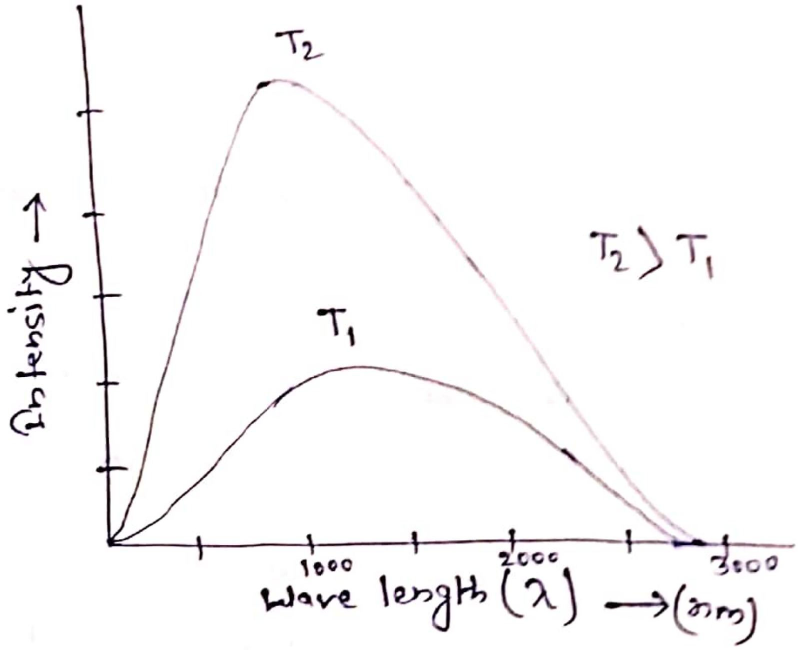
* Black body radiation and Planck's quantum theory

An ideal body which emits or absorb all (frequency) radiation in forms of electromagnetic radiations, are called a black body and this radiation emitted by such a body is called black body radiation.

When solid of high melting point are heated, they emits radiation over a wide range of wavelengths. If an iron bar is heated, it first becomes red, then yellow and finally begins to glow with white and then blue light. It means that the radiations emitted go from lower frequency to a higher frequency as the temperature increases. (from higher wavelength to lower wave length) The red colour lies in the lower frequency region while blue colour belongs to the higher frequency region of the electromagnetic spectrum.

At a given temperature, the intensity of radiation emitted increases with the increase of wavelength, reaches a maximum value at a given wavelength and then starts decreasing.

This facts could not be explained by classical wave theory.



* Planck's quantum Theory

This theory was given by Max planck's.

A/c to this theory —

"Energy is not emitted or absorbed Contineously. Energy is lost or gain in the forms of small packets (bundles) called Photon. Each such Packet of energy is called a quantum. In case of Light. the quantum of energy is called a photon.

A/c to Planck's eqn —

$$E = h\nu \quad \text{(Energy of 1- photon)}$$

Where,

h = Planck's Constant $= 6.626 \times 10^{-34}$ J sec.

ν = frequency in sec^{-1} (or Hz).

'E' is the energy of photon and is proportional to the frequency of radiation. 'h' is called Planck's constant.

Since, $\nu = \frac{c}{\lambda}$

thus,

$$E = \frac{hc}{\lambda}$$

Where,

c = velocity of light = 3×10^{8} m/sec.

λ = wave length

The energy of emitted or absorbed may be —

$h\nu$, $2h\nu$, $3h\nu$, $4h\nu$ .... but cannot be

$1.5\,h\nu$, $2.6\,h\nu$, $5.2\,h\nu$ etc.

Thus, energy emitted or gained = $nh\nu$

Where, n = no. of photons = 1, 2, 3 .....

$h\nu$ = 1 quantum.

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