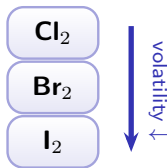


Group 17

A-Level Chemistry ■ Topic 11

A-Level Chemistry



What we will cover

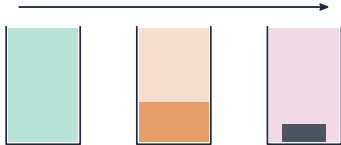
- 1 States & volatility
- 2 Oxidising power & displacement
- 3 The silver halide test
- 4 Halides & sulfuric acid
- 5 Reactions of chlorine



chlorine kills microbes

States and volatility

volatility decreases (intermolecular forces get stronger)



Cl₂
pale green
gas

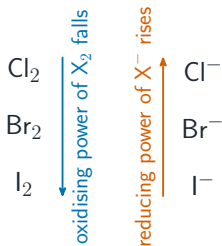
Br₂
red-brown
liquid

I₂
grey-black
solid



bromine

Oxidising power and displacement



a more reactive halogen
displaces a less reactive one:
 $\text{Cl}_2 + 2\text{Br}^- \rightarrow 2\text{Cl}^- + \text{Br}_2$

- halogens gain an electron –
oxidising power 氧化能力 **falls**
down
- **halide ions** 卤离子 lose an electron
– **reducing power** 还原能力 **rises**
down

A more reactive halogen **displaces** a less reactive one: $\text{Cl}_2 + 2\text{KBr} \rightarrow 2\text{KCl} + \text{Br}_2$.

The silver halide test

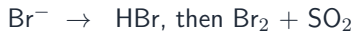
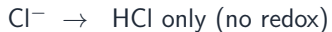


Add Ag^+ , then **ammonia** 氨, to identify the halide:

- Cl^- – **white**, dissolves in dilute NH_3
- Br^- – **cream**, only in conc. NH_3
- I^- – **yellow**, insoluble

Halides with concentrated sulfuric acid

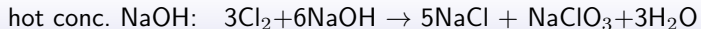
reducing power increases
↓



The stronger reducing agents are oxidised by the acid:

- Cl^- – only HCl (no redox)
- Br^- – also Br_2 & SO_2
- I^- – I_2 , H_2S & SO_2 (strongest reducer)

Reactions of chlorine



Both are **disproportionation** 歧化 (Cl goes up *and* down from 0). In water, $\text{Cl}_2 + \text{H}_2\text{O} \rightleftharpoons \text{HOCl} + \text{HCl}$ – HOCl kills **bacteria** 细菌.

Worked example – halogen displacement

Chlorine water is added to potassium bromide solution. State what is seen and give the ionic equation.

- Cl_2 is a **stronger oxidising agent** than Br_2 , so it takes the electrons.
- $\text{Cl}_2 + 2\text{Br}^- \rightarrow 2\text{Cl}^- + \text{Br}_2$
- Seen: the solution turns **orange** as Br_2 forms.
- Cl_2 is **reduced** ($0 \rightarrow -1$); Br^- is **oxidised** ($-1 \rightarrow 0$).

A halogen displaces any halide **below** it. Oxidising power falls down the group: $\text{Cl}_2 > \text{Br}_2 > \text{I}_2$.

Topic 11 – key takeaways

1

Volatility

falls down; gas to liquid to solid

2

Redox trends

oxidising power down; reducing power up

3

Halide test

AgCl white, AgBr cream, AgI yellow

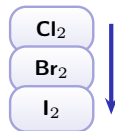
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Chlorine

disproportionation with NaOH; purifies water

Check yourself

- 1 Which way does oxidising power change down Group 17?
- 2 Colour of the AgI precipitate?
- 3 Which halide is oxidised to I_2 by conc. H_2SO_4 ?
- 4 What type of reaction is Cl_2 with NaOH?



Answers 1. decreases 2. yellow 3. iodide (I^-) 4. disproportionation