INVESTIGATION OF THE VARIATION OF RESISTANCE WITH TEMPERATURE FOR A METAL WIRE

Specification reference: **AS Component** **2.2 – Resistance**

A level Component **2.2 – Resistance**

Theory:

Resistance increases with temperature for metals in a linear relationship. This practical will enable data to be obtained to investigate this relationship.

Apparatus:

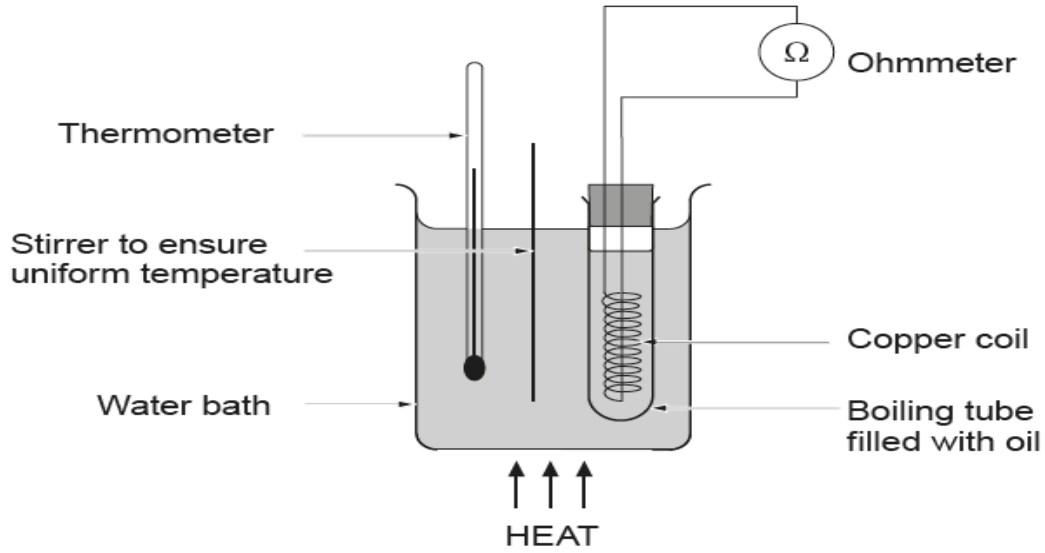
Bunsen burner; tripod, gauze and stand
250 ml beaker of water or water bath with heating element
Ice
Thermometer 0 – 100 °C
Multimeter set on ohm range to measure resistance
Copper coil
Stirrer

Further Guidance for Technicians:

A fixed d.c. voltage supply can be used with an ammeter and voltmeter instead of the ohmmeter, if preferred. The resistance can be determined by using $R = V/I$. The coil can be placed in a boiling tube full of oil and then placed in the water bath or in ice.

Experimental method:

The circuit should be set-up as follows:



The water bath should be heated and the water stirred continuously in order to ensure an even temperature throughout the water bath. Once the required temperature has been reached then remove the heat and record the reading of resistance or take the ammeter and voltmeter readings. This process should be repeated at intervals until the water boils.

Repeat the experiment during cooling. Plot a graph of resistance (y-axis) against temperature (x-axis). This should be a straight line through the origin.

An ice water mixture can be used to record the resistance at a temperature of 0 ^{o}C.

Extension:

The variation of resistance with temperature for a thermistor could also be investigated. *Data Logging*: Digital ammeters, voltmeters and thermometers could be used that are part of a data logging set up.

Practical Techniques:

- Use appropriate analogue apparatus to record a range of measurements (to include length/distance, temperature, pressure, force, angles, volume) and to interpolate between scale markings.
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- Use calipers and micrometers for small distances, using digital or vernier scales.
- Correctly construct circuits from circuit diagrams using D.C. power supplies, cells, and a range of circuit components, including those where polarity is important.
- Use ICT such as computer modelling, or data logger with a variety of sensors to collect data, or use of software to process data.

Relevant previous practical past papers:

- PH6 2014 Data analysis task