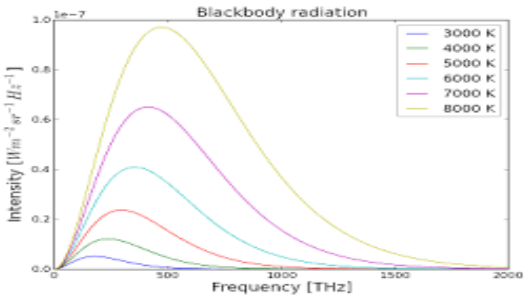
CL4_Q1. Mention the characteristics of a black body spectrum.

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 5.6×10^{12}Hz at 330 K.

Answer

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

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