Group 17 Map

Cambridge International AS & A Level Chemistry · Topic 11 Group 17

1 Physical trends

11.1

- Volatility **falls**: stronger id–id forces
- Cl_2 gas, Br_2 liquid, I_2 solid
- Electronegativity **falls**: F 4.0 → I 2.5
- Bond energy: Cl–Cl > Br–Br > I–I



2 Displacement

11.2.1

- Oxidising power: **Cl_2 > Br_2 > I_2**
- $Cl_2 + 2Br^- \rightarrow 2Cl^- + Br_2$
- Hexane: Br_2 **orange-red**, I_2 **purple**
- Water: Br_2 yellow-orange, I_2 brown

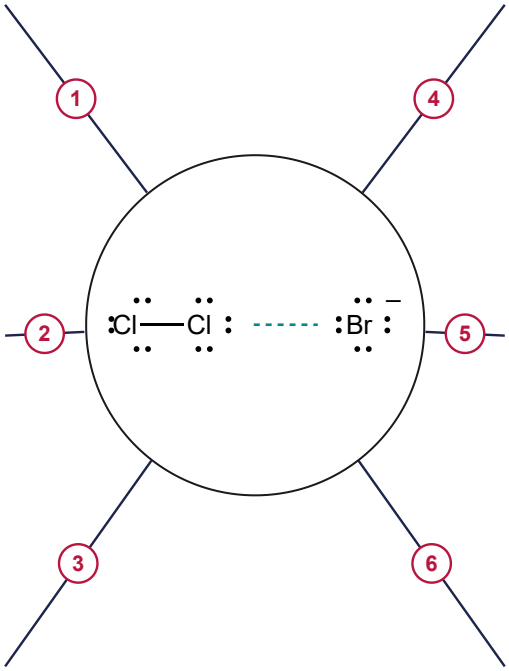


3 Hydrogen halides

11.2.2-11.2.3

- $H_2 + X_2 \rightarrow 2HX$
- F_2 explosive; I_2 slow and reversible
- H–X bond **weaker** down the group
- HI decomposes: a hot wire gives **purple** I_2





4 Chlorine disproportionates

11.4

- $Cl_2 + H_2O \rightleftharpoons HCl + HClO$
- Cold NaOH: NaCl + **NaClO** (bleach)
- Hot NaOH: 5NaCl + **$NaClO_3$**
- Cl 0 → −1, +1 or +5



5 Halides with H_2SO_4

11.3.1, 11.3.2(b)

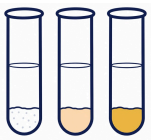
- Cl^-: steamy HCl fumes only
- Br^-: Br_2 + **SO_2** (S +4)
- I^-: I_2, SO_2, S, **H_2S** (S −2)
- Reducing power: **I^- > Br^- > Cl^-**



6 Silver nitrate tests

11.3.2(a)

- AgCl white, AgBr cream, AgI yellow
- Acidify with **HNO_3** first
- Dilute NH_3: **AgCl** dissolves
- Conc. NH_3: AgBr dissolves; **AgI** does not



The halides compared

one larger ion explains most of the rows

Halide	With $AgNO_3$	NH_3	With conc. H_2SO_4
F^-	no precipitate	–	HF only
Cl^-	white AgCl	dissolves in dilute	HCl only: steamy fumes
Br^-	cream AgBr	dissolves in concentrated	HBr, Br_2, SO_2
I^-	yellow AgI	insoluble	HI, I_2, SO_2, S, H_2S

Worked examples

Predict a displacement

- Br_2 + KI: yes
- $Br_2 + 2I^- \rightarrow 2Br^- + I_2$
- hexane layer **purple**

Hot alkali

- $3Cl_2 + 6OH^-$
- $\rightarrow 5Cl^- + ClO_3^- + 3H_2O$
- 5 e^- gained = **5 e^- lost**

Name the halide

- cream precipitate
- dissolves in conc. NH_3 only
- **bromide**

Halogens return with halogen compounds (Topic 15) and electrode potentials (Topic 24).

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