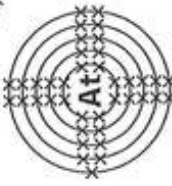
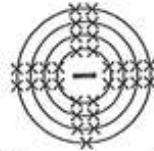


GROUP 7(17): the HALOGENS

GROUP 7(17)

HALOGENS

The elements in Group 7 (17) are known as the halogens and have seven electrons in their outer shell.



HALIDES

They most commonly form ions with a charge of -1 , known as the halides.

TRENDS

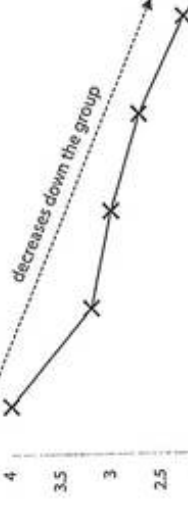
Down Group 7:

- as protons are added, nuclear charge increases
- as electron shells are added, atomic radius increases

TRENDS

F Cl Br I At

ELECTRO-NEGATIVITY



BOILING POINT



ELECTRONEGATIVITY

Down Group 7, electron shells are added. Electrons in bonds are less attracted by the nucleus due to:

- increased atomic radius
- increased shielding

Electronegativity decreases down the group as a result.

In hydrogen halides, the electrons in the covalent bond are closer to the halogen atom for elements higher in Group 7.



EXAM TIP

Electronegativity is the word that describes how much 'pull' atoms have on the electrons in their bonds.

BOILING POINT

Halogen molecules are diatomic (contain two atoms).



Halogen molecules further down Group 7 have higher boiling points because the molecules have more electrons, so there are stronger van der Waals forces between molecules, requiring a higher temperature to break.

REDOX REACTIONS

REMINDER

Redox reactions are reactions where one species is **reduced** and another is **oxidised**.

Oxidation and reduction describe the movement of electrons between atoms.

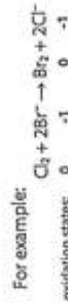
Whenever one thing is oxidised, something must be reduced, and vice versa.

OILRIG is a useful way of remembering this:

- O oxidation
- I is
- L loss (of electrons)
- R reduction
- I is
- G gain (of electrons)

WITH GROUP 7

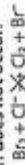
Halogen molecules can react with halide ions.



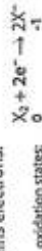
EXPLAINING THIS IN TERMS OF OXIDATION:

Chlorine is a stronger oxidising agent than bromine, so chlorine (Cl_2) oxidises bromide (Br^-) to bromine (Br_2).

For the same reason, the opposite reaction does not occur:



Oxidising ability decreases down Group 7, i.e. it gains electrons:



Down the group, atomic radius increases so additional electrons are added into shells which are:

- further from the nucleus and
- shielded by more shells of electrons.

Therefore, the halogens lower in Group 7 are worse at attracting electrons.

EXPLAINING THIS IN TERMS OF REDUCTION:

Bromine is a stronger reducing agent than chlorine, so bromide (Br^-) reduces chlorine (Cl_2) to chloride (Cl^-).

For the same reason, the opposite reaction does not occur:

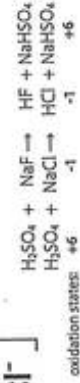


WITH SULFURIC ACID

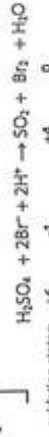
Sodium halides (NaCl , NaI , etc.) all react with sulfuric acid in a different way.

F^- and Cl^- are weak reducing agents, so don't reduce sulfuric acid.

Instead, sulfuric acid acts as an acid to make hydrogen halides. The oxidation state of sulfur stays at $+6$.



Br^- is a stronger reducing agent than F^- and Cl^- . Br^- reduces sulfuric acid to sulfur dioxide.



I^- is an even stronger reducing agent than Br^- , so sulfuric acid is reduced to hydrogen sulfide.

