Topic: Chemical Combinations I

Subtopics:

1. **Periodic Table (First 20 Elements)**
2. **Electronic Configuration of Atoms**

Lesson Objectives:

By the end of this lesson, students should be able to:

- Recite the **first 20 elements of the periodic table in order**.
- Write the **symbols and atomic numbers** of the first 20 elements.
- Describe and write the **electronic configuration** of atoms (first 20 elements).
- Explain the **relationship between electronic configuration and chemical combination**.

---

1. Periodic Table (First 20 Elements)

What is the Periodic Table?

The **Periodic Table of Elements** is an arrangement of all known elements **in order of their atomic numbers** (number of protons).
It helps in **classifying elements** and **predicting their properties**.

The First 20 Elements

Atomic Number	Element Name	Symbol
1	Hydrogen	H
2	Helium	He
3	Lithium	Li
4	Beryllium	Be

Atomic Number	Element Name	Symbol
5	Boron	B
6	Carbon	C
7	Nitrogen	N
8	Oxygen	O
9	Fluorine	F
10	Neon	Ne
11	Sodium	Na
12	Magnesium	Mg
13	Aluminium	Al
14	Silicon	Si
15	Phosphorus	P
16	Sulphur	S
17	Chlorine	Cl
18	Argon	Ar
19	Potassium	K
20	Calcium	Ca

Grouping of the First 20 Elements

Group (Column)	Example Elements
Group 1 (Alkali Metals)	Lithium (Li), Sodium (Na), Potassium (K)
Group 2 (Alkaline Earth Metals)	Beryllium (Be), Magnesium (Mg), Calcium (Ca)
Group 17 (Halogens)	Fluorine (F), Chlorine (Cl)

Group (Column)	Example Elements
Group 18 (Noble Gases)	Helium (He), Neon (Ne), Argon (Ar)
Group 13–16 (Other Nonmetals & Metalloids)	Boron, Carbon, Nitrogen, Oxygen, Sulphur, etc.

---

2. Electronic Configuration of Atoms

What is Electronic Configuration?

Electronic configuration is the arrangement of **electrons in shells (energy levels)** around the nucleus of an atom.

Rules of Electronic Configuration:

1. **Shell Order:**
   The first shell (K) = 2 electrons
   The second shell (L) = 8 electrons
   The third shell (M) = 8 electrons (for the first 20 elements)

---

2. **Filling Order:**

Electrons fill the **lowest energy levels first** before moving to higher shells.

Electron Distribution Formula (First 20 elements):

Shell	Maximum Electrons
First shell (K)	2
Second shell (L)	8
Third shell (M)	8
Fourth shell (N)	2 (for elements up to 20)

Electronic Configuration of the First 20 Elements:

Atomic No.	Element	Configuration
1	Hydrogen	1
2	Helium	2
3	Lithium	2, 1
4	Beryllium	2, 2
5	Boron	2, 3
6	Carbon	2, 4
7	Nitrogen	2, 5
8	Oxygen	2, 6
9	Fluorine	2, 7
10	Neon	2, 8
11	Sodium	2, 8, 1
12	Magnesium	2, 8, 2
13	Aluminium	2, 8, 3
14	Silicon	2, 8, 4
15	Phosphorus	2, 8, 5
16	Sulphur	2, 8, 6
17	Chlorine	2, 8, 7
18	Argon	2, 8, 8
19	Potassium	2, 8, 8, 1
20	Calcium	2, 8, 8, 2

Relation to Chemical Combination:

- **Group number** is usually determined by the **number of electrons in the outermost shell**.
- **Atoms combine** by **losing, gaining, or sharing electrons** to achieve **octet (8 electrons) or duplet (2 electrons)** in their outer shell.

Examples of Combination Tendencies:

Element	Outer Electrons	Combination Behavior
Sodium (Na)	1	Loses 1 electron → Na^+
Magnesium (Mg)	2	Loses 2 electrons → Mg^{2+}
Chlorine (Cl)	7	Gains 1 electron → Cl^-
Oxygen (O)	6	Gains 2 electrons → O^{2-}
Carbon (C)	4	Shares electrons (forms covalent bonds)

Octet Rule:

Atoms **tend to combine** so that each atom has **8 electrons** in its outer shell (like noble gases).

Duplet Rule:

For **hydrogen and helium**, stability is achieved when they have **2 electrons** in the first shell.

Summary of Key Points:

Term	Meaning
Periodic Table	Organized arrangement of elements by atomic number
Atomic Number	Number of protons (and electrons in neutral atoms)
Electronic Configuration	Distribution of electrons in shells
Octet Rule	Atoms seek 8 electrons in outer shell for stability

Term	Meaning
Duplet Rule	Applies to small atoms like H and He (2 electrons)

Conclusion:

Understanding the **Periodic Table** and **electronic configuration** helps explain how and why atoms **combine chemically**. This knowledge is essential for studying chemical bonding and reactions.