

Edexcel IGCSE Chemistry

Topic 1: Principles of chemistry

Elements, compounds and mixtures

Notes



1.8 understand how to classify a substance as an element, compound or mixture

- Element = substance made from only one type of atom
- Compound = substance made from two or more elements that have reacted chemically with each other
- A mixture:
 - Consists of 2 or more elements or compounds not chemically combined together
 - Chemical properties of each substance in the mixture are unchanged

1.9 understand that a pure substance has a fixed melting and boiling point, but that a mixture may melt or boil over a range of temperatures

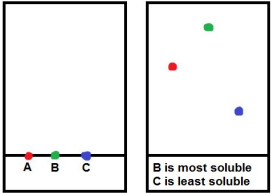
- A pure substance = a single element or compound, not mixed with any other substance
- In everyday language, a pure substance = substance that has had nothing added to it, so it is unadulterated and in its natural state, e.g. pure milk
- Pure substances melt and boil at specific temperatures
 - This melting and boiling points data can be used to distinguish pure substances from mixtures (which melt over a range of temperatures due to them consisting of 2 or more elements or compounds)

1.10 describe these experimental techniques for the separation of mixtures: simple distillation, fractional distillation, filtration, crystallisation, paper chromatography

- Simple distillation
 - Used to separate a pure liquid from a mixture of liquids
 - Works when the liquids have different boiling points
 - Commonly used to separate ethanol from water
 - (Taking the example of ethanol...) ethanol has a lower bp than water so it evaporates first. The ethanol vapour is then cooled and condensed inside the condenser to form a pure liquid.
 - Sequence of events in distillation is as follows: heating -> evaporating -> cooling -> condensing
- Fractional distillation
 - The oil is heated in the fractionating column and the oil evaporates and condenses at a number of different temperatures.
 - The many hydrocarbons in crude oil can be separated into fractions each of which contains molecules with a similar number of carbon atoms



- o The fractionating column works continuously, heated crude oil is piped in at the bottom. The vaporised oil rises up the column and the various fractions are constantly tapped off at the different levels where they condense.
- o The fractions can be processed to produce fuels and feedstock for the petrochemical industry.
- Filtration
 - o If you have produced e.g. a precipitate (which is an insoluble salt), you would want to separate the salt/precipitate from the salt solution.
 - You would do this by filtering the solution, leaving behind the precipitate
- Crystallisation
 - o If you were to have produced a soluble salt and you wanted to separate this salt from the solution that it was dissolved in
 - You would first warm the solution in an open container, allowing the solvent to evaporate, leaving a saturated solution
 - Allow this solution to cool
 - The solid will come out of the solution and crystals will start to grow, these can then be collected and allowed to dry
- Paper chromatography
 - o Chromatography...
 - Used to separate mixtures and give information to help identify substances
 - Involves a stationary phase and a mobile phase
 - Separation depends on the distribution of substances between the phases

<p>Paper Chromatography</p> 	<p>Analytical technique separating compounds by their relative speeds in a solvent as it spreads through paper.</p> <p>The more soluble a substance is, the further up the paper it travels.</p> <p>Separates different pigments in a coloured substance.</p>
<p>Pigment</p>	<p>Solid, coloured substance</p>

1.11 understand how a chromatogram provides information about the composition of a mixture

- see 1.10- separates mixture into individual components, so reveals number of components in mixture and these components can be identified using R_f values
- Compounds in a mixture may separate into different spots depending on the solvent but a pure compound will produce a single spot in all solvents



1.12 understand how to use the calculation of R_f values to identify the components of a mixture

- R_f value = distance moved by substance / distance moved by solvent (/ represents a dividing sign)
 - Different compounds have different R_f values in different solvents, which can be used to help identify the compounds

1.13 practical: investigate paper chromatography using inks/food colourings

