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Science 9 – Chemistry Topic 2.3 – Concept 2: Elements in chemical groups have similar electron arrangements.

Key patterns in the periodic table:

1. Atoms in the same group have the same number of free valence electrons

- Group 1: one valence electron
- Group 2: two valence electrons
- Groups 13-18: 3, 4, 5, 6, 7, 8 valence electrons
- Exception: Helium has 2 valence electrons (other noble gasses have 8 valence electrons)

2. Atoms in the same period have the same number of occupied energy shells

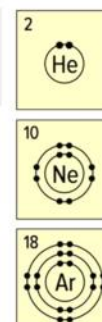
- First period (hydrogen and helium): One occupied energy shell
- Second period: two occupied energy shells
- Third period: three occupied energy shells

Noble Gas Stability: A Full Valence Shell

Noble gases are stable (unreactive) because they have full valence shells

- Their atoms do not tend to gain, lose, or share electrons.

Noble Gases:
Full valence shells

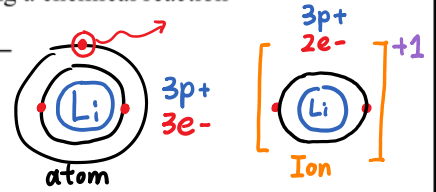


How Other Elements Achieve Full Valence Shells?

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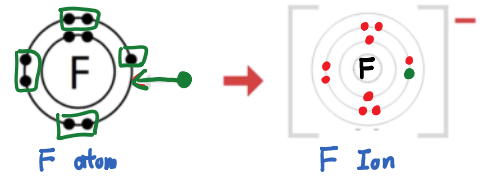
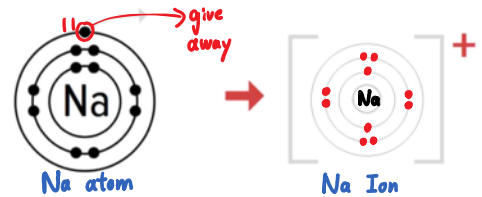
Other elements can get a full valence shell by gaining or losing electrons during a chemical reaction

- When a **neutral atom gains or loses** an electron, it becomes an **Ion**
 - Loses an electron: becomes positively charged ion
 - gain an electron: becomes a negatively charged ion



Reactivity of an element is linked to how close it is to having a full valence shell

- Most reactive elements: Groups **1** and **17** (elements are only **One** electron away from a full valence shell)
- Example: **Sodium** (group 1) easily give up an electron, since it exposes the full valence shell underneath
- Example: Fluorine (group 17) readily gains an electron, since it completes their valence shell



Draw the Bohr diagram for the following Atom and Ions

Element	Sulfur Atom → Neutral	Potassium Atom	Nitrogen Atom
Bohr Diagram	<p>16p⁺ 16e⁻</p>	<p>19p⁺ 19e⁻</p>	
	<p>16p⁺ 18e⁻</p> <p>[S²⁻]</p>	<p>19p⁺ 18e⁻</p> <p>[K⁺]</p>	<p>7p⁺ 10e⁻</p> <p>[N³⁻]</p>