**11-THERMAL PROPERTIES OF MATTER**

**1. Measurement of Temperature**

1. If *TC, TF,TR*  and *T* are the temperatures of a body on Celsius, Fahrenheit and Kelvin scales respectively, then   or  2.  3.   4.  or  5. For a constant volume air thermometer  In terms of triple point of water,  6. For a platinum resistance thermometer, resistance of platinum at *t 0C*, *R = R0 (1+α*) Temperature coefficient of resistance, α = 

**2. Thermal Expansion**

1. Change in length, *l’- l= l α (T’-T)* or *∆l=l α ∆T* 2. Coefficient of linear expansion, 3. Final length, 4. Change in surface area,  or  5. Coefficient of superficial expansion,  6. Final surface area,  7. Change in volume,  or 

8. Coefficient of cubical expansion,  9. Final volume  10. Relation between and   and  11. Final density, 

**3.Specific Heat and Latent Heat**

1. Heat gained or lost,  2. According to the principle of calorimetry, Heat gained = Heat lost 3. Water equivalent, *w = mc* (gram) 4. Heat capacity = *mc* (cal 0C-1) 5. Latent heat of vaporization or fusion, *Q* = *ml*

**4. Thermal Conductivity**

1. The amount of heat that flows in time *t* across the opposite faces of a slab of thickness *x* and cross-section *A,*  where T1 and T2 are the temperatures of hot and cold faces and *K* is the coefficient of thermal conductivity of the material of the slab. 2. Rate of flow of heat,  Here *dt/dx* is the rate of fall of temperature with distance and is called temperature gradient.

**5. Newton’s Law of Cooling**

*Newton’s law of cooling.* If the temperature difference between body and surroundings is small, then Rate of loss of heat Temperature difference from the body. Rate of loss of heat from the body is  Here temperature of the body falls from T1­ to T2 in time-interval *t*.

**6. Stefan’s Law**

1. *Stefan’s law.* Energy emitted per second per unit area by a black body at a absolute temperature T, , where = Stefan’s constant. 2. *Stefan-Boltzmann law.* When a black body at temperature T is placed in an enclosure at temperature T0 the net heat energy radiated per unit area,  3. Energy radiated by a surface of emissivity, area *A* in time *t*, (i)  (*Stefan’s law*) (ii)  (*Stefan-Boltzmann law)*

**7. Wien’s Displacement Law**

1. *Wien’s displacement:* The wavelength corresponding to maximum energy emission by a black body at absolute temperature T is given by  Where *b* = Wien’s constant = 0.002898 mK