

Saitechinfo NEET-JEE Academy



Here are key equations, symbols, expressions, SI units, and constant values related to the topic "Thermal Properties of Matter":

Important Equations and Expressions

1. Ideal Gas Equation

$$PV = \mu RT$$

where P is pressure, V is volume, μ is the number of moles, R is the universal gas constant ($R = 8.31 \text{ J mol}^{-1}\text{K}^{-1}$), and T is absolute temperature.

2. Conversion between Celsius and Kelvin

$$T = t_C + 273.15$$

where T is in Kelvin and t_C is in Celsius.

3. Linear and Volume Expansion

○ Linear Expansion:

$$\frac{\Delta l}{l} = \alpha_l \Delta T$$

where Δl is change in length, l is the original length, α_l is the coefficient of linear expansion, and ΔT is temperature change.

○ Volume Expansion:

$$\frac{\Delta V}{V} = \alpha_V \Delta T$$

where $\alpha_V = 3\alpha_l$, representing the coefficient of volume expansion.

4. Specific Heat Capacity

$$s = \frac{\Delta Q}{m\Delta T}$$

where ΔQ is the heat absorbed, m is the mass, and ΔT is the temperature change.

5. Latent Heat

$$Q = mL$$

where Q is the heat required for a phase change, m is mass, and L is latent heat (SI unit: J/kg).

6. Newton's Law of Cooling

$$\frac{dQ}{dt} = -k(T_2 - T_1)$$

where T_2 is the temperature of the body, T_1 is the temperature of the surroundings, and k is a proportionality constant.

7. Stefan-Boltzmann Law of Radiation

$$H = A\sigma T^4$$

where H is the radiated energy per unit time, A is the area, T is the temperature, and σ is the Stefan-Boltzmann constant ($5.67 \times 10^{-8} \text{ W m}^{-2}\text{K}^{-4}$).

8. Wien's Displacement Law

$$\lambda_m T = \text{constant} = 2.9 \times 10^{-3} \text{ m K}$$

where λ_m is the wavelength of maximum emission and T is the temperature.

Key Symbols and Constants

- R : Universal Gas Constant = $8.31 \text{ J mol}^{-1} \text{ K}^{-1}$
- α_l : Coefficient of Linear Expansion (SI unit: K^{-1})
- α_V : Coefficient of Volume Expansion (SI unit: K^{-1})
- σ : Stefan-Boltzmann Constant = $5.67 \times 10^{-8} \text{ W m}^{-2}\text{K}^{-4}$
- L : Latent Heat (J/kg), includes latent heat of fusion (L_f) and vaporization (L_v)