CONCEPT MAP

Properties of Bulk Matter

Heat & Temperature

Specific heat capacity : It is the amount of heat required to raise the temperature of unit mass of the substance through 1°C.

$$S = \frac{1}{m}\frac{\Delta Q}{\Delta T}$$

Thermal Expansion : All solids expand on heating. Thermal expansion of solids is of three types.

- Linear expansion
- Area expansion
- Volume expansion
- Relation between α, β, γ:

$$\alpha = \frac{\beta}{2} = \frac{\gamma}{3}$$

where α, β and γ are coefficient of linear expansion, superficial expansion and cubical expansion.

Heat : Heat is the form of energy that flows between a body and its surrounding medium by virtue of temperature difference between them.
The SI unit of heat is joule.

Temperature : Temperature is basically a measure of degree of hotness or coldness of a body.

Transfer of Heat :

$$\frac{\Delta Q}{\Delta t} = KA\frac{\Delta T}{\Delta t}$$

Newton's law of cooling : It states that rate of cooling of a body is proportional to the excess temperature of the body over the surroundings

$$-\frac{dQ}{dt} \propto (T - T_0)$$

In case of liquid,

$$\gamma_r = \gamma_a + \gamma_g$$

where γ_r, γ_a and γ_g are coefficient of real expansion of liquid, coefficient of apparent expansion of liquid and coefficient of cubical expansion of vessel.

Principle of Calorimetry :
Heat lost = heat gained

Thermal Conductivity :

- Conduction
- Convection
- Radiation

Temperature of the Sun :

$$T = \left(\frac{R^2 s}{R_s^2 \sigma}\right)^{1/4}$$

Relationship Between different temperature scales :

$$\frac{T_C - 0}{100} = \frac{T_F - 32}{180} = \frac{T_R - 0}{80} = \frac{T_{Ra} - 460}{212} = \frac{T_K - 273.15}{100}$$

an's Boltzman Law : It states that the radiant gy emitted by a perfectly black body per unit area sec (*i.e.*, radiancy or intensity of black body ation) is directly proportional to the fourth power absolute temperature

i.e. $E \propto T^4$ or $E = \sigma T^4$

e σ is a constant, called Stefan's constant.

Wien's Displacement Law : According to this law, the product of wavelength corresponding to maximum energy and the absolute temperature is constant,

i.e., $\lambda_m T$ = constant.

Symbols Used

C_V = molar specific heat at constant volume
C_P = molar specific heat at constant pressure
ΔQ = heat conducted
Δt = time interval
K = thermal conductivity
A = area of hot face
$T - T_0$ = temperature difference
T = absolute temperature
λ_m = wavelength corresponding to maximum energy
m = mass of substance