Brief introduction of thermal radiation

Part I

Thermal radiation:- The energy emitted by a body in the form of radiation by virtue of its temperature is called thermal radiation.

properties of thermal radiation:-

It has the following properties:

(i) Thermal radiations have the wave length ranging from 8×10^{-7} m to 4×10^{-4} m.

(ii) Thermal radiation can travel through vaccum.

(iii) The radiation always travel along straight lines.

(iv) Thermal radiations obey the laws of reflection

(v) Thermal radiation can be refracted

(vi) The velocity of thermal radiation is equal to the velocity of light-

(vii) Thermal radiation do not effect the medium through which they pass.

(viii) Thermal radiation obey the inverse square law.

Absorptive power:- The absorptive power of a body is the ratio of the heat radiation absorbed by the body in a given time to the amount of radiation incident on it in the same time.

The absorptive power of the body for a particular wavelength is called monochromatic absorptive power.

The absorptive power of a body for a given wavelength and at a given temperature may also be defined as the ratio of the radiant energy of that wavelength absorbed per second by its surface to the radiation of that wavelength incident in one second on the same area. It denoted by a_λ.

Emissive power:- The emissive power of a body at a given temperature and

for a given wavelength is defined as the radiant-energy of that wavelength emitted per second per unit area of its surface.

It is also called emissivity of the body and it is denoted by e_λ.

Kirchhoff's Law:- It states that at any given temperature, the ratio of the emissive power to absorptive power corresponding to a given wavelength is constant for all bodies and this constant is equal to emissive power of the perfect black body at the same temperature and corresponding to the same wavelength.

If e_λ and a_λ be the emissive power and absorptive power of a body corresponding to wavelength λ, then

$$\frac{e_\lambda}{a_\lambda} = E_\lambda \text{ (constant)}$$

where E_λ = Emissive power of perfect black body.