

Atoms, Elements, and Compounds

Atomic Structure

- **Atoms:** The smallest particles of a chemical element.
- **Elements:** Substances composed of the same type of atom.
- **Atomic structure:** Made up of protons, neutrons, and electrons.

Subatomic Particle	Location	Charge	Relative Mass
Proton	Nucleus	Positive (+)	1
Neutron	Nucleus	Neutral (0)	1
Electron	Shells (orbiting the nucleus)	Negative (-)	1/1840 (negligible)

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- **Isotopes:** Atoms of the same element with different neutron numbers.

Periodic Table

- Summarizes all elements and their properties.
- Provides information about proton number, mass number, and electron arrangement.
- Proton number (atomic number) = number of protons.
- Mass number = number of protons + neutrons.
- Number of electrons = number of protons in a neutral atom.

Electron Arrangement

- Electrons are held in shells.
- Each shell has a maximum number of electrons:
 - First shell: 2 electrons
 - Second and third shells: 8 electrons

- Electrons fill shells from the innermost to the outermost.

Reactivity of Elements

- Atoms strive to achieve a full outer electron shell.
- Elements with incomplete outer shells are more reactive.
- Noble gases have full outer shells and are generally inert.

Chemical Bonding

- **Ionic bonding:** Between a metal and a non-metal.
 - Metal atoms lose electrons to form cations.
 - Non-metal atoms gain electrons to form anions.
 - Oppositely charged ions are attracted by electrostatic forces.
- **Covalent bonding:** Between two non-metals.
 - Atoms share electrons to achieve a full outer shell.
 - Can be single, double, or triple bonds.
- **Metallic bonding:** Between metal atoms.
 - Metal atoms lose electrons to form cations.
 - Cations are arranged in a lattice structure.
 - Delocalized electrons (sea of electrons) bond the structure together.

Macromolecules

- **Giant structures** made of millions of atoms joined by covalent bonds.
- Examples: diamond, graphite, silicon (IV) oxide.