Simple Atomic Structure

Models of Atom

- Dalton's model
- **J.J. Thomson's model**
  - Plum Pudding model of atom
- **Rutherford's model**
  - Atom consisting of number of electrons moving round a positive charged nucleus.
  - **alpha-particle scattering experiment**
    - Atom is spacious
    - Electrostatic repulsive force between alpha particles
- **Modern model**
  - Electron cloud model

Bohr's Theory of hydrogen atom

Energy of electron

$$E_{total} = E_p + E_k$$

$$E_n = -\frac{ke^2}{2r_n}$$

Bohr's Postulate

$$F_c = F_E \Rightarrow \frac{mv_n^2}{r_n} = \frac{ke^2}{r_n^2}$$

$$L = mv_n r_n = n\frac{h}{2\pi}$$

Energy of electron remains constant.

$$E_i - E_f = hf = \frac{hc}{\lambda}$$

Conditions of stability

$$r_n = \frac{n^2h^2}{4\pi^2 kme^2}$$

$$v_n = \frac{e^2}{2\varepsilon_0 nh}$$

$$E_n = \frac{-13.6}{n^2}\text{eV}$$

Hydrogen spectral

$$\frac{1}{\lambda} = R(\frac{1}{n_f^2} - \frac{1}{n_i^2})$$

$n_f = 1$: Lyman Series (u.v. series)

$n_f = 2$: Balmer Series (visible series)

$n_f = 3$: Paschen Series (I.R. series)

Energy levels in spectra

$$f_{max} = \frac{E_n - E_1}{h}$$

$$f_{min} = \frac{E_n - E_{n-1}}{h}$$

$$\lambda_{max} = \frac{hc}{E_n - E_{n-1}}$$

$$\lambda_{min} = \frac{hc}{E_n - E_1}$$