

Chapter 4: Structure of the Atom – Notes

1. Introduction

- Atom: Fundamental building block of all matter.
- Earlier models: Dalton's atomic theory → atom was indivisible.

2. Discovery of Subatomic Particles

- **Electrons:** Discovered by **J.J. Thomson** (using cathode ray experiment).
- **Protons:** Discovered by **E. Goldstein** (using canal ray experiment).
- **Neutrons:** Discovered by **James Chadwick**.

3. Atomic Models

(i) Thomson's Model ("Plum Pudding Model")

- Atom is a positively charged sphere with electrons embedded in it.
- Like "raisins in a pudding."
- **Failed** to explain atom's stability.

(ii) Rutherford's Model (Gold Foil Experiment)

- Alpha particles were bombarded on thin gold foil.
- Observations:
 - Most alpha particles passed through.
 - Some deflected at angles.
 - Very few bounced back.
- Conclusions:
 - Atom is mostly empty.
 - Positive charge and mass are concentrated at center (nucleus).
- Drawback: Couldn't explain stability of atom (electrons should spiral into nucleus).

(iii) Bohr's Model

- Electrons revolve around nucleus in **fixed orbits (energy levels)**.
- **Energy is quantized:** Electrons don't lose energy in fixed orbits.
- Energy levels named as K, L, M, N, etc.

4. Atomic Number, Mass Number

- **Atomic Number (Z)** = No. of protons = No. of electrons (for neutral atom).
- **Mass Number (A)** = No. of protons + No. of neutrons.

- **Example:**
 - Sodium (Na): $Z = 11$, $A = 23$
 - Protons = 11
 - Electrons = 11
 - Neutrons = $23 - 11 = 12$

5. Isotopes and Isobars

- **Isotopes:** Same atomic number, different mass numbers.
 - Example: Hydrogen $\rightarrow$ Protium (^1H), Deuterium (^2H), Tritium (^3H).
- **Isobars:** Different atomic numbers, same mass numbers.
 - Example: ^{40}Ar and ^{40}Ca .