GCSE Physics required practical activity 1: Specific heat capacity

Student sheet

Required practical activity	Apparatus and techniques
An investigation to determine the specific heat capacity of one or more materials. The investigation will involve linking the decrease of one energy store (or work done) to the increase in temperature and subsequent increase in thermal energy stored.	AT 1, AT 5

What is the specific heat capacity of copper?

In this investigation you will heat up a block of copper using an electric heater. You will measure the mass, the work done by the heater and the temperature. You will plot a graph of temperature against work done and use the gradient of this graph, and the mass of the block, to determine the specific heat capacity of copper.

Learning outcomes
1 **2** **Teachers to add these with particular reference to working scientifically**

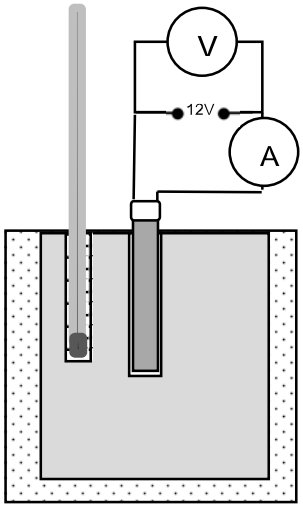
Method

You are provided with the following:

- copper block wrapped in insulation, with two holes for a thermometer and heater
- thermometer
- pipette to put water in the thermometer hole
- 30 W, 12 V heater and power supply
- insulation to wrap around the blocks
- ammeter and voltmeter
- five 4 mm leads
- stop watch or stop clock
- balance

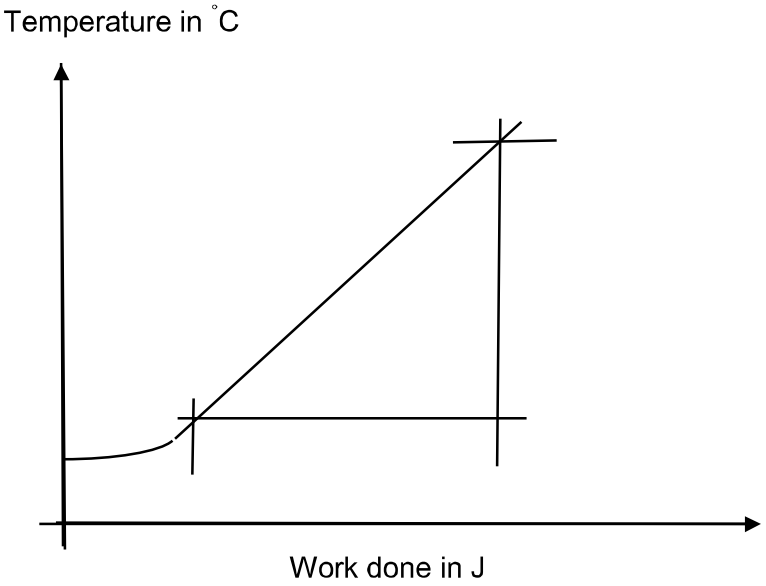
You should read these instructions carefully before you start work.

1. Measure and record the mass of the copper block, in kg.
2. Place a heater in the larger hole in the block. Connect the ammeter, power pack and heater in series.
3. Connect the voltmeter across the power pack.
4. Put a small amount of water in the other hole using the pipette.
5. Put the thermometer in this hole.
6. Switch the power pack to 12 V and switch it on.
7. Record the ammeter and voltmeter readings. These shouldn't change during the experiment.
8. Measure the temperature and switch on the stop clock.
9. Record the temperature every minute for 10 minutes. Your results table will need three columns. Notice that the time is measured in seconds, so the column will go 0, 60, 120, etc.



Time in seconds	Work done in J	Temperature in °C

10. Calculate the power of the heater in watts. To do this, multiply the ammeter reading by the voltmeter reading.
11. Calculate the work done by the heater. To do this, multiply the time in seconds by the power of the heater.



12. Plot a graph of temperature in ^{o}C against work done in J.
13. Draw a line of best fit. Take care as the beginning of the graph may be curved.
14. Calculate the gradient of the straight part of your graph.
15. The heat capacity of the block is 1/gradient.
16. The specific heat capacity is the heat capacity divided by the mass of the block in kg. Work out the specific heat capacity of the material of the block.
17. If you can, repeat this experiment for other blocks such as aluminium and iron. There is a suggestion that if metal blocks have the same mass, the bigger the volume: the bigger the specific heat capacity. Is this true for the blocks you tested?