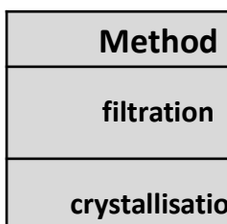
AQA C1a Atomic structure and the periodic table
COMBINED HIGHER

Atoms, elements and compounds

atom	The smallest part of an element that can exist	Have a radius of around 0.1 nanometres and have no charge
element	Contains only one type of atom	Around 100 different elements each one is represented by a symbol e.g. O, Na, Br
compound	Two or more elements chemically combined	Compounds can only be separated into elements by chemical reactions



nucleus	Contains protons and neutrons
electron shells	Contains electrons

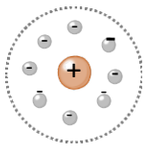
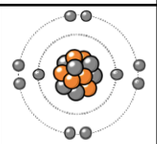
Sub atomic particles

name of particle	relative charge	relative mass
proton	+1	1
neutron	0	1
electron	-1	very small

$^{7}_{3}Li$

mass number	The sum of the protons and neutrons in the nucleus.	
atomic number	The number of protons in the atom	number of electrons = number of protons

The development of the model of the atom

pre 1900		Tiny solid balls that could not be divided	Before the discovery of the electron, John Dalton said these solid balls made up the different elements.
1897 'plum pudding'		A ball of positive charge with negative electrons embedded in it	JJ Thompson's experiments showed that an atom must contain small negative charges (discovery of electrons).
1909 nuclear model		Positively charged nucleus at the centre surrounded by negative electrons	Ernest Rutherford's alpha particle scattering experiment showed that most of the mass of an atom was at its centre.
1913 Bohr model		Electrons orbit the nucleus at specific distances	Niels Bohr proposed that electrons orbited in fixed shells; this was supported by experimental observations.

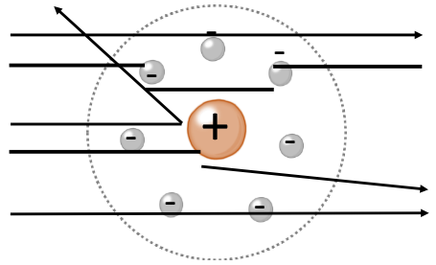
James Chadwick	Provided the evidence to show the existence of neutrons within the nucleus

Electronic structures

Electron shell	How many electrons?
1	2
2	8
3	8
4	18

Rutherford's scattering experiment

A beam of alpha particles were directed at very thin gold foil



Most of the alpha particles passed right through.
A few positive alpha particles were deflected by the positive nucleus.
A tiny number of particles reflected back from the nucleus.

mixtures	Two or more elements or compounds not chemically combined together.	Can be separated by one of these methods:

Method	Description	Example
filtration	Separating an insoluble solid from a liquid	To get sand from a mixture of sand, salt and water.
crystallisation	To separate a solid from a solution	To obtain pure crystals of sodium chloride from salt water.
simple distillation	To separate a solvent from a solution	To get pure water from salt water.
fractional distillation	Separating a mixture of liquids with different boiling points	To separate the different compounds in crude oil.
chromatography	Separating substances that move at different rates through a medium	To separate out the dyes in food colouring.

chemical equations	These show how chemical reactions change reactants into products. An energy change usually happens too.	Law of conservation of mass states the total mass of products must equal the total mass of reactants.
word equations	Uses words to show reaction: reactants → products magnesium + oxygen → magnesium oxide	Does not show what is happening to the atoms or the number of atoms.
symbol equations	Uses symbols to show reaction reactants → products $2Mg + O_2 \rightarrow 2MgO$	Shows the number of atoms and molecules in the reaction. These need to be balanced.

Relative atomic mass

isotopes	atoms of the same element with the same number of protons and different numbers of neutrons	^{35}Cl (75%) and ^{37}Cl (25%) relative atomic mass = ((% isotope 1 x mass isotope 1) + (% isotope 2 x mass isotope 2)) ÷ 100 e.g. ((25 x 37) + (75x 35)) ÷ 100 = 35.5