BRAIN MAP

CLASS XI

MASTERJEE CLASSES

THERMAL PROPERTIES OF MATTER

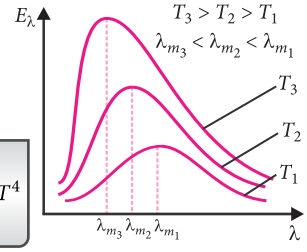
Latent Heat of Fusion (L_f)
Solid $\xrightarrow{Q = mL_f}$ Liquid

Latent Heat of Vapourisation (L_v)
Liquid $\xrightarrow{Q = mL_v}$ Gas

Latent Heat of Sublimation (L_s)
Solid $\xrightarrow{Q = mL_s}$ Gas

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

Wien's Displacement Law
$\lambda_m T = b$ = constant
$b = 2.89 \times 10^{-3}$ m K



Linear Expansion
$L = L_0[1 + \alpha\Delta T]$

Relation between α, β and γ

Superficial Expansion
$A = A_0(1 + \beta\Delta T)$

Volume Expansion
$V = V_0(1 + \gamma\Delta T)$

Stefan's Boltzmann Law
Emissive power, $E \propto T^4 \Rightarrow E = \sigma T^4$
For ordinary body, $E = e\sigma T^4$

Kirchhoff's Law
Ratio of emissive power to absorptive power at temperature, T is
$\frac{E_1}{A_1} = \frac{E_2}{A_2} = \ldots \left(\frac{E}{A}\right)_{\text{Perfectly black body}}$

CHANGE OF STATE
During the change of phase, temperature remains constant but heat is being supplied to the body.

THERMAL EXPANSION
Increase in configuration of a solid with increasing temperature.

Radiation
Heat is transferred without heating the intervening medium.

HEAT TRANSFER
Transfer of heat from one system to another system arises due to temperature difference.

Convection
Heat is transferred due to actual motion of heated particles.

Applications of Convection
- Formation of trade winds
- Causes monsoons
- Land and sea breezes etc.

HEAT
Heat is the form of energy transferred between two or more systems or a system and its surroundings by virtue of temperature difference.

Conduction
Heat is transferred without any actual motion of particles of the substance.

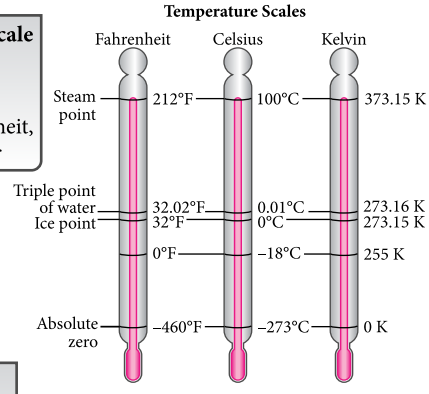
Rate of Heat Flow
$\frac{Q}{t} = \frac{KA(T_1 - T_2)}{d}$; $(T_1 > T_2)$
(K = Coefficient of thermal conductivity)

TEMPERATURE
It is defined as the thermal state of the body, which would determine the direction of flow of heat when this body is placed in contact with another body.

PRINCIPLE OF CALORIMETRY
It is based on the law of conservation of energy.
Heat lost by one body = Heat gained by other body

THERMOMETRY
A branch of physics which deals with the measurement of temperature, is known as the thermometry.

Conversion of Temperature Scale
$\frac{C}{5} = \frac{F - 32}{9} = \frac{K - 273}{5} = \frac{R}{4}$
where, C = Celsius, F = Fahrenheit, K = Kelvin, R = Reaumur

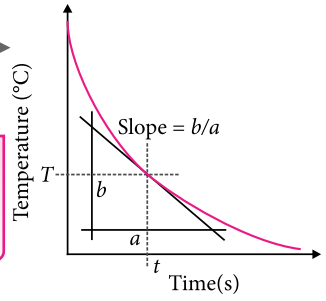


NEWTON'S LAW OF COOLING
The rate of loss of heat by a body is directly proportional to the excess of temperature of the body over surroundings, provided excess is small.

Triple Point of Water
Temperature and pressure at which all the three phases of water exists in equilibrium. $T_3 = 273.16$ K

HEAT CAPACITY
The amount of heat absorbed by a given amount of substance to change the temperature by unity.

Newton's Law of Cooling
Rate of cooling of a body is proportional to the excess temperature of the body over the surroundings
$\frac{dT}{dt} = \frac{-k}{ms}(T_2 - T_1)$



Specific Heat Capacity
The amount of heat required to raise the temperature of 1 g of substance by 1 °C. $s = \frac{\Delta Q}{m\Delta T}$

Molar Specific Heat
The amount of heat required to raise the temperature of one mole of a substance by unity. $C = \frac{\Delta Q}{n\Delta T}$

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