Your notes

GCSE Chemistry: revision notes

Group 1, Group 7 and Group 0

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Start here: why groups matter

- Elements in the same column (group) of the periodic table have the same number of electrons in their outer shell, so they react in similar ways.
- Group 1 metals have 1 outer electron to lose, so they are very reactive. Group 7 non-metals need 1 more electron, so they are reactive too. Group 0 gases have a full outer shell, so they are unreactive.
- Learn how each group changes as you go down it, and you can predict how an element you have never seen behaves.

Group 1: the alkali metals

- The **alkali metals** (lithium, sodium, potassium...) have one electron in their outer shell. They are soft metals with low density.
- They react with water to form a **metal hydroxide** and hydrogen: $2Na + 2H_2O \rightarrow 2NaOH + H_2$. The solution is alkaline.
- They react with oxygen to form metal oxides, and with chlorine to form metal chlorides.
- Reactivity increases down the group: the outer electron is further from the nucleus and more shielded, so it is attracted less strongly and lost more easily.
- With water: lithium fizzes steadily; sodium melts into a ball and moves quickly; potassium burns with a lilac flame.

Group 7: the halogens

- The **halogens** are non-metals that exist as molecules of two atoms (**diatomic**), such as Cl_2 and Br_2.

- Down the group, relative molecular mass, melting points and boiling points increase. Fluorine is a gas, bromine a liquid and iodine a solid at room temperature.
- They react with metals to form ionic compounds in which the **halide ion** has a –1 charge, and form covalent compounds with non-metals.
- Reactivity decreases down the group: the outer shell is further from the nucleus, so it is harder to gain an electron.

Displacement reactions

- A more reactive halogen displaces a less reactive halogen from an aqueous solution of its salt.
- Chlorine + potassium bromide → potassium chloride + bromine (the solution turns orange).
- Bromine does not react with potassium chloride, because bromine is less reactive than chlorine.

Group 0: the noble gases

- The **noble gases** (helium, neon, argon...) are unreactive and do not easily form molecules, because they have stable electron arrangements: 8 outer electrons, or 2 for helium.
- Boiling points increase down the group as relative atomic mass increases.

Exam tip

- Explain trends with electrons: Group 1 gets more reactive going down because the outer electron is further from the nucleus and is lost more easily. Group 7 gets less reactive because it's harder to gain one.
- Describe what you'd see in a reaction, as well as naming the products.

Common mistakes

- Saying Group 7 gets more reactive going down. It's the other way round.
- Mixing up **halogens** (the elements) with halides (their ions).

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Worked examples

Predict how rubidium reacts with water.

Find it: rubidium is in group 1, below potassium. **group 1**

In group 1, reactivity increases down the group (the outer electron is further from the nucleus, so it is lost more easily). **more reactive than potassium**

Group 1 metals react with water to make a metal hydroxide and hydrogen. **rubidium hydroxide + hydrogen**

Answer: Even more violently than potassium (it may explode), making rubidium hydroxide and hydrogen

Key terms

Alkali metals	The group 1 elements, which react with water to form alkaline solutions.
Halogens	The group 7 elements, which exist as diatomic molecules.
Noble gases	The unreactive group 0 elements with full outer shells.
Diatomic	Made of molecules containing two atoms, such as Cl_2.
Halide ion	A negative ion with a –1 charge formed from a halogen, such as Cl^-.
Displacement reaction	A reaction in which a more reactive element takes the place of a less reactive one in a compound.
Metal hydroxide	A compound formed, along with hydrogen, when an alkali metal reacts with water.

Quick questions

Cover the answers and test yourself: remembering is what makes it stick.

1. How many electrons are in the outer shell of a group 1 metal?
2. What are the products of sodium reacting with water?
3. Why does reactivity increase down group 1?
4. What colour flame does potassium burn with when it reacts with water?
5. How does reactivity change down group 7?
6. What is the state of bromine at room temperature?
7. What is the charge on a halide ion?
8. Which reaction happens?

Answers

1. One
2. Sodium hydroxide and hydrogen
3. The outer electron is further from the nucleus and lost more easily
4. Lilac
5. It decreases

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6. Liquid
7. –1
8. Chlorine + potassium iodide

What to do next

Practise 11 questions on this topic

Try 7 exam questions, with mark schemes

Read the lesson, one step at a time

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