

The Zig-Zag Line of the Periodic Table

Navigating the geographic boundaries between metals, non-metals, and metalloids.

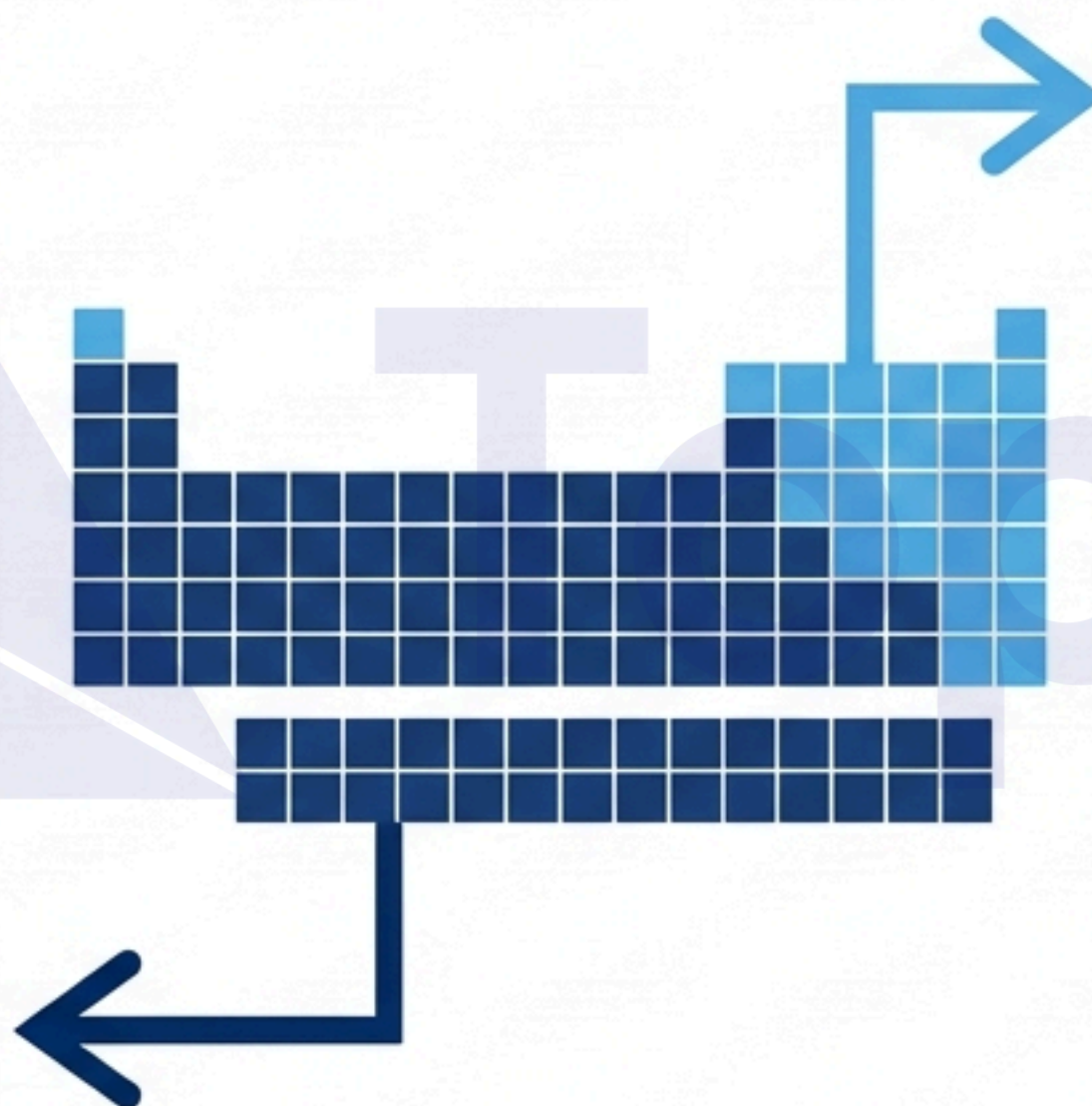


The Macro-Geography of Elements

Metals (>78% of all elements)

- Usually solids at room temperature
- High melting & boiling points
- Malleable (can be flattened) & ductile (drawn into wires)
- Good conductors

⚠ Exceptions: Mercury (Hg) is liquid; Gallium (Ga, 303K) and Caesium (Cs, 302K) have exceptionally low melting points.



Non-Metals

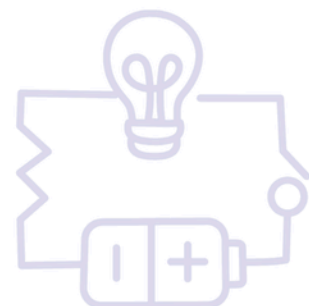
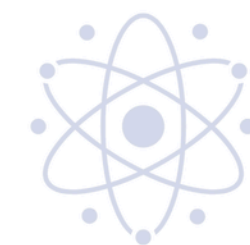
- Usually solids or gases at room temp
- Low melting & boiling points
- Brittle (neither malleable nor ductile)
- Poor conductors

⚠ Exceptions: Boron (B) and Carbon (C) have high melting and boiling points.



**You've Learned the Theory.
Let's Test Them Now.**

$$E=mc^2$$



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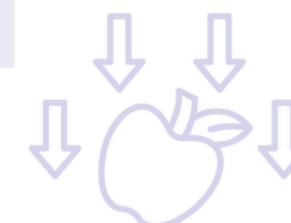
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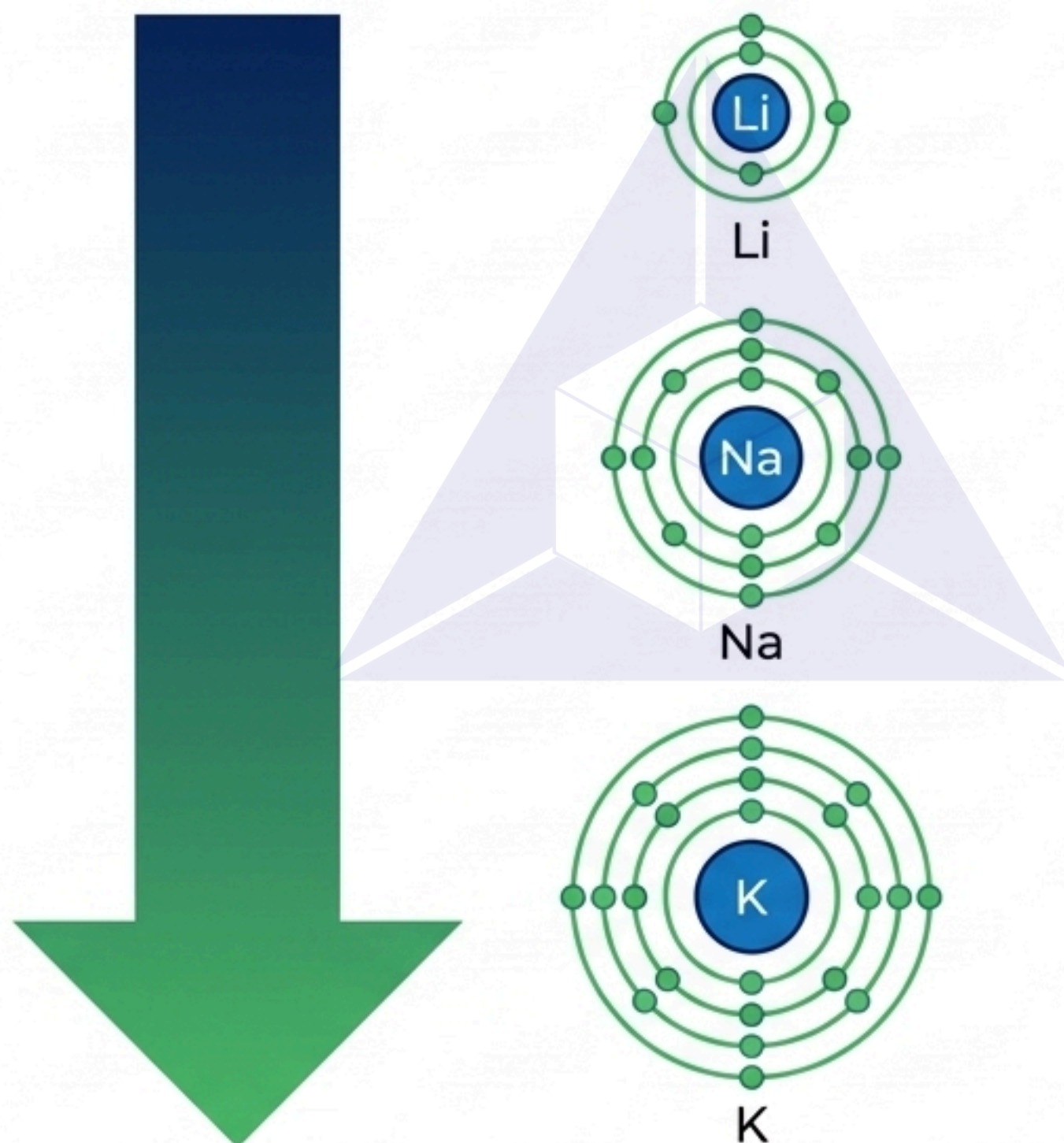
Key Highlights

- » Free Study Material, Videos & Infographics
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- » Practice Unlimited MCQs for NEET & JEE
- » Get Clear Explanations, Not Just Marks
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The Vertical Compass: Down a Group

Metallic character increases as you move down a group.



[Mechanism]

Step 1: Principal quantum number (n) increases.



Step 2: Inner energy levels fill with electrons, increasing the shielding effect.



Step 3: Valence electrons are pushed farther from the nucleus (Atomic Radius increases).



Step 4: Ionization Enthalpy drops significantly.



Result: Electrons are lost more easily (the chemical definition of metallic character).

The Horizontal Compass: Across a Period



Metallic character decreases (and non-metallic character increases) from left to right.



[Core Concept]

Step 1: Electrons enter the same valence shell across the period.



Step 2: Shielding remains constant while nuclear charge increases.



Step 3: Effective nuclear charge increases, pulling electrons inward (Atomic Radius shrinks).



Step 4: Outer electrons are held tightly (Ionization Enthalpy increases).



Result: Harder to lose electrons, easier to gain them. Electronegativity and non-metallic properties rise.

The Borderlands: Semi-Metals



[Exam Focus] Memorize this exact list of five elements for MCQ elimination.

- The transition from metallic to non-metallic character is not an abrupt cliff. It is a **diagonal border**.
- These elements, known as **Metalloids** or **Semi-Metals**, border the zig-zag line and display characteristic **properties** of both metals and non-metals.

JEE Application: Ordering Metallic Character

Problem 3.4: Arrange the following elements in increasing order of metallic character: Si, Be, Mg, Na, P.



$P < Si < Be < Mg < Na$

[Solution Strategy]

- 1. Identify Non-Metals:** Phosphorus (P) is on the far right (most non-metallic).
- 2. Locate Metalloids:** Silicon (Si) sits on the zig-zag line (semi-metal).
- 3. Apply Horizontal Rule:** Beryllium (Be) is Group 2, left of the metalloids (more metallic than Si).
- 4. Apply Vertical Rule:** Magnesium (Mg) is directly below Be in Group 2 (larger radius = more metallic than Be).
- 5. Find the Extreme Left:** Sodium (Na) is Group 1, far left (lowest ionization enthalpy = most metallic).



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