

C1: Atomic Structure: Chemistry Specification

Atoms

All substances are made of atoms. An atom is the smallest part of an element that can exist. Atoms of each element are represented by a chemical symbol for example the symbol for magnesium is Mg.

Conservation of Mass

The law of conservation of mass says that no atoms are lost or made during a chemical reaction. This means that the mass of the products equals the mass of the reactants, so symbol equations must be balanced.

Compounds

Compounds are formed from elements by chemical reactions. Compounds contain two or more elements chemically bonded together. They can be separated into elements by chemical reactions.

Mixtures

A mixture consists of two or more elements or compounds not chemically joined together. This means that they still have the same chemical properties and they can be separated using different separation techniques. These techniques include filtration, crystallisation, distillation, fractional distillation and chromatography. These techniques do not involve chemical reactions.

Crystallisation

This is a separation technique to separate a soluble substance from a solvent. For example it can be used to separate salt from water or other substances that have dissolved. It involves adding the solution to an evaporating dish and heating it with a Bunsen Burner to get the water to evaporate. Heating is stopped when crystals form and the rest of the water is left to then evaporate at room temperature. To heat the salt more gently you can use a water bath which involves placing the evaporating dish on a beaker of water that is being heated with a Bunsen Burner.

Filtration

This is a separation technique to separate an insoluble substance from a solvent. For example it can be used to separate sand from water or other solids that have not dissolved. It involves a funnel and filter paper and pouring the solution through the filter paper. The insoluble substance collects on the filter paper and this can then be washed and dried.

Fractional Distillation

This is a separation technique to separate mixture of miscible liquids such as ethanol and water that have different boiling points.. It involves adding the mixture to round bottom flask connected fractioning column that usually contains glass beads. This is then fitted to a condenser. The mixture is then heated with a Bunsen Burner to get the liquids to evaporate. The substance with a higher boiling point will condense more readily and fall back into the solution, while the substance with the lower boiling point will rise up the column and into the condenser.

Chromatography

This is a separation technique to separate different soluble substances from each other. It can be used to separate food colourings. It involves getting a piece of chromatography paper and drawing an origin line in pencil. A spot of the substance to be separated is then added to this origin line and the paper is then placed in a solvent with the origin line above the solvent. The solvent moves up the chromatography paper and the substance dissolves into it. The more soluble the substance the further up the paper it moves. As different substances have different solubility's they move up the paper different amounts and so are separated.

Development of the Model of the Atom

Dalton suggested that atoms were tiny spheres that could not be divided. JJ Thompson then discovered the electron. He also suggested the Plum Pudding Model. This was the idea that the atom was a ball of positive charge with negative electrons embedded in it. Then due to results from the alpha particle scattering experiment the nuclear model of the atom was suggested. Discovered the electron. Suggested the Plum Pudding Model. This was the idea that the atom was a ball of positive charge with negative electrons embedded in it. Niels Bohr then adapted this model by suggesting that electrons orbit the nucleus at specific distances and then James Chadwick proved the existence of neutrons.

Structure of the Atom

The atom has protons and neutrons in its nucleus with electrons orbiting in shells on the outside. Protons and neutrons have a mass of 1 while electrons have a very small mass. Protons have a positive charge, electrons are negative while neutrons are neutral. Atoms are small, having a radius of about 0.1 nm and the radius of a nucleus is less than 1/10 000 of that of the atom. An atom is neutral because it has the same number of electrons and protons.

Mass number

Number of protons and neutrons an atom has. It is an average value that takes into account the abundance of the isotopes.

Ion

An atom that has lost or gained electrons and so has a charge.

Isotope: Atoms with the same number of protons but different number of neutrons. They have different mass numbers.

Chemical Reactions

Reactants are what go into a chemical reaction while products are what are made. For example in the word equation hydrogen and oxygen are the reactants while water is the product.:

Hydrogen + Oxygen \rightarrow Water
Overall in any equation:
Reactants \rightarrow Products

Electron Configuration

The electrons in an atom occupy the lowest available energy levels. The electronic structure of an atom can be represented by numbers or by a diagram. 2 electrons fill the first shell, and 8 fill the second and third shell. Once shell 3 is full the 4th begins to fill.

Atomic Number

The number of protons an atom has.

State Symbols

Solid	(s)
Liquid	(l)
Gas	(g)
Solution	(aq)

Elements

Elements are made up of just one type of atom. In the periodic table there are about 100 different elements.