

Specific Heat (c)

The amount of energy that raises the temperature of 1 kg of a substance by 1°K is called the **specific heat** of that substance. The symbol for specific heat is *c*.

Suppose you do an experiment in which you add energy to water, either by doing work on it or transferring heat to it. Either way, you will find that adding 4190 J of energy raises the temperature of 1 kg of water by 1 K.

Purpose: To calculate the specific heat of a metal sample.

Apparatus:

- Metal Sample
- Sensitive balance.
- Water.
- Heater with stirrer. محرك
- Beaker.
- An insulated container.
- Stand with clamps.

Glass Thermometer

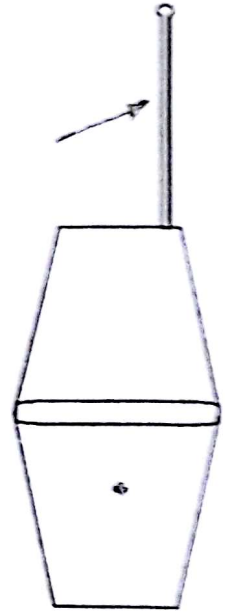


Figure: insulated container

Steps:

- 1- Start with finding the mass of the metal sample by a sensitive balance.
- 2- Heat the sample to 100°C or approximately 100°C in case of not getting the exact temperature.
- 3- Measure 100ml water at room temperature (use a gradual cylinder).
Remember that 1ml = 1g (for water). Then,
 $100\text{ml} = 100\text{g}$ صب
- 4- Pour the 100ml water in an insulated container (or calorimeter). (This container will not gain heat so that water gain all the energy lost from the heated metal). حاوية مسعر
- 5- Measure the temperature of water in the container with a lab thermometer.
- 6- Heat a beaker with water to the boiling degree and put the metal inside it without touching the bottom.

- 7- Fix a lab thermometer so that the bulb of it is in the same level as the metal.
- 8- Wait long enough till you be sure that the temperature of the metal is the same as the boiling water.
- 9- Take the thermometer reading (this will be the initial temperature for the metal).
- 10- Take the reading of 100ml of water in the container (this is the initial temp. of water).
- 11- Raise the metal and quickly put it in the insulated container. Put the cup on it to avoid losing heat to the environment.
- 12- Shake the container to be sure of getting a uniform temperature.
- 13- When reading stop changing we record that temperature. (This is the final temp. for both the water and metal).
- 14- Arrange the following table:

	Initial T(°C)	Final T(°C)	Mass (g)
Water			100g
Metal			

$$C_w = 4190 \text{ J/Kg}^\circ\text{K}.$$

Calculate the specific heat for the metal sample by applying the equation:

$$Q = MC\Delta T$$

Questions:

- 1- Why we avoid the metal touching the bottom of the beaker.
- 2- Why the lab thermometer should be in the same level as the metal.
- 3- Which is longer waiting till the metal getting 100°C temperature or waiting till the metal lose its heat in the container?
- 4- Can we use this method to identify a metal? Explain.