4. Repeat the steps of the first time

The graph for the diode:



There are no negative values because the diode has a high resistance in the reverse direction