التجربة الاولى

اسم التجربة:- السعة الحرارية للمسعر

The heat capacity of the calorimeter

The purpose of the experiment:-

Determine the heat capacity of the calorimeter

Used equipment's :-

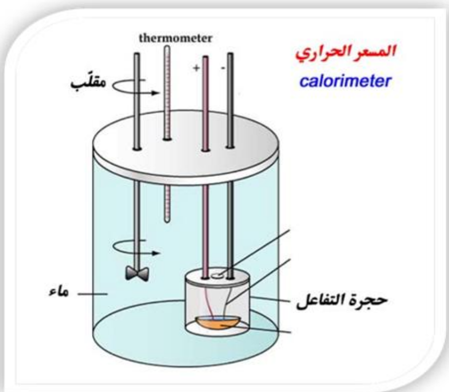
Calorimeter, thermometer, beaker, graduated tester, stop watch, heater, scales.

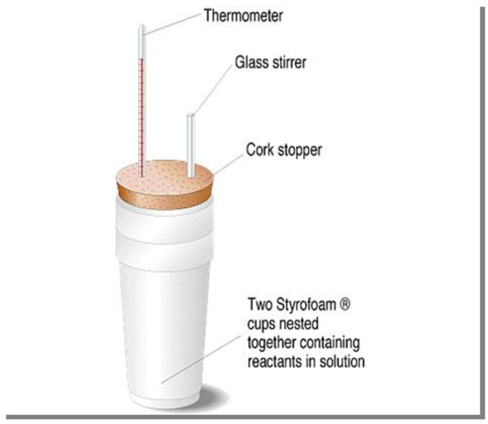
Theory :-

A calorimeter is a device used in chemical laboratories to measure the amount of heat produced by chemical reactions or the heat generated by physical changes in addition to measuring the specific heat of materials.

Principle of work: - It depends on the law of energy conservation in a closed and isolated system so that no heat enters the system from outside and no heat exits from it to the surrounding medium.

- Of the simple calorimeters that can be used in the laboratory are those shown in the following figure:





The heat capacity of the calorimeter is defined as: "the number of calories absorbed during the instant the calorimeter's temperature increases by one degree Celsius."

The idea of the experiment depends on mixing a known quantity of cold water with another quantity of known weight of hot water, so that the heat transfers from the hot water to the cold water. As it is assumed that the amount of heat lost from hot water is equal to the amount of heat gained from cold water, but by calculation there is a difference between them, and this difference represents the amount of heat transferred to the calorimeter.

Work steps :-

1- Clean and dry the calorimeter, then determine its weight while it is empty and let it be (W_c).

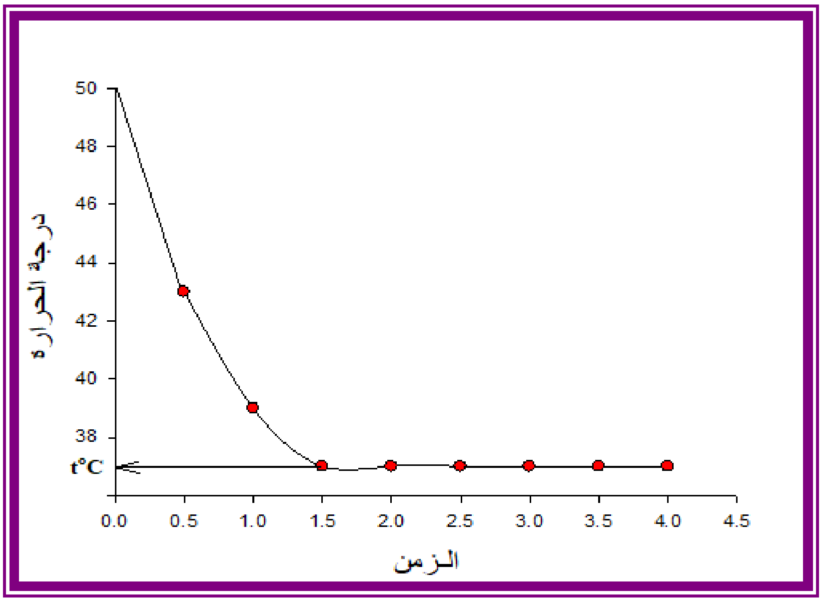
2- Put (50 ml) of distilled water in the calorimeter. This volume should be determined using a graduated cylinder, then the calorimeter and the water it contains should be weighed. Let it be (W_1).

3- The calorimeter is covered with the lid that contains the openings of the thermometer and the stirrer. It is stirred well and the temperature is recorded when it becomes constant or its change is slight and stable. Let it be (t_r) where (r) stands for room temperature.

4- When the temperature is fixed, (50 ml) of distilled water is quickly added to the calorimeter, which was previously heated in the glass beaker to (50 °C) and it is completely fixed at this temperature, and the degree is measured exactly and let it be (t_h). Where (h) stands for heating temperature, then the calorimeter cover is quickly returned. And weigh the calorimeter with its contents of cold and hot water, let its weight be (w_2)

5- He continues to stir the contents of the calorimeter while observing and recording the temperature every half minute for ten minutes or until it begins to stabilize for a period of two minutes or for four consecutive readings.

6- To accurately determine the final temperature, the relationship between temperature and time is drawn, by extending the line until the time is zero, that is, until the line intersects with the y-axis, and the cut-off value will be the representative of the temperature (t), as shown in the following figure, which is the final temperature of an ideal isolated calorimeter.



7- Calculating the heat capacity of the calorimeter taking into consideration that the specific heat of water is (1Call/g.C^o) as will be shown through the calculation method attached to the experiment.

Table of accounts

1- Measure the weight of the cold water

$$w_r = w_1 - w_c \quad g$$

2- Measure the weight of the final hot mixture

$$w_h = w_2 - w_c \quad g$$

3- Find Δt_1, which is equal to the change in temperature of the cold water as a result of mixing

$$\Delta t_1 = t - t_r \quad °C$$

4- The temperature change of hot water as a result of mixing Δt_2 is calculated as follows

$$\Delta t_2 = t_h - t \quad °C$$

5- apply the law:

$$q = C \times w \times \Delta t \quad cal$$

As the specific heat of water (1 Call/g.C^o) So

- The amount of heat lost from hot water, q_h, is calculated as follows: $q_h = 1 \times w_h \times \Delta t_2$ cal
- The amount of heat gained by cold water, q_r, is calculated as follows: $q_r = 1 \times w_r \times \Delta t_1$ cal
- The amount of heat transferred to the calorimeter, q_c, is calculated as follows: $q_c = q_h - q_r$ cal.
- The heat capacity of the calorimeter (C) is calculated as follows:

$$C_1 = q_c / \Delta t_1$$

$$C_2 = q_c / \Delta t_2$$

$$C = (C_1 + C_2) / 2$$