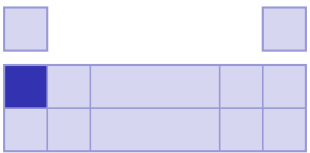
The Periodic Table

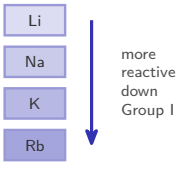
IGCSE Chemistry ▪ Topic 8

IGCSE Chemistry



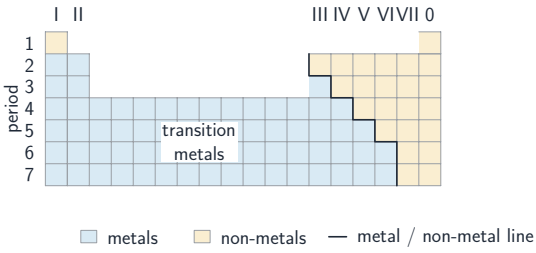
What we will cover

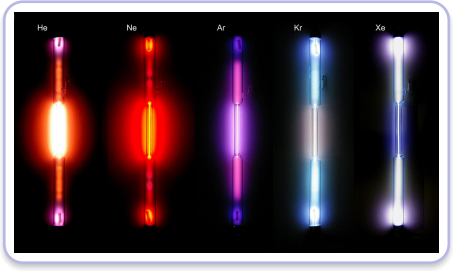
1. How the elements are arranged
2. Group I – alkali metals
3. Group VII – halogens
4. Group trends & displacement
5. Transition elements
6. Group VIII – noble gases



group trends

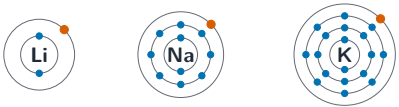
How the elements are arranged





Noble gases are unreactive

Group I – the alkali metals

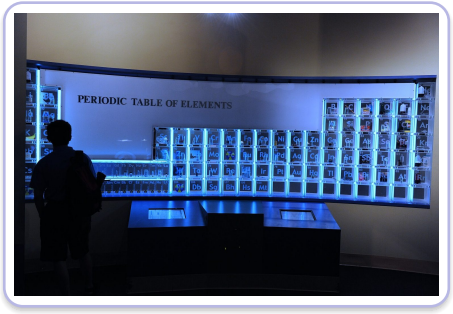


lithium
2,1

sodium
2,8,1

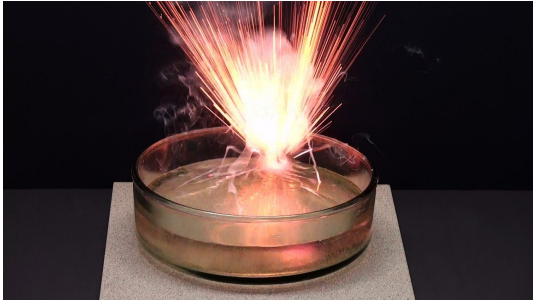
potassium
2,8,8,1

every Group I atom has **one** electron in its outer shell (shown in orange), so they react in similar ways



The periodic table organises the elements

Group I reactivity



Transition metals often form coloured compounds

Group VII – the halogens

chlorine	**bromine**	**iodine**
pale green gas	red-brown liquid	grey-black solid

Halogens 卤素 are **diatomic** 双原子 non-metals (Cl_2). Down the group: density up, reactivity down.

Opposite group trends

Group I

Li
Na
K

reactivity increases down

Group VII

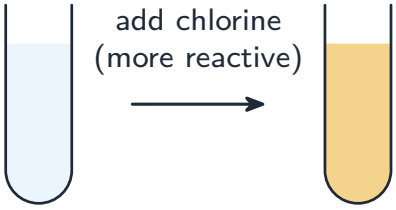
Cl
Br
I

reactivity increases up

- Group I: more reactive down
- Group VII: less reactive down

Metals lose electrons more easily lower down; non-metals gain them less easily.

Displacement reactions



A more reactive halogen **displaces** 置换 a less reactive **halide** 卤化物.

$$Cl_2 + 2KBr \rightarrow 2KCl + Br_2$$

The released bromine turns the solution orange.

Transition elements and noble gases

transition elements 过渡元素
high density & melting point; coloured compounds; catalysts; variable oxidation numbers (Fe^{2+}/Fe^{3+})

noble gases 稀有气体
Group VIII; **monatomic** 单原子 & unreactive – they already have a full outer shell

Worked example – predicting Group I behaviour

Predict how rubidium reacts with water, compared with sodium.

- Group I reactivity increases down the group.
- Rb's outer electron is further from the nucleus and more shielded.
- So it is lost more easily than sodium's.
- Rb reacts more violently, giving RbOH + hydrogen – and the H_2 ignites.

Group I gets more reactive down (easier to lose an electron); Group VII gets less reactive down (harder to gain one). Opposite trends.

Topic 8 – key takeaways

1 Arrangement

by proton number; groups share outer electrons

2 Group I

soft metals; more reactive down the group

3 Group VII

diatomic; less reactive down; displacement

4 Other blocks

transition: coloured, catalysts; noble: inert

Check yourself

1. What does the group number tell you about electrons?
2. How does Group I reactivity change going down?
3. What state is iodine at room temperature?
4. Why are noble gases unreactive?

Answers **1.** the number of outer-shell electrons **2.** it increases **3.** a grey-black solid **4.** they have a full outer shell