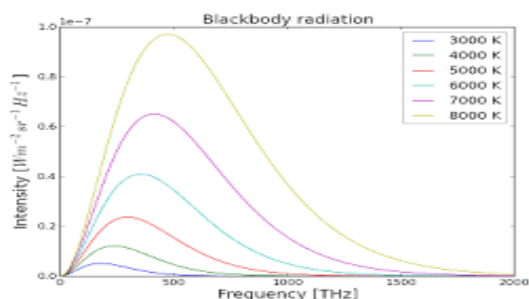


**CL4\_Q1. Mention the characteristics of a black body spectrum.**

**Answer**



From the spectrum of black body radiation the following inferences can be made.

- At all temperatures, energy radiated by the body first increases, reaches a maximum at a particular frequency and then decreases.
- As the temperature increases, the peak shifts to higher frequencies
- An increase in temperature causes an increase in energy emission for all frequencies

The total area bounded by the curves with the X – axis gives the rate of radiation through unit area of the body and is found to be the fourth power of the temperature of the body.

**CL4\_Q2. Mention Planck's formula for black body radiation.**

**Answer**

Based on the assumptions of quantum theory of radiation, Planck derived a formula according to which, the energy density of radiation can be evaluated as

$$\rho(\nu)d\nu = \langle E \rangle dN = \frac{8\pi}{c^3} \nu^2 d\nu \frac{h\nu}{e^{h\nu/kT} - 1} = \frac{8\pi h \nu^3}{c^3} \frac{1}{e^{h\nu/kT} - 1} d\nu$$

**CL4\_Q3.** Calculate the average energy of Planck's oscillator of frequency  $5.6 \times 10^{12}$  Hz at 330 K.

**Answer**

Given:  $\nu = 5.6 \times 10^{12}$  Hz ;  $T = 330$  K

The average energy of Planck's oscillator =  $\frac{h\nu}{e^{\frac{h\nu}{kT}} - 1} = 2.945 \times 10^{-21}$  Joules