

C2: The Periodic Table: Chemistry Specification

Group 7

Elements in Group 7 are called the halogens and they have similar reactions because they have 7 electrons in their outermost shell. The halogens are non-metals and are molecules made of pairs of atoms. At room temperature F_2 is a yellow gas, Cl_2 is a green gas, Br_2 is a brown liquid while when in solution is it yellow and I_2 is a shiny black solids while when in solution it is a dark brown/red colour. When they form compounds with metals they form white solids.

Trends in Group 7

Down the group the elements in group 7 become less reactive. This is because the atoms are bigger and so the outermost electrons are further away from the nucleus. This means that there is a weaker attraction between the electrons and the nucleus and so it is harder to gain an electron to the outermost shell.

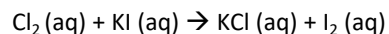
The Periodic Table

The elements in the periodic table are arranged in order of atomic number. This means that elements with similar properties are in the same groups. The table is called a periodic table because similar properties occur at regular intervals.

Displacement

A more reactive halogen can displace a less reactive halogen from an aqueous solution of its salt. For example:

Chlorine + Potassium Iodide \rightarrow Potassium Chloride + Iodine



Chlorine is green when in solution and will displace the iodine. At the end of the reaction the iodine will be displaced and so the solution will be a brown colour.

Groups

Groups are the vertical columns in the periodic table. Elements in the same group have the same number of electrons in their outermost shell and so they have similar properties. Every atom in group 1 has 1 electron in its outermost shell, while everything in group 7 has 7 electrons in its outermost shell.

Periods

Periods are the horizontal rows on the periodic table. Every element in the same period has the same number of shells. For example all elements in period 3 have 3 shells while all elements in period 4 have 4 shells.

Metals

Metals form positive ions and are found on the left side of the periodic table and towards the bottom.

Non Metals

Non Metals form negative ions. They found on the right side of the periodic table and towards the top.

Development of the Periodic Table

Before the discovery of protons, neutrons and electrons, scientists grouped the elements by arranging them in order of their atomic weights. This posed some problems. Firstly, the early periodic tables were incomplete as not all elements had been discovered and secondly, some elements were placed in the wrong place if the order of atomic weights was followed. Mendeleev overcame these problems by firstly leaving gaps for undiscovered elements and he swapped the position of some elements when arranging them by atomic weight put them in the wrong groups. Overtime Mendeleev's periodic table was accepted because elements with properties predicted by Mendeleev were discovered and filled the gaps that he had left. Knowledge of isotopes made it possible to explain why the order based on atomic weights was not always correct and proved that Mendeleev was right to swap the position of some elements.

Transition Metals

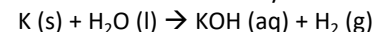
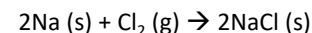
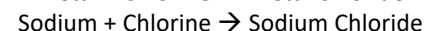
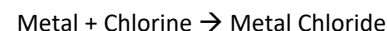
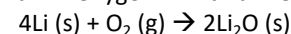
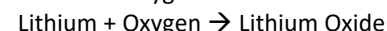
These are metals positioned in the large central block of the periodic table between groups 2 and 3. Compared to the alkali metals the transition metals are harder, stronger, have a higher density, have higher melting and boiling points and are less reactive. Alkali metals form +1 ions while the transition metals form ions with different charges. Alkali metals form white compounds while the transition metals form coloured compounds. Transition metals are used as catalysts while alkali metals are not.

Group 0

Elements in Group 0 are called the noble gases. They are unreactive and don't easily form molecules because their atoms have stable arrangements of electrons because they all have full outermost shells. The noble gases have eight electrons in their outer shell, except for helium, which has only two electrons. Down the group the boiling point increases and the gases become more dense.

Group 1

Elements in Group 1 are called the alkali metals and they have similar properties because they all have 1 electron on their outermost shell. They all react with oxygen, chlorine and water and down the group the metals become more reactive.



Trends in Group 1

Down the group the elements in group 1 become more reactive. This is because the atoms are bigger and so the outermost electrons are further away from the nucleus. This means that there is a weaker attraction between the electrons and the nucleus and so the outermost electron is lost more easily.

Comparing Metals and Non Metals

Metals	Non Metals
Conduct Electricity	Do not conduct electricity.
Higher melting and boiling points	Lower melting and boiling points
Ductile	Not ductile
Malleable	Brittle