TAP 607- 2: The specific heat capacity of water and aluminium

This experiment is designed to measure the specific heat capacities of water and aluminium.

Before starting the experiment read through the instructions carefully.

You will need:

* 12 V immersion heater 60 W
* aluminium saucepan
* 1 kg block of aluminium
* thermometer
* 12 V power supply (6 A)
* stop clock
* balance
* 2 digital multimeters

What to do

1. Water

Put 1 kg of water in the saucepan and measure its temperature. Now hold the heater in your hand and switch on the power supply. When you feel the heater getting warm put it in the water and start the stop clock. After 10 minutes switch off the power supply, stir the water and take its temperature. Allow the heater to cool in air.

2. Aluminium

Put the thermometer in the small hole in the aluminium block. Switch on the heater and when it is warm put it in the large hole in the block and start the stop clock, having recorded the initial temperature of the block. After 10 minutes switch off the power supply and take the temperature of the block.

Safety

Check the seals on the immersion heaters before use. Reject any that are obviously defective. In doubtful cases, any water which has entered during a precious activity can be removed by placing the heater in an oven for an hour at about 80 °C.

Measurements to make

Mass of water (m) = kg

Temperature of water before heating = oC

Temperature of water after heating = oC

Rise in temperature of water () = oC

Voltage applied to heater (V) = V

Current through heater (I) = A

Electrical energy converted to heat energy in 10 minutes = J

Heat energy required to heat m kg by oC = J

Specific heat capacity of water = J / (kg oC)

Make up a similar set of results for aluminium.

Questions

1. Why do you think that you allowed the heater to warm up before putting it in the water?
2. Why will your result for either experiment not be very accurate?
3. Why should you stir the water at the end?
4. Why would it not be a good idea to get the water or aluminium too hot?

Follow up topic

Devise an experiment to measure the specific heat capacity of soil.

Practical advice

After switching off the heater make sure you take the highest temperature reached by the thermometer in the aluminium block.

External reference

This activity is taken from Resourceful Physics