The Thomas Alleyne Academy

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Knowledge Organiser - The Periodic Table

Science Department

A column on the periodic table is known as a group. A row is called a period.

Alkali metals

Non-metals

Halogens (7)

Metalloids

Transition metals

Noble gases (0)

Key

relative atomic mass
atomic symbol
name
atomic (proton) number

1	2										3	4	5	6	7	0
																4 He helium 2
7 Li lithium 3	9 Be beryllium 4										11 B boron 5	12 C carbon 6	14 N nitrogen 7	16 O oxygen 8	19 F fluorine 9	20 Ne neon 10
23 Na sodium 11	24 Mg magnesium 12										27 Al aluminium 13	28 Si silicon 14	31 P phosphorus 15	32 S sulfur 16	35.5 Cl chlorine 17	40 Ar argon 18
39 K potassium 19	40 Ca calcium 20	45 Sc scandium 21	48 Ti titanium 22	51 V vanadium 23	52 Cr chromium 24	55 Mn manganese 25	56 Fe iron 26	59 Co cobalt 27	59 Ni nickel 28	63.5 Cu copper 29	65 Zn zinc 30	70 Ga gallium 31	73 Ge germanium 32	75 As arsenic 33	79 Se selenium 34	80 Br bromine 35	84 Kr krypton 36
85 Rb rubidium 37	88 Sr strontium 38	89 Y yttrium 39	91 Zr zirconium 40	93 Nb niobium 41	96 Mo molybdenum 42	[98] Tc technetium 43	101 Ru ruthenium 44	103 Rh rhodium 45	106 Pd palladium 46	108 Ag silver 47	112 Cd cadmium 48	115 In indium 49	119 Sn tin 50	122 Sb antimony 51	128 Te tellurium 52	127 I iodine 53	131 Xe xenon 54
133 Cs caesium 55	137 Ba barium 56	139 La* lanthanum 57	178 Hf hafnium 72	181 Ta tantalum 73	184 W tungsten 74	186 Re rhenium 75	190 Os osmium 76	192 Ir iridium 77	195 Pt platinum 78	197 Au gold 79	201 Hg mercury 80	204 Tl thallium 81	207 Pb lead 82	209 Bi bismuth 83	[209] Po polonium 84	[210] At astatine 85	[222] Rn radon 86
[223] Fr francium 87	[226] Ra radium 88	[227] Ac* actinium 89	[261] Rf rutherfordium 104	[262] Db dubnium 105	[266] Sg seaborgium 106	[264] Bh bohrium 107	[277] Hs hassium 108	[268] Mt meitnerium 109	[271] Ds darmstadtium 110	[272] Rg roentgenium 111		Elements with atomic numbers 112 – 116 have been reported but not fully authenticated					

METALS

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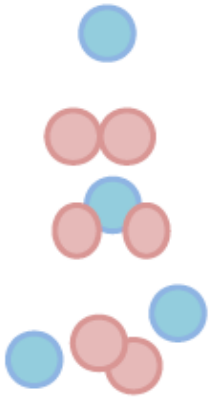
KPI 8CP1: Identify, with reasons, differences between atoms, elements and compounds.

Atoms, elements and compounds



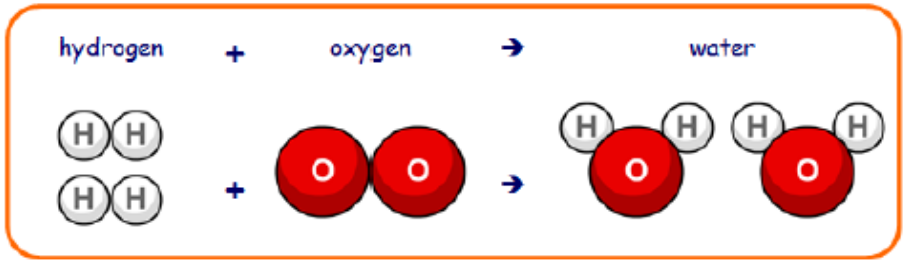
Atom	The building block of matter (the smallest thing everything is made of)
Element	A substance made of only one type of atom
Compound	A substance made of more than one type of atom which are chemical bonded
Mixture	A substance made of more than one elements or compounds that are <u>not</u> bonded together

All of the elements we know of are found on the periodic table.

Why isn't water an element?

Chemical reaction

When two or more elements react in a chemical reaction a compound is formed.



Each element is given its own chemical symbol, like **H** for hydrogen or **O** for oxygen. Chemical symbols are usually one or two letters long.

Every chemical symbol starts with a capital letter, with the second letter written in lower case.

For example, **Mg** is the correct symbol for magnesium, but mg, mG and MG are wrong. **Take care to write chemical symbols correctly.**

Mg	mg	mG	MG
✓	✗	✗	✗

The same chemical symbols are used all over the world, no matter which language is spoken, which makes them very useful.

Properties

Each element or compound will have specific properties, this means what the element is like.
Physical properties are factors such as a substance's boiling point, density or melting point.
Chemical properties are factors such as a substance's reactivity.
A compound has very different properties to the elements from which it is made.

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KPI 8CP 2: Represent chemical reactions as word equations and apply this to the idea of conservation of mass

Chemical reactions

In a chemical reaction, one or more new substances are always formed.

The starting substances used in a reaction are the **reactants.**
The new substances formed are the **products.**

reactants → products

The arrow means 'change into'. In a chemical reaction, the reactants change into the products.

Word equations

A word equation is a quick, shorthand way of writing a chemical reaction. You must always include the reactants, the products and an arrow.

For example, magnesium and oxygen will react to form magnesium oxide. The word equation for this would be:

Magnesium + Oxygen → Magnesium oxide

Where:
Reactants = magnesium and oxygen
Products = magnesium oxide

Can you identify the reactants and the products in the equations on the right hand side?

Conservation of mass and symbol equations

In a chemical reaction, atoms are never created or destroyed, they are simply rearranged. For example:

magnesium + copper oxide → magnesium oxide + copper

In this reaction, the bonds between the copper and oxygen break and the magnesium bonds with the oxygen. We have the same elements as we did at the start, but they are arranged differently.
This is known as the conservation of mass.

As every element has its own symbol on the periodic table, we can use this to create symbol equations. These are a good way of showing how mass is conserved in a chemical reaction.

The symbol equation for the above chemical reaction is:

Mg + CuO → MgO + Cu

Use your periodic table to write word equations for these reactions.
Challenge: can you write their symbol equations?
Remember: mass must be conserved in a chemical reaction (you must have the same elements at the end as you did at the start, they might just be arranged differently)!

- When plants carry out photosynthesis they use light energy from the Sun to turn carbon dioxide and water into oxygen and glucose ($C_6H_{12}O_6$).
- A student burned copper with oxygen which produced a black substance called copper oxide.

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KPI 8CP 3: Explain how an element's position in the periodic table links to its properties and reactivity (groups 1 and 7).

The periodic table

The positioning of elements on the periodic table is not random, they elements are put in very specific positions and the locations of elements can tell us a lot about its properties (what the element is like).

In the 19th Century a scientist named Mendeleev grouped elements together that had similar properties, this idea was the foundation for the periodic table we use today.

Metals and non-metals

Metals are found on the left hand side and in the middle of the periodic table.

Some common properties of metals are:

- Lustrous (shiny)
- Malleable (can be hammered/pressed into shape without breaking)
- Good conductors of heat and electricity
- High melting and boiling points
- Hard
- Dense
- Ductile (can be drawn out into a thin wire without breaking).

Group 1: the alkali metals

The alkali metals are in group 1 of the periodic table.
They are very reactive with other substances, such as oxygen and water.

They are grouped together as they behave similarly when in contact with water and oxygen, but their reactivity increases as you go down the group.

These elements are called the 'alkali metals' because when the metal reacts with water, an alkaline solution is formed.

7	23	39	85	133	[223]
Li	Na	K	Rb	Cs	Fr
lithium	sodium	potassium	rubidium	caesium	francium
3	11	19	37	55	87

Group 0: the noble gases

The noble gases are the elements found on the far right of the periodic table (group 0).

They all have very low boiling points so are all gases at room temperature.

The noble gases are very unreactive (they will not react easily with other elements). which makes them very useful. For instance, neon is used to make brightly coloured signs.

4	20	40	84	131	[222]
He	Ne	Ar	Kr	Xe	Rn
helium	neon	argon	krypton	xenon	radon
2	10	18	36	54	86

Group 7: the halogens

The halogens are found in group 7 of the periodic table and contain elements such as fluorine, chlorine (used in swimming pools) and bromine.

The halogens tend to have low melting and boiling points, although these increase as you go down the group.

How do you think the boiling point of astatine will compare to fluorine?

7	19	35.5	80	127	[210]
	F	Cl	Br	I	At
	fluorine	chlorine	bromine	iodine	astatine
	9	17	35	53	85

116 have icated

Displacement

Unlike their melting and boiling points, the reactivity of the halogens *decreases* as you go down the group.

If a less reactive halogen came into contact with a compound of a less reactive halogen, then a **displacement** reaction happens.

For example:

Potassium + fluorine → potassium + chlorine
chloride fluoride

Fluorine is above chlorine in the periodic table so is more reactive. It will therefore bond with potassium, removing and replacing the less reactive chlorine.