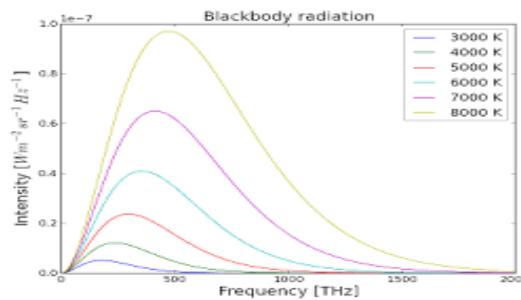


CL4_Q1. Mention the characteristics of a black body spectrum.
Answer


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 $5.6 \times 10^{12} \text{ Hz}$ at 330 K.

Answer

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

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

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