

# HEAT

## Heat

It is a kind of energy which produces the sensation of warmth.

It can also be defined as the internal energy of a body which is transferred from one body at higher temperature to a body at lower temperature, till their temperature become equal.

Its C.G.S. and M.K.S. units are calorie (cal) and Joule (J) respectively.

## Temperature

It is the degree of hotness or coldness of a body. The temperature can be defined as the thermal state of a body gives the direction of flow of heat from one body to another when they are placed in contact.

According to kinetic theory of gases, the temperature of a body is the measure of the average kinetic energy of its molecules.

According to zeroth law of thermodynamics "the temperature is a physical quantity or parameter which has the same value for all system which are in thermal equilibrium with each other. It is measured in Celsius ( $^{\circ}\text{C}$ ) in C.G.S. unit and Kelvin (K) in M.K.S. units.

## Heat capacity or thermal capacity

It is defined as the amount of heat required to raise its temperature through one degree.

If  $\Delta Q$  is the heat supply to a body of mass  $m$  to raise its temperature  $\Delta T$ , then

$$\Delta Q = mc\Delta T \quad \dots(1)$$

Let,  $m =$  unit mass (1 g or 1 kg or 1 mole)

$$\Delta T = 1^{\circ}\text{C or 1 K}$$

$$c = \Delta Q \quad \dots(2)$$

The C.G.S. unit of specific heat is  $\text{cal g}^{-1} \text{ }^{\circ}\text{C}^{-1}$  and S.I. unit is  $\text{J kg}^{-1} \text{ K}^{-1}$ .

## Specific heat

It is defined as the amount of heat required to raise the temperature of unit mass of the substance through one degree.

If  $\Delta Q$  is the heat supply to a body of mass  $m$  to raise its temperature  $\Delta T$ , then

$$\Delta Q = mc\Delta T \quad \dots(1)$$

Let,  $m =$  unit mass (1 g or 1 kg or 1 mole)

$$\Delta T = 1^{\circ}\text{C or 1 K}$$

$$c = \Delta Q \quad \dots(2)$$

The C.G.S. unit of specific heat is  $\text{cal g}^{-1} \text{ }^{\circ}\text{C}^{-1}$  and S.I. unit is  $\text{J kg}^{-1} \text{ K}^{-1}$ .

The specific heat depend upon nature of substance and its temperature.

Molar specific heat of a substance is defined as the amount of heat required to raise the temperature of one mole of the substance through one degree. Its S.I. is  $\text{J/mol K}$ .

### Water equivalent

The water equivalent of a body is defined as the mass of water which require the same amount of heat as is required by the given body for the same rise of temperature.

Water equivalent = Mass of body x Specific heat  $W = me$

The C.G.S. unit of water equivalent is g and the M.K.S. unit is kg.

### Calorimetry

The calorimetry is the branch of physics that deals with the measuremental heat.

According to the principle of calorimetry or law of mixture when a body a higher temperature is brought in contact with another body a lower temperature, the heat lost by the hot body is equal to the heat gained by the colder body, provided no heat is allowed to escape to the surroundings. Heat gained = Heat lost

### Calorimeter

It is a device in which heat measurement can be made. It consists a metallic vessel with a stirrer of the same material like copper or aluminium. The vessel is kept inside a wooden jacket which contain heat insulating material like glass wool etc. Thus the calorimeter is thermally insulated from surroundings. The inner and outer surfaces of jacket are highly polished to reduce the radiation loss. The lid is provided with two small holes for inserting a thermometer and a stirrer into the calorimeter. When two bodies at different temperature are mixed together in the calorimeter, heat is exchanged between the bodies as well as with the calorimeter.

According to law of mixture,

Heat lost by hot bodies = Heat gained by cold bodies It is also used to determine the specific heat and latent heat.