

Chapter 4: Atomic Structure

1. Fundamental Subatomic Particles

Atoms are the basic units of matter, composed of three fundamental **subatomic particles**:

Particle	Symbol	Charge	Mass	Location
Proton	p^+	+1 (Positive)	1 atomic mass unit (amu)	Nucleus
Neutron	n^0	0 (Neutral)	1 amu	Nucleus
Electron	e^-	-1 (Negative)	Negligible ($\sim 1/1836$ amu)	Outside the nucleus (electron shells/orbits)

2. Nucleus and Extranuclear Region

- **Nucleus:**
 - The central part of the atom containing **protons and neutrons**.
 - It holds most of the atom's mass.
 - Has a **positive charge** due to protons.
- **Extranuclear Region:**
 - Electrons revolve around the nucleus in specific energy levels or **shells (orbits)**.
 - These shells are labeled as **K, L, M, N, ...** based on their distance from the nucleus.

3. Atomic Number and Mass Number

- **Atomic Number (Z):**
 - Number of protons in an atom.
 - Also equals the number of electrons in a neutral atom.
 - Example: **Hydrogen (Z = 1), Carbon (Z = 6), Oxygen (Z = 8)**.
- **Mass Number (A):**
 - Total number of **protons and neutrons** in an atom.
 - Formula: $\text{Mass Number}(A) = \text{Protons} + \text{Neutrons}$
 - Example: **Carbon-12 (A = 12), Oxygen-16 (A = 16)**.