

Halogens Map

Edexcel A Level Chemistry · Topic 4 Inorganic Chemistry and the Periodic Table · Group 7

1 Physical trends

4B.9-4B.10

- Boiling temperature **rises**: more electrons
- Cl₂ gas, Br₂ liquid, I₂ solid
- Electronegativity **falls**: F 4.0 → I 2.5
- More shells, more shielding



2 Displacement

4B.11

- Oxidising power: Cl₂ > Br₂ > I₂
- Cl₂ + 2Br⁻ → 2Cl⁻ + Br₂
- Hexane: Br₂ **orange-red**, I₂ **purple**
- Water: Br₂ yellow-orange, I₂ brown



3 Halogens with metals

4B.12 i

- 2Na + Cl₂ → 2NaCl
- Mg + Br₂ → MgBr₂
- Metal **oxidised**; halogen **reduced**
- Halogen 0 → -1



4 Chlorine disproportionates

4B.12 ii-iv

- Cl₂ + H₂O ⇌ HCl + HClO
- Cold NaOH: NaCl + **NaClO** (bleach)
- Hot NaOH: 5NaCl + **NaClO₃**
- Cl 0 → -1, +1 or +5



5 Halides with H₂SO₄

4B.13 i

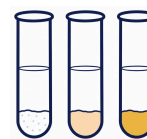
- Cl⁻: steamy HCl fumes only
- Br⁻: Br₂ + **SO₂** (S +4)
- I⁻: I₂, SO₂, S, **H₂S** (S -2)
- Reducing power: I⁻ > Br⁻ > Cl⁻



6 Tests and predictions

4B.13 ii-iii, 4B.14

- AgCl white, AgBr cream, AgI yellow
- NH₃: dilute, conc., insoluble
- HX + NH₃ → NH₄X: **white smoke**
- At: black solid; AgF soluble



The halides compared

one larger ion explains most of the rows

Halide	With AgNO ₃	NH ₃	With conc. H ₂ SO 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 ₂ S

Worked examples

Predict a displacement

- Br₂ + KI: yes
- Br₂ + 2I⁻ → 2Br⁻ + I₂
- hexane layer **purple**

Hot alkali

- 3Cl₂ + 6OH⁻
- 5Cl⁻ + ClO₃⁻ + 3H₂O
- 5 e⁻ gained = **5 e⁻ lost**

Name the halide

- cream precipitate
- dissolves in conc. NH₃ only
- bromide**

Halogens return with halogenoalkanes (Topic 6), redox titrations and electrode potentials (Topic 14).



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