OCR A GCSE Chemistry

Topic 4: Predicting and identifying reactions and products

Predicting chemical reactions

Notes

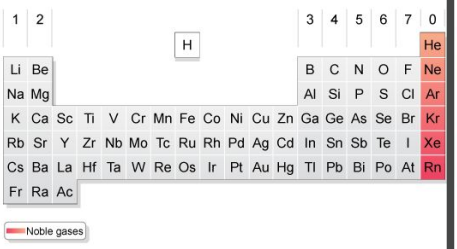
C4.1a recall the simple properties of Groups 1, 7 and 0

Group 1 – Alkali metals

- They have characteristic properties due to the single electron in their outer shell.
- Metals in group one react vigorously with water to create an alkaline solution and hydrogen.
- They all react with oxygen to create an oxide.
- They all react with chlorine to form a white precipitate.
- The reactivity of the elements increases going down the group.

Group 0 – Noble gases

- They have 8 electrons in their outer shell (except helium, which has 2).
- They are unreactive and do not easily form molecules, because they have a stable arrangement of electrons.
- The boiling points of the noble gases increase with increasing relative atomic mass (going down the group).



Group 7 – The halogens

- Similar reactions due to their seven electrons in their outer shell.
- Non-metals and consist of molecules made of pairs of atoms.
- They react with metals to form ionic compounds in which the halide ion carries a -1 charge.
- A more reactive halogen can displace a less reactive in an aqueous solution of its salt.

As you go further down:

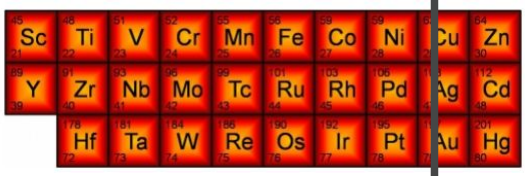
- The element is less reactive because the higher the energy level of the outer electrons, the less easily electrons are gained (attracted to the positive nucleus.)
- The higher its relative molecular mass, melting and boiling points.

C4.1b explain how observed simple properties of Groups 1, 7 and 0 depend on the outer shell of electrons of the atoms and predict properties from given trends down the groups

- see C4.1a

C4.1c recall the general properties of transition metals and their compounds and exemplify these by reference to a small number of transition metals

Compared to group 1, the transition elements:



- Are harder and stronger
- Have higher melting points (except for mercury) and higher densities
- Much less reactive and don't react as vigorously with oxygen or water
- Refer to Cr, Mn, Fe, Co, Ni, Cu as examples of transition metals when comparing to alkali metals.

Typical properties

- They have ions with many different charges
- Form coloured compounds
- Are useful as catalysts.

C4.1d predict possible reactions and probable reactivity of elements from their positions in the periodic table

- left hand side = forms positive ions, right hand side = forms negative ions (to gain stable electron arrangement like noble gases)
- remember the group an element is in indicates how many electrons are in its outer shell

C4.1e explain how the reactivity of metals with water or dilute acids is related to the tendency of the metal to form its positive ion

- Metals react by forming positive ions, therefore a metal that tends to form a positive ion more than another is more reactive
    - Greater tendency to form a positive ion = more reactive metal
- only the most reactive metals will react with dilute acids:
  Metal + dilute acid → salt + hydrogen
- most metals will react with water, but some very unreactive ones won't:
  Metal + water → metal hydroxide + hydrogen

C4.1f deduce an order of reactivity of metals based on experimental results

- use the reactions above, those which undergo the most vigorous reactions are the most reactive and those which don't react at all are the least reactive