

Introduction to the Periodic Table

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Key concepts, historical background, and how to read the table

1. What Is the Periodic Table?

- A systematic arrangement of the **118 known chemical elements**.
 - Organized by **atomic number** (number of protons) ? increasing left?to?right.
 - Shows recurring (“periodic”) trends in **physical and chemical properties**.
 - Serves as a roadmap for predicting element behavior, bonding patterns, and reactivity.
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2. Historical Milestones

Year	Scientist	Contribution
1869	Dmitri Mendeleev	First widely accepted periodic table; left gaps for undiscovered elements.
1913	Henry Moseley	Demonstrated that atomic number, not atomic weight, determines placement (X?ray spectra).
1940s? 1950s	Glenn T. Seaborg	Added actinide series; reorganized the table to include the lanthanides and actinides .
2016	IUPAC	Officially recognized elements 113, 115, 117, 118, completing the current table.

3. Layout of the Table

3.1 Periods (Rows)

- **7 horizontal periods** (1–7).
- Each period corresponds to the filling of a **principal electron shell** ($n = 1$ to 7).
- As you move right, electrons fill higher?energy subshells.

3.2 Groups (Columns)

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- **18 vertical groups** (numbered 1–18).
- Elements in the same group share **valence?electron configurations**, leading to similar chemical behavior.
- Main groups: **IA–VIIIA** (1, 2, 13?18) ? “representative elements.”
- Transition metals: **Groups 3–12**.
- Lanthanides & actinides: **f?block** placed below the main table.

3.3 Blocks

- **s?block**: Groups 1?2 (plus H & He). Outer electrons fill s?orbitals.
- **p?block**: Groups 13?18. Outer electrons fill p?orbitals.
- **d?block**: Transition metals (Groups 3?12). Outer electrons fill d?orbitals.
- **f?block**: Lanthanides & actinides. Outer electrons fill f?orbitals.

4. Reading Element Information

Symbol	Example: Carbon (C)
Atomic number (Z)	6 – number of protons
Atomic mass (A)	12.011 u – average mass of isotopes
Electron configuration	$1s^2?2s^2?2p^2$
Oxidation states	–4, +2, +4 (common)
Category	Non?metal, p?block
Block	s?p (p?block)
Group	14 (IV)
Period	2

Tip: The **group number** (for main?group elements) often equals the number of valence electrons.

5. Periodic Trends

Trend	Direction in Table	Explanation
Atomic radius	? across a period, ? down a group	Increases with added electron shells; decreases as nuclear charge pulls