KNOCKHARDY NOTES

A LEVEL CHEMISTRY

THE HALOGENS

GROUP VII

AT A GLANCE

SIMILARITIES within the Group

- ***Non-metals***
- **Form negative ions**
- ***Similar electronic configuration ... $ns^2\ np^5$***
- **Diatomic covalent molecules**

TRENDS down the Group

Boiling point	INCREASES	- Increased Van der Waals forces
Electronegativity	DECREASES	- Increased shielding and radius
Oxidising power	DECREASES	- Increased shielding and radius

OXIDISING ABILITY - DISPLACEMENT REACTIONS

chlorine oxidises bromide ions to bromine $\mathbf{Cl_2 + 2Br^- \longrightarrow Br_2 + 2Cl^-}$

chlorine oxidises iodide ions to iodine $\mathbf{Cl_2 + 2I^- \longrightarrow I_2 + 2Cl^-}$

bromine oxidises iodide ions to iodine $\mathbf{Br_2 + 2I^- \longrightarrow I_2 + 2Br^-}$

REDUCING ABILITY

Trend $\mathbf{F^- < Cl^- < Br^- < I^-}$

Reason Easier to remove electrons from larger ions

HYDROGEN HALIDES

At RTP all are colourless gases, EXCEPT HF is a colourless liquid

B.Pt **HF 20°C HCl -85°C HBr -69°C HI -35°C**

HF value is much higher than expected (**hydrogen bonding**)

CHLORINE - Reactions

Water $\mathbf{Cl_{2(g)} + H_2O_{(l)} \rightleftharpoons HCl_{(aq)} + HOCl_{(aq)}}$

HCl: strong acid; HOCl: bleaches by oxidation

Cold alkali $\mathbf{2NaOH_{(aq)} + Cl_{2(g)} \longrightarrow NaCl_{(aq)} + NaOCl_{(aq)} + H_2O_{(l)}}$

Examples of DISPROPORTIONATION

TESTING FOR HALIDES

SILVER NITRATE

Ion	Ppt	Formula	dil. NH_3	conc. NH_3
Cl^-	**white**	AgCl	**soluble**	-
Br^-	**cream**	AgBr	**insoluble**	**soluble**
I^-	**yellow**	AgI	**insoluble**	**insoluble**

CONCENTRATED SULPHURIC ACID

Halide	Observation(s)	Product	O.S.	Reaction type
NaCl	**misty** fumes	HCl	-1	Displacement of Cl^-
NaBr	**misty** fumes	HBr	-1	Displacement of Br^-
	brown vapour	Br_2	0	Oxidation of Br^-
	colourless gas	SO_2	+4	Reduction of H_2SO_4
NaI	**misty** fumes	HI	-1	Displacement of Cl^-
	purple vapour	I_2	0	Oxidation of I^-
	colourless gas	SO_2	+4	Reduction of H_2SO_4
	yellow solid	S	0	"
	bad egg smell	H_2S	-2	"