Black Body Radiation :-

A hot object emits electromagnetic radiation. At high temperature, an appreciable portion of the radiation is in visible region of the spectrum, and a higher proportion of short wavelength blue light is generated as the temperature is raised. The glowing of red hot iron ~~bar~~ bar which become white hot when heated further is an examble of black body radiation.

Rayleigh - Jeans law first explains the property of black body radiation as follows,

$$\boxed{dE = \rho\, d\lambda \,, \quad \rho = \frac{8\pi kT}{\lambda^4}}$$

where ρ is the density of of states, and K is boltzmann constant $(1.381 \times 10^{-23}\, J K^{-1})$.

Notes

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WK	M	T	W	T	F	S	S
14	1	2	3	4	5	6	7
15	8	9	10	11	12	13	14
16	15	16	17	18	19	20	21

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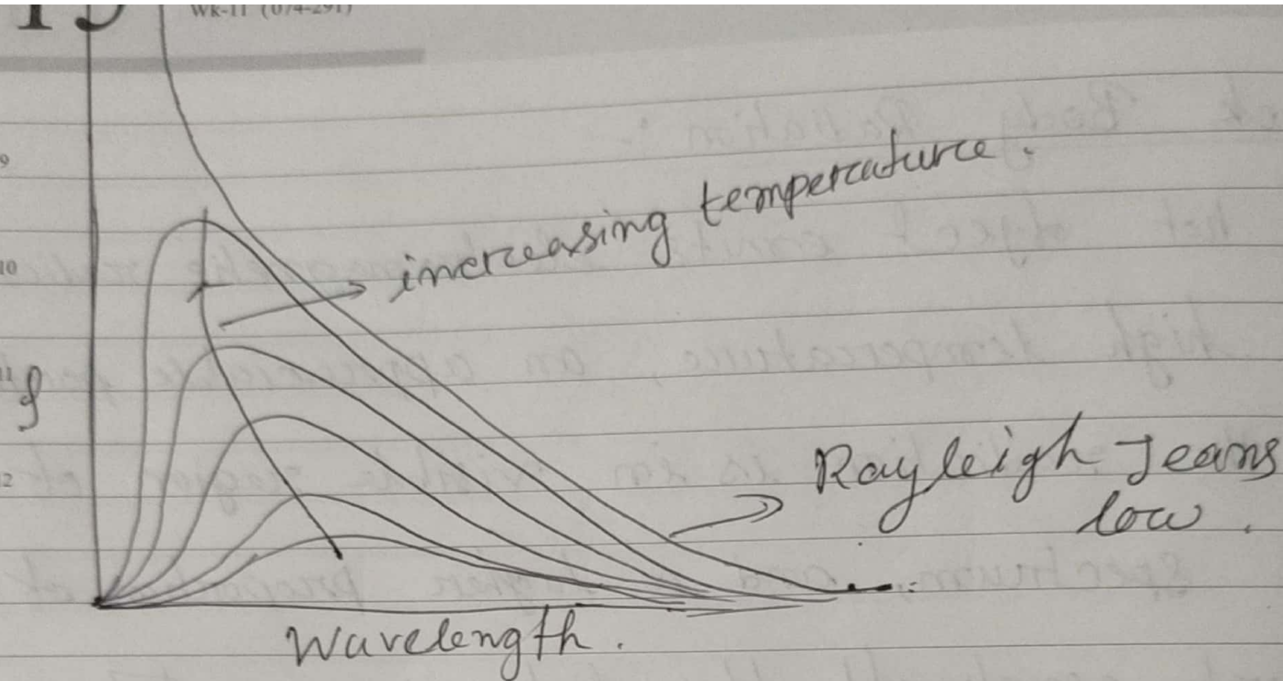

The Rayleigh-Jeans law is quite successful at long wavelength, but fails badly at short wavelength. Thus as λ decreases, f increases without going through a maximum. The equation therefore predict that oscilator of very short wavelength are strongly excited even at room temperature. This implies that large amount of energy is radiated in the high frequency region

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which is called ultraviolet catastrophe.

Planck distribution :-

Planck distribution states that

$$\boxed{dE = \rho \, d\lambda, \quad \rho = \frac{8\pi hc}{\lambda^5 \left(e^{hc/\lambda kT} - 1\right)}}$$

This expression fits the experimental curve very ~~wel~~ well at all wavelength.

Wave Particle Duality :-

1. Particle Nature of e.m.r.

Electromagnetic radiation of frequency ν can possess only energies $0, h\nu, 2h\nu, 3h\nu \ldots$ suggest that thought of as consisting $0, 1, 2 \ldots$ particles, each particle having energy $h\nu$. These particles of electromagnetic radiation are called photon.

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18	29	30					

The energy of ~~a~~ radiation is $E = Nh\nu$
N is no. of Photon.

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(2) Wave nature of particle.

Louis de Boglie suggested that any particle travelling with a linear momentum p should have wavelength

$$\boxed{\lambda = \frac{h}{p} = \frac{h}{mv}}$$

Photoelectric Effect :-

Some metals like potassium, sodium, Rubidium etc emits electrons when irradiated with beam of light. Such ejection of electron by light is known as photoelectric effect. Einstein explains photoelectric effect as following points.

i) When a photon of frequency ν strikes on the surface of a metal, it gives ups its

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energy to an electron.

ii) A certain amount of energy of the photon is used to overcome the attractive forces between electron and the metal. This energy is the minimum energy required to eject an electron which involves threshold frequency ν_0. This threshold frequency is characteristic of metal and its energy $h\nu_0$ is called work function.

iii) The remaining energy of the photon becomes available to the ejected electron and appears as kinetic energy $\frac{1}{2}mv^2$.

Thus. $\boxed{h\nu = h\nu_0 + \frac{1}{2}mv^2}$

iv) The number of electron ejected is proportional to the intensity of light.

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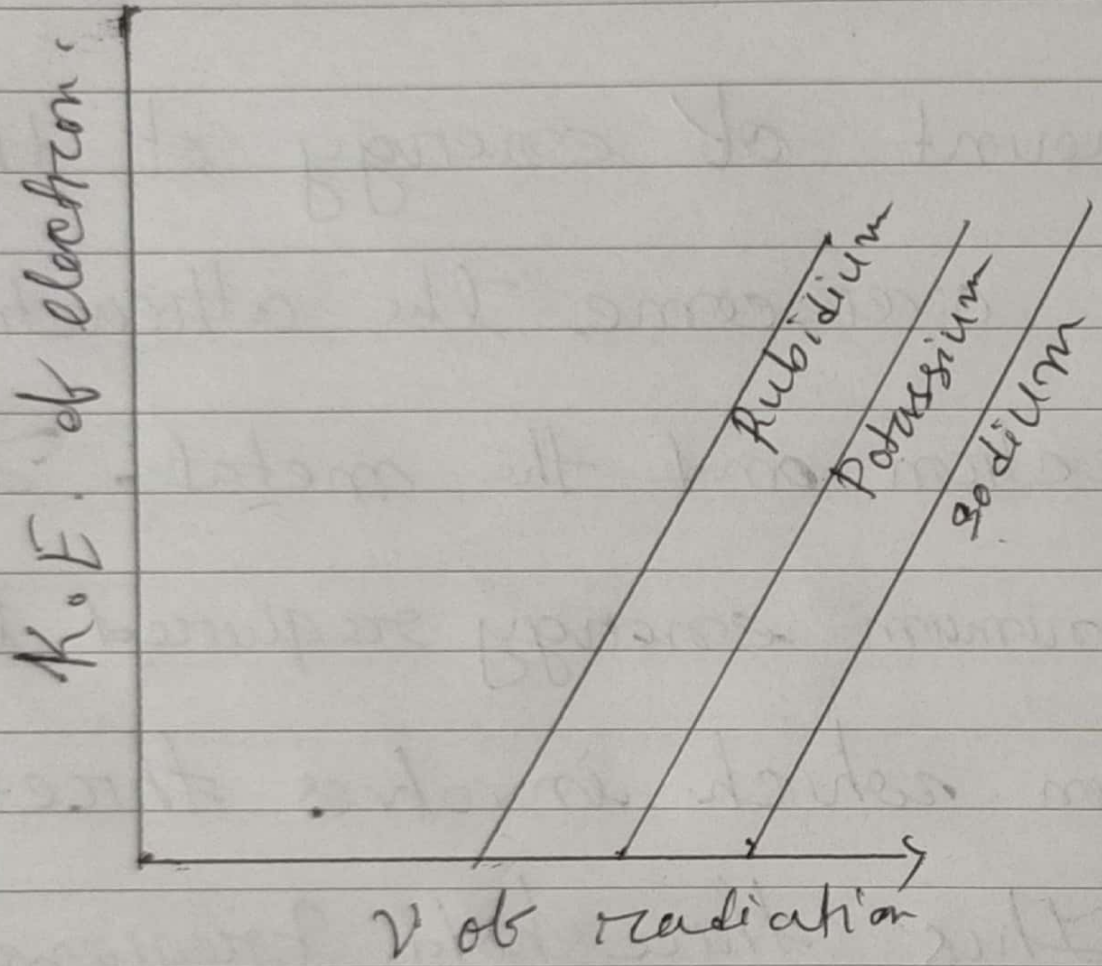

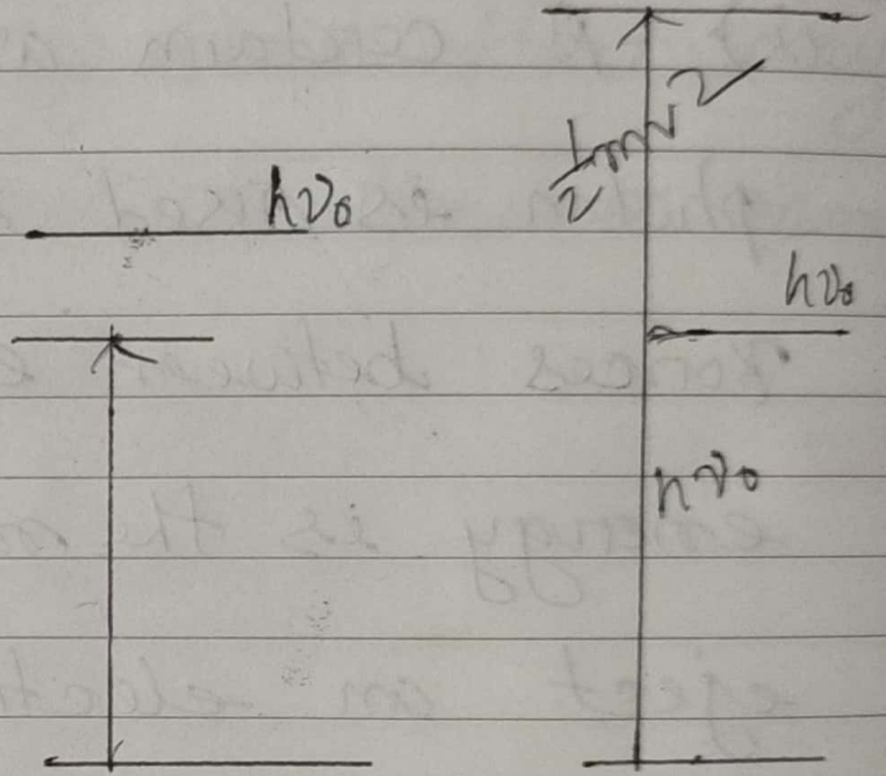

no photoelectric effect observed.

Photoelectric effect will observe