

Groups 1, 7 & 0 trends

Elements in each **group** of the **periodic table** share similar **chemical properties** and show patterns in **reactivity** and **physical characteristics**. Understanding these **trends** helps explain the behaviour of certain elements and their roles in everyday applications.

Group 1

Known as the **alkali metals** because they react with water to produce an **alkaline solution** (pH above 7).

- **Elements:** lithium (Li), sodium (Na), potassium (K), rubidium (Rb) and caesium (Cs).
- **Physical properties:** the group 1 metals are **soft**, and you can cut them with a knife. Lithium, sodium and potassium are **less dense** than water, so they float. They have **low melting points** compared to other metals and these decrease as you go down the group.
- **Chemical properties:** alkali metals are **highly reactive**; they react vigorously with water. Each metal gives off a **characteristic flame colour** when heated. For example, Li, red; Na, yellow; K, lilac.
- **Key trend:** alkali metals become **more reactive** as you move down the group because their atoms get larger. This means the outermost electron is further from the nucleus and the attraction between them is weaker, so the electron is more easily lost.

Did you know ...?

Lithium is in demand because it's used in rechargeable batteries such as those in mobile phones and laptops.

Group 7

Known as the **halogens** because they react with metals to form salts and in Greek, halogen means **salt former**.

- **Elements:** fluorine (F), chlorine (Cl), bromine (Br), iodine (I) and astatine (At).
- **Physical properties:** fluorine and chlorine are gases at room temperature. The elements get **darker in colour** as you go down the group (at room temperature, Cl is greenish-yellow, Br is red-brown and I is dark grey).
- **Chemical properties:** halogens are **reactive non-metals** and readily form salts when they react with metals. A more reactive halogen can **displace** a less reactive one from a compound.

- **Key trend:** halogen **reactivity decreases** as you move down the group because their atoms get larger, meaning there's a weaker attraction between the nucleus and the incoming electrons.

Did you know ...?

Chlorine kills bacteria, so it's used to treat drinking water. It's a poisonous gas and was used as a chemical weapon during the first world war

Group 0

Known as the **noble gases** because they are unreactive and generally exist as **unbonded atoms**, giving the idea that they are 'unwilling to interact' with others.

- **Elements:** helium (He), neon (Ne), argon (Ar), krypton (Kr), xenon (Xe) and radon (Rn).
- **Physical properties:** all the group 0 elements are gases. They have **very low boiling points**, which increase slightly down the group.
- **Chemical properties:** noble gases are very **unreactive** and unlikely to form compounds under normal conditions.
- **Key trend:** the boiling points of the noble gases **increase** down the group because their atoms get **larger**. Larger atoms have stronger forces of attraction between them and require more energy to overcome.

Did you know ...?

Helium is used in balloons and airships because it's lighter than air, so it floats.