

Kirchoff's Law

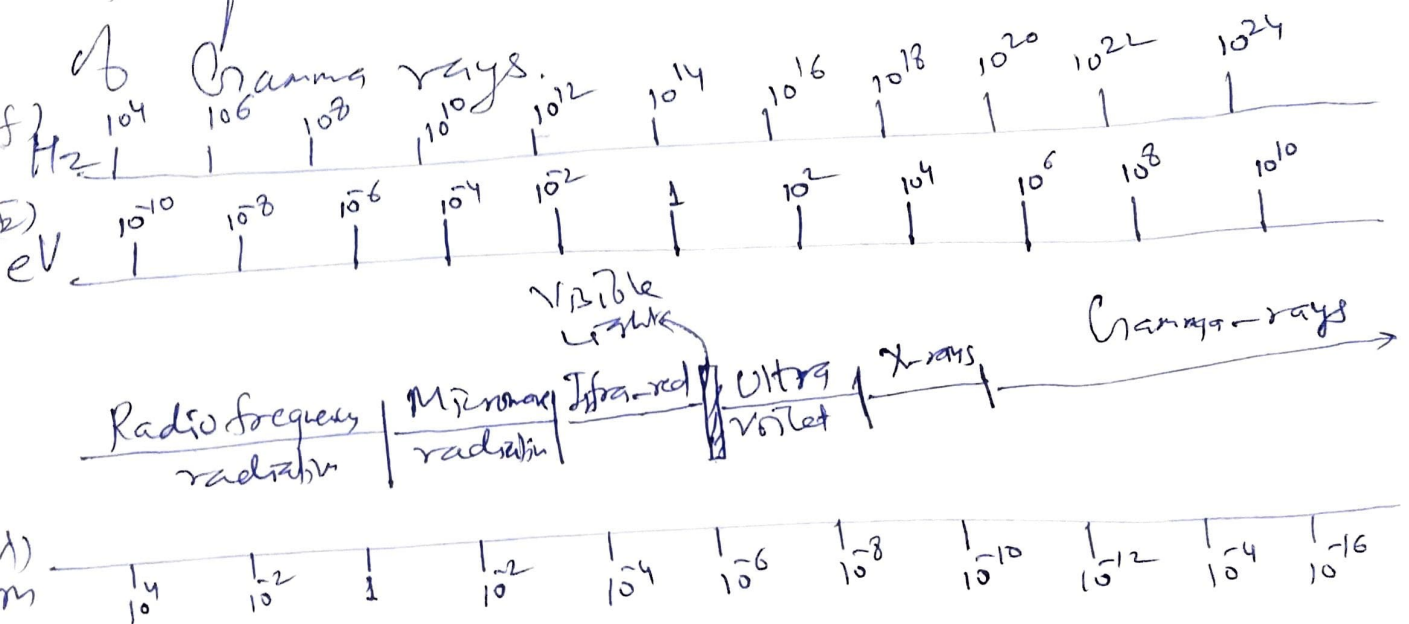
Black body radiation

Planck's quantum theory, P.E.

Photons & electromagnetic spectrum

$$E = h\nu = hc/\lambda$$

E.M. Spectrum \rightarrow extends from low frequencies of radio waves to high frequencies



The electromagnetic spectrum

X-rays and Compton effect \rightarrow change in wave length.

Romson scattering \rightarrow no change in the wave length of incident particle

The Nuclear Atom

Atomic nature well established in ^{early} 20th century
electrons are known

Atomic Sizes

(8)

Information of atomic sizes \rightarrow found from simple arguments about the nature of solids.

Assume that in a solid the atoms are packed as closely as possible.

If diameter of each atom $\rightarrow D$

Length L of a material contains $\frac{L}{D}$ atoms
and volume L^3 contains $\left(\frac{L}{D}\right)^3$ atoms.

No. of atoms in one mole of substance is equal to Avogadro's number N_A .

If the density is ρ kg m^{-3} , one mole will occupy a volume of $\left(\frac{M}{\rho}\right) \text{m}^3$, $M \rightarrow$ atomic weight.

\Rightarrow Unit volume contains $\left(\frac{\rho}{M}\right) 6 \times 10^{23}$ atoms. \rightarrow equated to $\frac{1}{D^3}$

$$\Rightarrow D = \left[\frac{M}{\rho} 10^{-26} \right]^{1/3}$$

$\approx 2 \times 10^{-10} \text{ m}$ for most of elements

Li 2.3×10^{-10}

C 1.8×10^{-10}

Fe 2.3×10^{-10}

Ag 2.6×10^{-10}

Au 2.6×10^{-10}

p6

3.1×10^{-10}

Atomic Orbital :- Thomson Model

Experiments of Creiger, Marsden and Rutherford (1906-1913)

↓ how mass & positive charges are distributed within the atoms

Scattering of α -particles by metallic foils of various thickness.

Bohr's Postulates

$$L = nh \quad n=1,2,3, \dots$$

$$\nu = \frac{E_i - E_f}{h}$$

$$E = - \frac{mZ^2e^4}{(4\pi\epsilon_0)^2 h^2} \frac{1}{n^2}$$

$n=1,2,3, \dots$

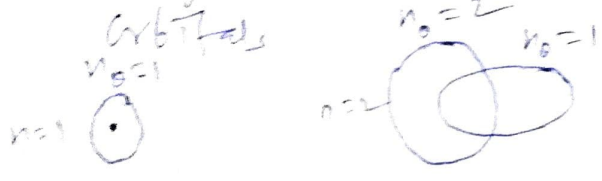
$e \rightarrow$ electron
Cathode Rays
Thomson's method for measuring charge per unit mass (e/m)
Charge on electron
 $1.602139 \times 10^{19} \text{ C}$
Millikan's experiment

Quantization of orbital angular momentum of the electron leads to a quantization of its total energy.

Frank-Hertz experiment \rightarrow atomic energy states are quantized.

Sommerfeld's Model

elliptical Bohr-Sommerfeld orbitals



$$\oint L_{\theta} d\theta = n_{\theta} h$$

$$\oint p_r dr = n_r h$$

