Specific heat or Specific Heat Capacity.

It characterizes the nature of the substance in response to the heat supplied to the substance. Specific heat can be defined by two following ways: Gram specific heat and Molar specific heat.

(1) Gram specific heat: Gram specific heat of a substance may be defined as the amount of heat required to raise the temperature of unit mass of the substance by unit degree.

Gram specific heat $c = \frac{\Delta Q}{m\Delta T}$

Units: $\frac{cal}{gm \times °C}$, $\frac{cal}{gm \times kelvin}$, $\frac{Joule}{kg \times kelvin}$

Dimension: $[L^2 T^{-2} \theta^{-1}]$

(2) Molar specific heat: Molar specific heat of a substance may be defined as the amount of heat required to raise the temperature of one gram mole of the substance by a unit degree, it is represented by capital (C)

$$C = \frac{Q}{\mu\Delta T}$$

Units: $\frac{calorie}{mole \times °C}$, $\frac{calorie}{mole \times kelvin}$ or $\frac{Joule}{mole \times kelvin}$

Important points

(1) $C = Mc = \frac{M}{m}\frac{\Delta Q}{\Delta T} = \frac{1}{\mu}\frac{\Delta Q}{\Delta T}$ $\left[\text{As } \mu = \frac{m}{M}\right]$

i.e. molar specific heat of the substance is M times the gram specific heat, where M is the molecular weight of that substance.

(2) Specific heat for hydrogen is maximum $c = 3.5\frac{cal}{gm \times °C}$.

(3) In liquids, water has maximum specific heat $c = 1\frac{cal}{gm \times °C}$.

(4) Specific heat of a substance also depends on the state of substance i.e. solid, liquid or gas.

Example: $c_{\text{ice}} = 0.5 \frac{cal}{gm \times °C}$, $c_{\text{water}} = 1 \frac{cal}{gm \times °C}$, $c_{\text{steam}} = 0.47 \frac{cal}{gm \times °C}$

(5) Specific heat also depends on the conditions of the experiment i.e. the way in which heat is supplied to the body. In general, experiments are made either at constant volume or at constant pressure.

In case of solids and liquids, due to small thermal expansion, the difference in measured values of specific heats is very small and is usually neglected. However, in case of gases, specific heat at constant volume is quite different from that at constant pressure.