

Atoms, elements and compounds

| | | |
|-----------------|---|---|
| Atom | <i>The smallest part of an element that can exist</i> | Have a radius of around 0.1 nanometres and have no charge (0). |
| Element | <i>Contains only one type of atom</i> | Around 100 different elements each one is represented by a symbol e.g. O, Na, Br. |
| Compound | <i>Two or more elements chemically combined</i> | Compounds can only be separated into elements by chemical reactions. |

| | |
|------------------------|--------------------------------------|
| Central nucleus | Contains protons and neutrons |
| Electron shells | Contains electrons |

| Electronic shell | Max number of electrons |
|------------------|-------------------------|
| 1 | 2 |
| 2 | 8 |
| 3 | 8 |
| 4 | 2 |

| Name of Particle | Relative Charge | Relative Mass |
|------------------|-----------------|---------------|
| Proton | +1 | 1 |
| Neutron | 0 | 1 |
| Electron | -1 | Very small |

Relative electrical charges of subatomic particles

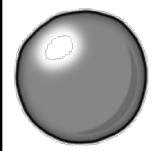
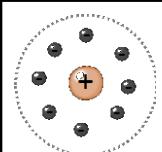
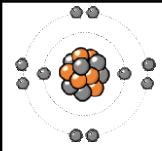
| | | | |
|--------------|----------------------|---|---|
| 7 Li 3 | Mass number | <i>The sum of the protons and neutrons in the nucleus</i> | |
| | Atomic number | <i>The number of protons in the atom</i> | Number of electrons = number of protons |

| | | |
|-----------------|---|---|
| Mixtures | <i>Two or more elements or compounds not chemically combined together</i> | Can be separated by physical processes. |
|-----------------|---|---|

| Method | Description | Example |
|--------------------------------|--|---|
| Filtration | <i>Separating an insoluble solid from a liquid</i> | To get sand from a mixture of sand, salt and water. |
| Crystallisation | <i>To separate a solid from a solution</i> | To obtain pure crystals of sodium chloride from salt water. |
| Simple distillation | <i>To separate a solvent from a solution</i> | To get pure water from salt water. |
| Fractional distillation | <i>Separating a mixture of liquids each with different boiling points</i> | To separate the different compounds in crude oil. |
| Chromatography | <i>Separating substances that move at different rates through a medium</i> | To separate out the dyes in food colouring. |

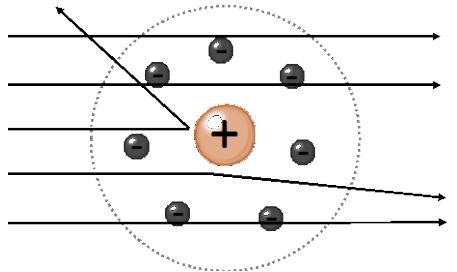
AQA GCSE Atomic structure and periodic table part 1

Electronic structures

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

The development of the model of the atom

| | |
|-----------------------|---|
| James Chadwick | <i>Provided the evidence to show the existence of neutrons within the nucleus</i> |
|-----------------------|---|

| | | | |
|---|--|--|---|
| Rutherford's scattering experiment | <i>A beam of alpha particles are directed at a very thin gold foil</i> |  | Most of the alpha particles passed right through. A few (+) alpha particles were deflected by the positive nucleus. A tiny number of particles reflected back from the nucleus. |
| | | | |

| | | |
|---------------------------|---|--|
| Chemical equations | <i>Show chemical reactions - need reactant(s) and product(s) energy always involves and energy change</i> | Law of conservation of mass states the total mass of products = the total mass of reactants. |
|---------------------------|---|--|

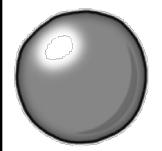
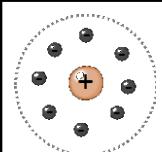
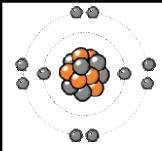
| | | |
|-------------------------|--|---|
| Word equations | <i>Uses words to show reaction</i> reactants → products <i>magnesium + oxygen → magnesium oxide</i> | Does not show what is happening to the atoms or the number of atoms. |
| Symbol equations | <i>Uses symbols to show reaction</i> reactants → products <i>2Mg + O₂ → 2MgO</i> | Shows the number of atoms and molecules in the reaction, these need to be balanced. |

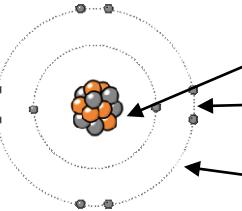
Relative atomic mass

| | | |
|-----------------|--|--|
| Isotopes | <i>Atoms of the same element with the same number of protons and different numbers of neutrons</i> | ³⁵Cl (75%) and ³⁷Cl (25%) Relative abundance = (% isotope 1 x mass isotope 1) + (% isotope 2 x mass isotope 2) ÷ 100 e.g. (25 x 37) + (75 x 35) ÷ 100 = 35.5 |
|-----------------|--|--|

Atoms, elements and compounds

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| | <i>Two or more elements chemically combined</i> | Compounds can only be separated into elements by chemical reactions. |

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|  | <i>Tiny solid spheres that could not be divided</i> | Before the discovery of the electron, John Dalton said the solid sphere made up the different elements. |
|  | <i>A ball of positive charge with negative electrons embedded in it</i> | JJ Thompson 's experiments showed that showed that an atom must contain small negative charges (discovery of electrons). |
|  | <i>Positively charge nucleus at the centre surrounded negative electrons</i> | Ernest Rutherford's alpha particle scattering experiment showed that the mass was concentrated at the centre of the atom. |
|  | <i>Electrons orbit the nucleus at specific distances</i> | Niels Bohr proposed that electrons orbited in fixed shells; this was supported by experimental observations. |



| | |
|--|--------------------------------------|
| | Contains protons and neutrons |
| | Contains electrons |

| Name of Particle | Relative Charge | Relative Mass |
|------------------|-----------------|---------------|
| | +1 | 1 |
| | 0 | 1 |
| | -1 | Very small |

| Electronic shell | Max number of electrons |
|------------------|-------------------------|
| 1 | |
| 2 | |
| 3 | |
| 4 | |

Electronic structures

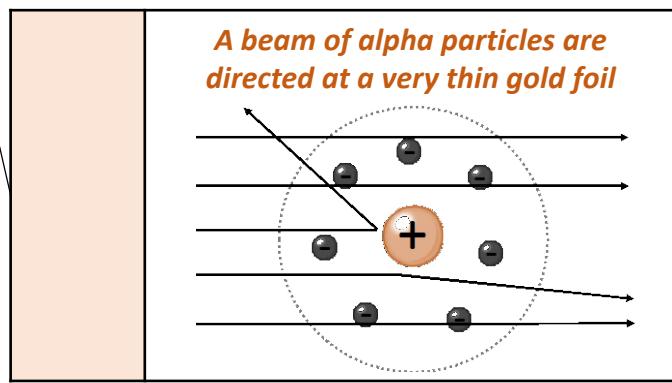
The development of the model of the atom

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

Relative electrical charges of subatomic particles

| | | |
|----|---|---|
| 7 | <i>The sum of the protons and neutrons in the nucleus</i> | |
| Li | <i>The number of protons in the atom</i> | Number of electrons = number of protons |
| 3 | | |

AQA GCSE Atomic structure and periodic table part 1



A beam of alpha particles are directed at a very thin gold foil

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

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| | <i>Two or more elements or compounds not chemically combined together</i> | Can be separated by physical processes. |
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Show chemical reactions - need reactant(s) and product(s) energy always involves and energy change

Law of conservation of mass states the total mass of products = the total mass of reactants.

| Method | Description | Example |
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| | <i>Separating an insoluble solid from a liquid</i> | To get sand from a mixture of sand, salt and water. |
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| | <i>Separating a mixture of liquids each with different boiling points</i> | To separate the different compounds in crude oil. |
| | <i>Separating substances that move at different rates through a medium</i> | To separate out the dyes in food colouring. |

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| | <i>Uses words to show reaction</i> reactants → products magnesium + oxygen → magnesium oxide | Does not show what is happening to the atoms or the number of atoms. |
| | <i>Uses symbols to show reaction</i> reactants → products 2Mg + O ₂ → 2MgO | Shows the number of atoms and molecules in the reaction, these need to be balanced. |

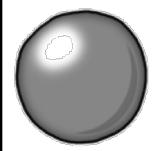
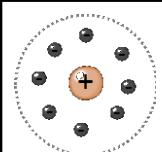
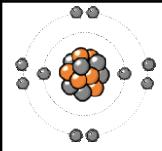
Relative atomic mass

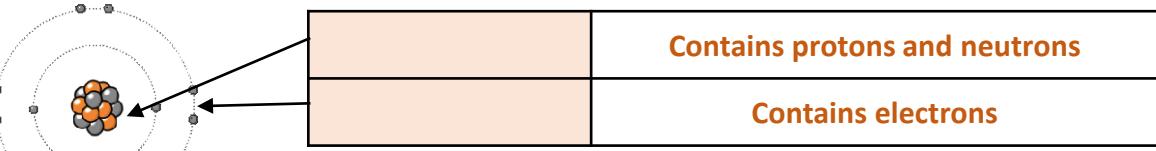
Atoms of the same element with the same number of protons and different numbers of neutrons

³⁵Cl (75%) and ³⁷Cl (25%)
Relative abundance =
(% isotope 1 x mass isotope 1) + (% isotope 2 x mass isotope 2) ÷ 100
e.g. (25 x 37) + (75x 35) ÷ 100 = 35.5

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| | 0 | 1 |
| | -1 | Very small |

| Electronic shell | Max number of electrons |
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| 2 | |
| 3 | |
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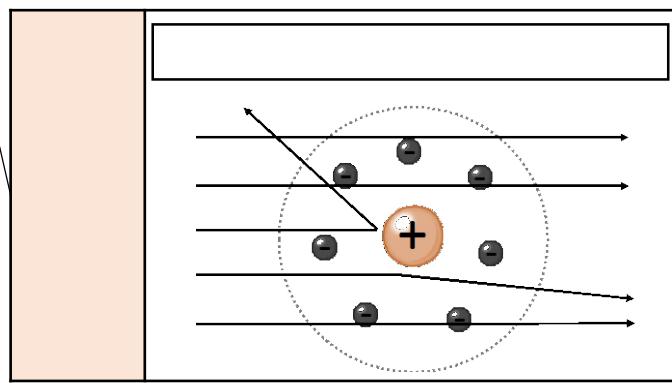
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| Li | | |
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AQA GCSE Atomic structure and periodic table part 1



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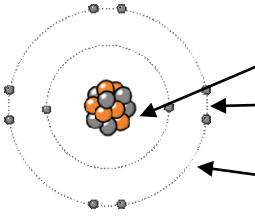
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Atoms, elements and compounds

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| Electronic shell | Max number of electrons |
|------------------|-------------------------|
| 1 | |
| 2 | |
| 3 | |
| 4 | |

Electronic structures

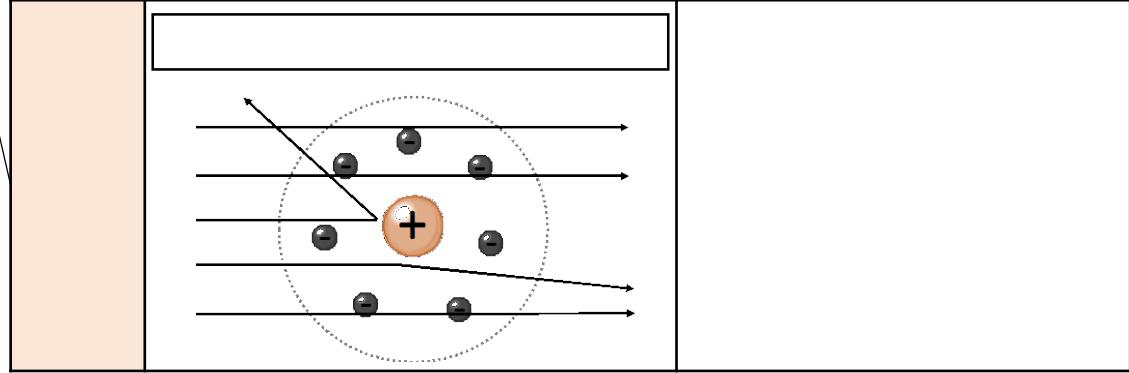
| Name of Particle | Relative Charge | Relative Mass |
|------------------|-----------------|---------------|
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The development of the model of the atom

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Relative electrical charges of subatomic particles

AQA GCSE Atomic structure and periodic table part 1



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| 7 | | |
| Li | | |
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| Method | Description | Example |
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Relative atomic mass

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