

Structure of Atom

★ Change to mass Ratio of electron

$$\frac{e}{m_e} = 1.758820 \times 10^{11} \text{ C-kg}^{-1}$$

e = Magnitude of the charge on the electron, m_e = Mass of the electron

Name	Symbol	Absolute charge (C)	Relative Charge	Mass (kg)
Electron	e	-1.6×10^{-19}	-1	9.1×10^{-31}
Proton	p	$+1.6 \times 10^{-19}$	+1	1.6×10^{-27}
Neutron	n	0	0	1.6×10^{-27}

Value of l	0	1	2	3	4	5
Subshell notation	s	p	d	f	g	h
no. of orbitals	1	3	5	7	9	11

Atomic no. (Z) = No. of protons in the nucleus of an atom = No. of electrons in a neutral atom

Mass number (A) = No. of protons (Z) + No. of Neutrons (n)

A → Mass number
 Z → Nuclear symbol
 X → Atomic Number

★ Relation between wavelength and frequency

$$c = \nu \lambda$$

c = velocity of light
 ν = frequency
 λ = wavelength

★ Work function

$$W_0 = h\nu_0$$

h = Planck's constant ($6.626 \times 10^{-34} \text{ J-sec}$)
 ν_0 = threshold frequency ν = velocity

★ Energy of Photon

$$E = h\nu$$

★ Kinetic Energy of Electron

$$E = h\nu_0 + \frac{1}{2} m_e \nu^2$$

★ De-Broglie Wavelength

$$\lambda = \frac{h}{m\nu} = \frac{h}{p}$$

p = momentum

★ Line spectra of Hydrogen

wave number

$$\bar{\nu} = R \left[\frac{1}{n_1^2} + \frac{1}{n_2^2} \right]$$

★ Bohr's frequency rule

$$\nu = \frac{\Delta E}{h} = \frac{E_2 - E_1}{h}$$

E_2 = Energy of highly allowed energy state
 E_1 = Energy of lower allowed energy state

★ Angular Momentum of Electron

$$m_e \nu r = \frac{n h}{2\pi}$$

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

★ Radii of the stationary states

$$r_n = n^2 a_0$$

$a_0 = 52.9 \text{ pm}$
 $n = 1, 2, 3, \dots$

★ Energy of stationary states

$$E_n = -R_H \left[\frac{1}{n^2} \right]$$

R_H = Rydberg constant

★ Heisenberg Uncertainty principle

$$\Delta x \times \Delta p \geq \frac{h}{4\pi}$$

Δx = Uncertainty in Position
 Δp = Uncertainty in momentum

★ Schrodinger Equation

$$\nabla^2 \psi + \frac{8\pi^2 m}{h^2} (E - V) \psi = 0$$

E = Total Energy of system
 V = Potential Energy of system

Mathematical operator

$$\nabla^2 = \frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2} + \frac{\partial^2}{\partial z^2}$$

★ Total no. of nodes

$$\text{Angular node} + \text{Radial node} = l + (n - l - 1) = n - 1$$

★ Aufbau Principle

Increasing order of Energy of orbitals

1s, 2s, 2p, 3s, 3p, 4s, 3d, 4p, 5s, 4d, 5p, 4f, 5d, 6p, 7s...