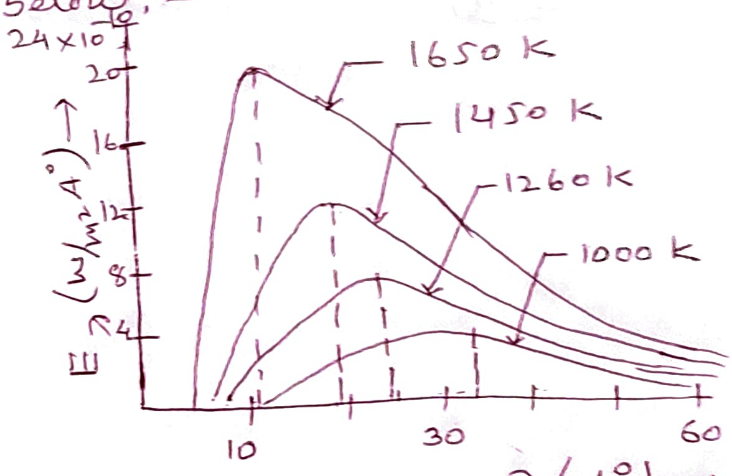
Inadequacy of classical Theory to Explain the spectrum of Black-Body radiation :—

A perfectly black body (a body has the capacity of absorbing radiation of all wavelengths incident on it, called a perfectly black body) is the best possible emitter at any given temperature. The radiation emitted by such a body is known as black body radiation.

The results measured by Lummer and Pringsheim (1899) by using infrared spectrometer and bolometer the intensities of the black body radiation of different wavelengths are shown below:-



Energy distribution in black body radi-

If E_λ is the emissive power, then $E_\lambda d\lambda$ represents the energy radiated per unit area per second for wavelength in the range between λ and $\lambda + d\lambda$.

The main characteristics of the curve are —

(a) For every wavelength E_λ increases with increase of temperature

(b) At a constant temperature E_λ increases as λ increases till it becomes the maximum at a certain wavelength and then E_λ decreases as λ increases further.

At higher wavelength λ_m at which E_λ is max^m, shifts towards shorter wavelength such that ~~of the emitter~~ $\lambda_m T$ = constant, where T = absolute temp. of the emitter

The above relation is known as Wien's displacement law

(c) E_m and T are connected by,

$$\frac{E_m}{T} = \text{constant}$$

(d) The area under the curve and λ - axis at a particular temperature T represents the total ~~emission~~ radiation emitted per square meter per second over all wavelengths,

i.e $$E = \int_0^\infty E_\lambda \, d\lambda = \sigma T^4$$

where, σ = stefan's constant = $5.6697 \times 10^{-8} \, W/m^2K^4$

the above eqn. is the Stefan's law regarding total radiation emitted by a blackbody at absolute temperature, T.