science

chemistry

Y8 Matter 2 – Periodic Table & Elements

1) Elements

Elements are substances **made of only one type of atom**. Atoms of the same element will have the same number of protons (atomic number). All elements are shown on the periodic table.

Each element is represented by their own chemical symbol which:

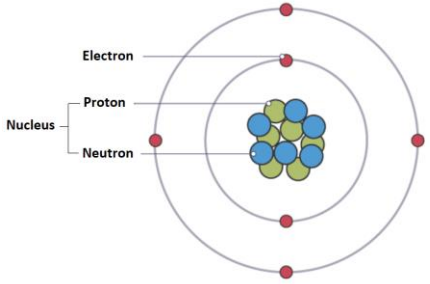
- Consists of one or two letters
- Always starts with a capital letter and the following letter is in lower case

O = oxygen **Mg = magnesium** **Na = sodium**

2) Structure of an Atom

Atoms have a central **nucleus** which contains the **protons** and **neutrons**. Moving around the nucleus are the **electrons** in their electron shells.

Atoms have no overall charge (neutral) as they have the same number of protons as electrons.

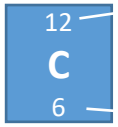


Subatomic Particle	Relative Mass	Relative Charge
Proton	1	+1
Neutron	1	0
Electron	Very small	-1

Electrons are found in shells. The first shell can have up to 2 electrons inside it, then 8 in the second and third shell.

Atomic Number and Mass Number: The atomic number of an atom is the number of protons in its nucleus.

The mass number of an atom is the total number of protons and neutrons in its nucleus.



Mass Number

Atomic Number

3) Mixtures

Mixtures contain **different elements and/or compounds that are not chemically joined together**. The substances in a mixture can be easily separated from each other, e.g. by evaporation, chromatography and distillation.

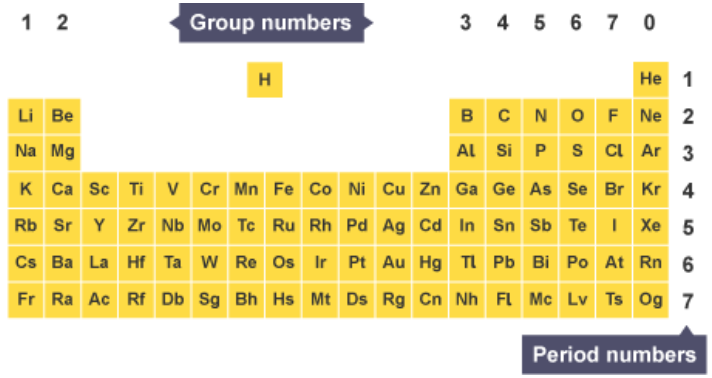
4) The Periodic Table

Mendeleev

In the late 1800s Dimitri Mendeleev arranged all the known elements in order of their **atomic weight**. He **left gaps** in the periodic table that he thought had not yet been discovered. Elements with properties predicted by Mendeleev were later discovered and filled the gaps.

Modern Periodic Table

The elements in the modern periodic table are arranged in order of **atomic number** so that elements with similar properties are in columns, known as groups.

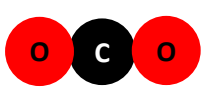


Elements in the same group in the periodic table have the same number of electrons in their outer shell and this gives them similar chemical properties.

5) Compounds

Compounds are substances which **contain two or more different elements which are chemically joined together**. They are held together by chemical bonds and so are difficult to separate.

Examples include carbon dioxide (carbon and oxygen) and water (hydrogen and oxygen).



Carbon dioxide – CO_2

Water – H_2O

6) Metals & Non-Metals

Metals are found to the left of the periodic table and non-metals to the right.

Properties of Metals

- Shiny
- Malleable
- Conduct heat
- Conduct electricity
- Solid at room temp.

Properties of Non-Metals

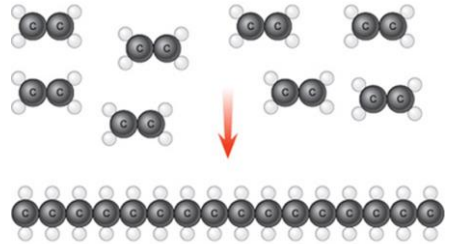
- Dull (non-lustrous)
- Brittle
- Poor conductor of heat
- Poor conductor of electricity
- Not always solid at room temp.

7) Polymers

Polymers are very long chain molecules made from small repeating units called monomers.

Polymers occur naturally but can also be manufactured.

Synthetic polymers are better known as plastics and have a range of uses.



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8) Group 1 – Alkali Metals

- Have normal metal properties (e.g. good conductors) except
- They are soft silvery white metals
- Have lower melting points compared to other metals.
- Less dense so float on water.

- React with cold water to produce an alkaline solution and fizz to produce hydrogen gas:
- Lithium – fizzes on the surface
- Sodium – more reactive, fizzes and melts into a ball
- Potassium – even more reactive, sets on fire (a lilac flame)

e.g. $2K + 2H_2O \rightarrow 2KOH + H_2$

- React with oxygen to form oxides (which is why the alkali metals are shiny on the inside but dull on the outside).

- As you go down group 1 the metals get more reactive.

9) Group 7 – The Halogens

- The halogens are a group of coloured non-metals whose melting points increase down the group (since the molecules get bigger down the group)
- fluorine (F_2) is a pale-yellow gas,
- chlorine (Cl_2) is a green gas,
- bromine (Br_2) is a red-brown liquid,
- iodine (I_2) is a dark grey solid.

- Halogens react with metals to make metal halides.
- Halogens react with non-metals by sharing electrons

e.g. with hydrogen

fluorine + hydrogen → hydrogen fluoride

$F_2 + H_2 \rightarrow 2HF$

- Halogens become less reactive as you go down the group.

- Halogens react with solutions of their ions to give "displacement reactions". A more reactive halogen will displace a less reactive halogen from one of its compounds, but the reaction does not work the other way round.

chlorine + potassium bromide → potassium chloride + bromine

$2Cl_2 + 2KBr \rightarrow 2KCl + Br_2$

10) Group 0 – The Noble Gases

- Noble gases are unreactive.
- This is because their atoms have full outer shell of electrons.
- The boiling points and densities of the noble gases increase down the group.
- Because they are unreactive, this explains the uses of the noble gases e.g. argon is used in welding to stop the hot metal reacting with oxygen in the air.

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