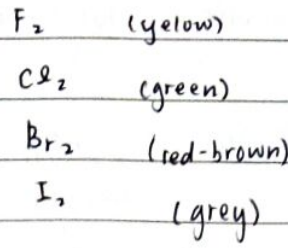


Topic 9 - Group VII Elements (Halogens)

- Trends, Going down the group:
- Colour intensity ↑
 - "solidity" ↑
 - Bp ↑
 - electro-veity ↓
(because shielding effect ↑, atomic radii ↑
less able to attract e⁻ towards itself)
 - oxidising power ↓ (because ↑) → reducing power of ions ↑
- * more reactive halogen will displace less reactive one.



- Test for halogens
- F ⇒ starch iodide paper (I⁻ → I₂) ∴ blue black
 - Cl ⇒ " " } or 2Br⁻ → Br₂
 - I ⇒ add starch solution, hexane → purple, ethanol → brown

→ Hydrogen halides → form white fumes when add ammonia. (ammonium salt sublimates)

→ Hydrogen halides as acids → dissociation of halides depends on H-X bond strength (strength ↓, dissociation ↑)

→ HCl < HBr < HI (HF forms strong H bonds w/ each other)

→ Hydrogen halides reducing ability → Iodide strongest ⇒ bigger ion, more e⁻, e⁻ less attracted ∴ can donate e⁻

→ Test for halides ions ⇒ like test in halogenoalkanes, but no need to use NaOH to use nucleophilic substitution to remove the halogen.

TEST (1)

→ just start w/ HNO₃ to remove carbonate,
↳ then Add AgNO₃ then ammonia (decant ppt first before adding NH₃)

F	no ppt (Agf soluble)	-
Cl	white ppt	soluble in dilute ammonia
Br	cream ppt	insoluble in dilute ammonia soluble in conc. ammonia
I	yellow ppt	insoluble in both

* exam won't give conc. ammonia

→ when they dissolve, a colourless diammine complex formed, [Ag(NH₃)₂]⁺ (aq)

AgCl + NH₃ → [Ag(NH₃)₂]⁺ Cl⁻

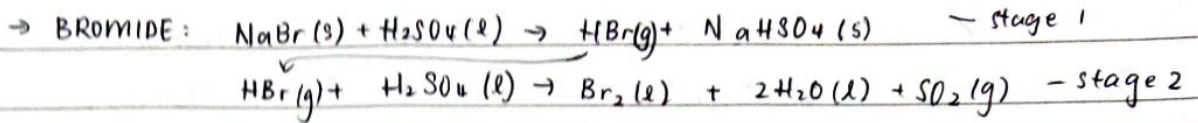
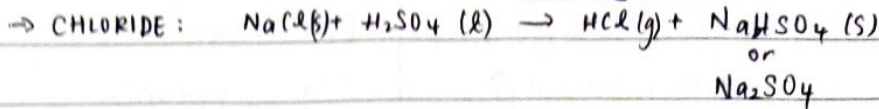
TEST (2)

→ add conc. H₂SO₄ to salts

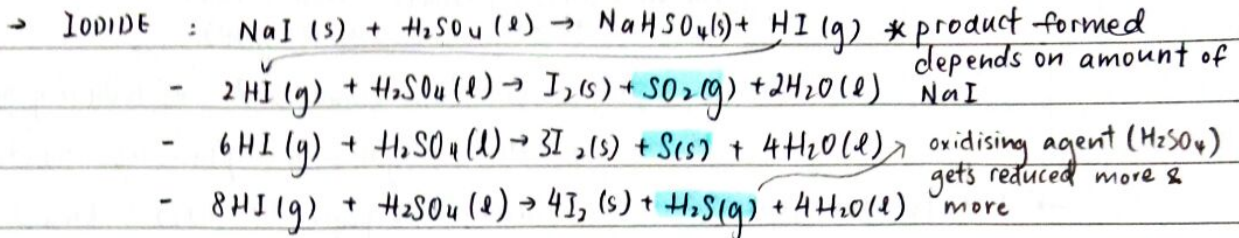
→ forms (HCl, HBr, HI) by displacement, then from 2Br⁻ → Br₂, 2I⁻ → I₂

BVT not 2Cl⁻ → Cl₂
too strong...

o: misty fumes



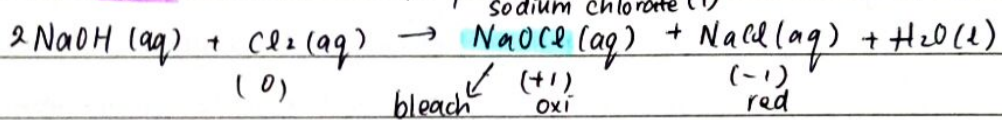
o: misty fumes (HBr), red brown vapour (Br₂), colourless gas (SO₂)



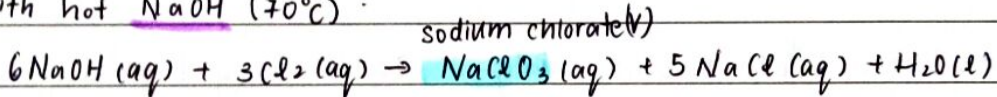
o: misty fumes (HI), purple vapour (I₂), colourless gas (SO₂), yellow solid (S), bad egg smell (H₂S).

→ Chlorine's oxidation states.

→ with cold NaOH (15°C) = disproportionation.

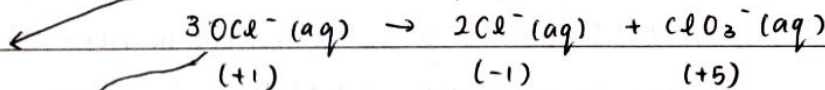


→ with hot NaOH (70°C)

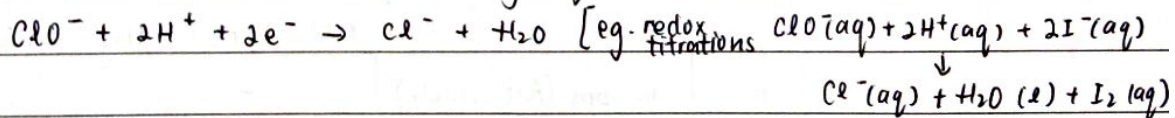


* sodium chlorate (I) disproportionates when heated

to manufacture bleach.



→ ClO⁻ (chlorate (I)) ions are oxidising agents



→ Uses of chlorine

- manufacture of bleach
- use as disinfectant in pools & water treatment
- manufacture PVC
- halogenated hydrocarbons as solvents (CCl₄)
- refrigerants & aerosols

i) toxic
 ii) ozone layer depletion from chlorofluorocarbons.