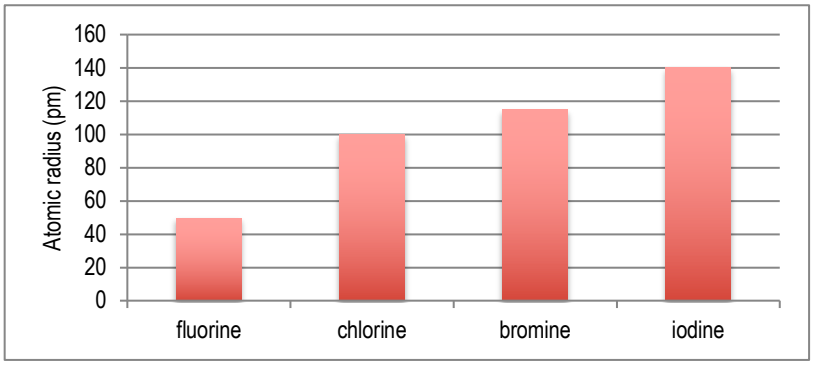
GROUP 7 - PROPERTIES

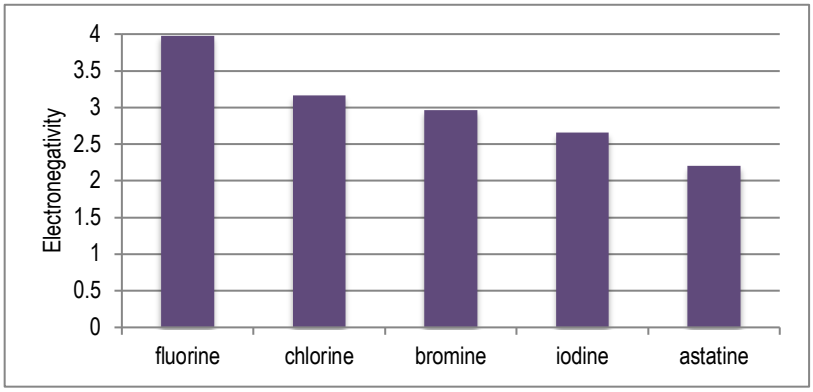
	fluorine (F_2)	chlorine (Cl_2)	bromine (Br_2)	Iodine (I_2)
appearance	yellow gas	green gas	brown liquid	grey crystalline solid
comments			• very easily forms orange vapour • often used as a solution in water (yellow-orange bromine water)	• very easily forms purple vapour • often used as a (sort of) solution in water (brown "iodine solution")

Atomic radius



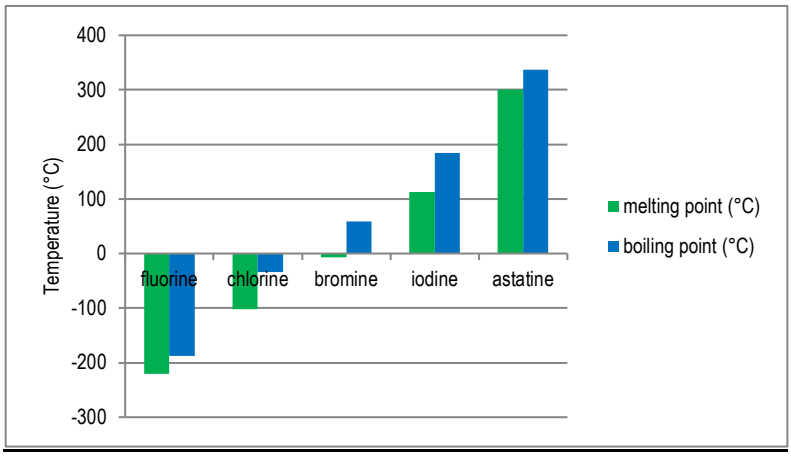
- due to more shells of electrons

Electronegativity



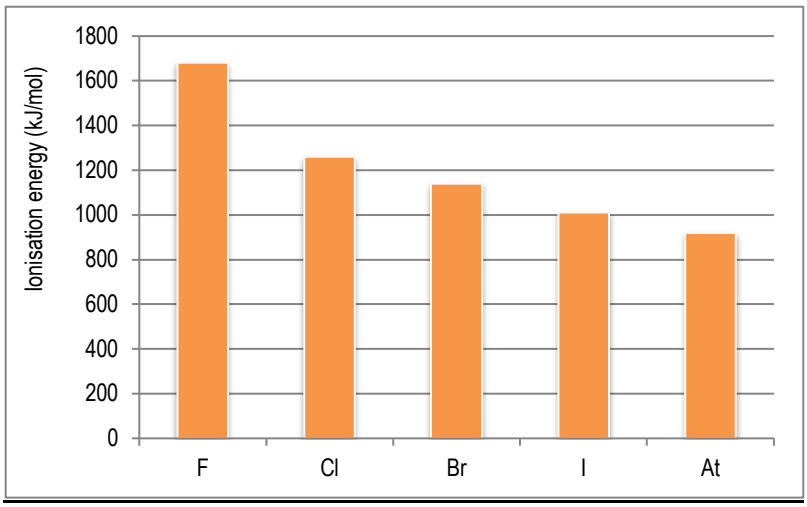
- electronegativity is power of an atom to attract the two electrons in the covalent bond
- down the group:
  - more shells
  - more shielding
  - weaker attraction between nucleus and pair of electrons in covalent bond

Melting & boiling points



- due to stronger van der Waals' forces between molecules
- due to molecules having more electrons

1st ionisation energy



- down the group:
  - more shells
  - more shielding
  - weaker attraction between nucleus and outer electron

Reactions of chlorine with water and NaOH(aq)

	Equation	Comments
Water	$Cl_2 + H_2O \rightleftharpoons HCl + HOCl$ **but in bright light** $HOCl \rightarrow HCl + ½O_2$ **so in bright light** $Cl_2 + H_2O \rightarrow 2HCl + ½O_2$	Chlorine disproportionates in water from 0 (Cl_2) to +1 (HOCl) and –1 (HCl) Chlorine(aq) appears pale green due to the presence of some dissolved Cl_2) in the equilibrium mixture. Very small amounts of chlorine are added to water to kill microbes. Although chlorine is toxic, it is added in low enough amounts to kill microbes but not harm humans. If an indicator is added to chlorine(aq), it will go the acid colour at first (due to the presence of the acids HOCl and HCl), but then it will be bleached by HOCl
NaOH(aq) (cold, dilute)	$Cl_2 + 2NaOH \rightarrow NaCl + NaOCl + H_2O$	Chlorine disproportionates in NaOH from 0 (Cl_2) to +1 (OCl^-) and –1 (Cl^-) This reaction is used to make bleach by reacting chlorine with excess NaOH – and so bleach is an aqueous mixture of NaCl, NaOCl and NaOH