NEATH PORT TALBOT COLLEGE
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School of Maths & Science
Science Practical

Specific Heat Capacity by an Electrical Method

◆ Aim

In this activity you will make measurements to calculate a value for specific thermal capacity and consider some of the uncertainties in the measurements you have made.

◆ Introduction

The value of the specific thermal capacity of a material tells us how much energy is needed to change the temperature of one kilogram of the material by 1 degree. It is an important measurement for engineers and physicists who work with any material that changes its temperature or is designed to retain thermal energy

◆ Safety

Control Measures

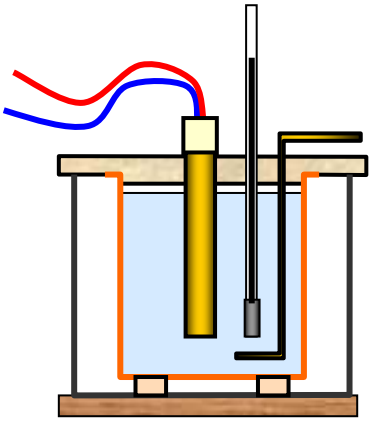
- You are reminded of the need of good laboratory practice in order to maintain a safe working environment.
- **Goggles and lab coats must be worn at all times.**

Hazards

General hazard. Take care with heating apparatus and hot metal blocks.

◆ Apparatus required

1 kg metal block, 12 V immersion heater, thermometer, 0 – 100 □C, power supply, 0 – 12 V rated to supply 6 A, 4 mm leads, two digital multimeters and a stopwatch.



◆ Procedure

1. Insert a thermometer and the immersion heater into their respective holes in the block. You may wish to drop a small amount of oil into the thermometer hole to improve the thermal contact between thermometer and block.
2. Allow the thermometer to reach thermal equilibrium and then write down the temperature.
3. Set up a suitable circuit that will enable you to measure the energy input to the heater.
4. Turn on the power, noting the time, current and voltage.
5. Monitor and note the meter readings as the energy is supplied each time the block heats up by 10 ^{o}C. Record your results in the table below.

Time / s									
Current / A									
Voltage / V									
Temperature / ^{o}C									

6. Plot a graph of temperature against time for the heated metal block.
7. Use the graph and the following equations to calculate to calculate the specific thermal capacity, c, of your block.

$$E = I\,T\,V$$

$$E = m\,c\,\Delta\,\theta$$

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8. Compare your answer with a data book value.

9. Was your calculated value of specific thermal capacity too high or too low? Determine the percentage difference between the experimental value of the specific heat capacity and the value from the data book.

10. Which of the measurements you made is likely to be the one most in error?

11. Using the graphs and your answers to the two sections above comment on the accuracy and reliability of the experiment.