

WJEC (Wales) Chemistry A-level

Unit 5 - Practicals Definitions

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Definitions and Concepts for WJEC (Wales) Chemistry A-level Practicals

SP 1.6a - Gravimetric Analysis

Accuracy: Relates to how closely the measured value in an experiment corresponds to the true value.

Coagulate: The formation of gel-like bubbles.

Corrosive: A substance which breaks down/destroys another material.

Decant: To gradually pour a liquid from one container to another.

Irritant: A substance is an irritant if it causes an inflammation or discomfort to the body. Contact with these substances should be avoided.

Precipitation: The formation of a solid from a solution.

SP 1.6b - Identification of Unknown Solutions by Qualitative Analysis

Approximate: A value that is close to the actual value but not precise.

Precipitation: The formation of a solid from a solution.

Toxic: A substance which is poisonous.

SP 1.7a - Preparation of a Soluble Salt by Titration

Flammable: A substance that ignites easily.

Indicator: A chemical solution whose colour depends on the pH of the solution it is in.

Irritant: A substance which causes an inflammation or discomfort to the body. Contact with these substances should be avoided.

Phenolphthalein: A type of pH indicator. It is colourless in an acidic solution and pink in a basic solution. This indicator changes colour between pH 8.3 and 10.



Titration: The addition of a solution with a known concentration to a solution with a known volume and an unknown concentration until the reaction reaches neutralization. This is often indicated by the colour change of an indicator.

SP 1.7b - Standardisation of an Acid Solution

Accuracy: Relates to how closely the measured value in an experiment corresponds to the true value.

Anhydrous: A compound which contains no water.

Concordant results: Results are said to be concordant if they are within 0.20 cm^3 of each other.

Indicator: A chemical substance that changes colour at a certain pH.

Irritant: A substance which causes an inflammation or discomfort to the body. Contact with these substances should be avoided.

Mean titre: The average of all the concordant titre results.

Meniscus: The curved surface of water in a tube. When measuring in a measuring cylinder or burette you always measure from the bottom of the meniscus curve.

Methyl orange: A type of pH indicator. It is yellow in a basic solution and red in an acidic solution. This indicator changes colour between pH 3.1-4.4.

Phenolphthalein: A type of pH indicator. It is colourless in an acidic solution and pink in a basic solution. This indicator changes colour between pH 8.3-10.

Standard solution: A solution with a known concentration of a compound/element.

Titration: The addition of a solution with a known concentration to a solution with a known volume and an unknown concentration until the reaction reaches neutralization. This is often indicated by the colour change of an indicator.

Trial titration: A rough titration that is used to find the approximate endpoint of the reaction, so it is known approximately how much of the solution in the burette is needed to neutralise the other solution. This means the next titrations can be done faster and with more accuracy.

Weighing by difference: The weight of a substance is calculated to be the difference between the weight of the weighing boat with the material and the weight of the weighing boat after the material has been transferred. It is a common way to weigh materials accurately.



SP 1.7c - Back Titration

Accuracy: Relates to how closely the measured value in an experiment corresponds to a true value.

Approximate: A value that is close to the actual value but not precise.

Excess: When a reactant is in excess there is more than the required amount for the reaction, having certain reactants in excess is can be required so that further substitution reactions do not occur.

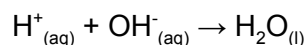
Flammable: A substance that ignites easily.

Indicator: A chemical substance that changes colour at a certain pH.

Irritant: A substance which causes an inflammation or discomfort to the body. Contact with these substances should be avoided.

Mean titre: The average of all the concordant titre results.

Neutralisation: A reaction between an acid and a base to form water and a salt. The ionic equation for neutralisation is:



Phenolphthalein: A type of pH indicator. It is colourless in an acidic solution and pink in a basic solution. This indicator changes colour between pH 8.3-10.

Standard solution: A solution with a known concentration of a compound/element.

Titration: The addition of a solution with a known concentration to a solution with a known volume and an unknown concentration until the reaction reaches neutralization. This is often indicated by the colour change of an indicator.

Trial titration: A rough titration that is used to find the approximate endpoint of the reaction, so it is known approximately how much of the solution in the burette is needed to neutralise the other solution. This means the next titrations can be done faster and with more accuracy.



SP 1.7d - Double Titration

Concordant results: Results are said to be concordant if they are within 0.20 cm^3 of each other.

End-point: The point at which the indicator changes colour in an acid-base titration.

Flammable: A substance that ignites easily.

Indicator: Chemical solutions whose colour depends on the pH of the solution they are in.

Irritant: A substance which causes an inflammation or discomfort to the body. Contact with these substances should be avoided.

Methyl orange: A type of pH indicator. It is yellow in a basic solution and red in an acidic solution. This indicator changes colour between pH 3.1-4.4.

Phenolphthalein: A type of pH indicator. It is colourless in an acidic solution and pink in a basic solution. This indicator changes colour between pH 8.3-10.

Titration: The addition of a solution with a known concentration to a solution with a known volume and an unknown concentration until the reaction reaches neutralization. This is often indicated by the colour change of an indicator.

SP 2.1a - Indirect Determination of an Enthalpy Change of Reaction

Accuracy: Relates to how closely the measured value in an experiment corresponds to a true value.

Brønsted-Lowry acid: Proton donors. These species release hydrogen ions in solution.

Brønsted-Lowry base: Proton acceptors.

Calorimetry: A method used to measure the amount of energy absorbed or released during a chemical reaction. This is determined by measuring the temperature change over the course of a reaction.

Enthalpy change (ΔH): The heat energy change measured under constant pressure.

Hess's law: The enthalpy change of a reaction is independent of the route taken.



Weighing by difference: The weight of a substance is calculated to be the difference between the weight of the weighing boat with the material and the weight of the weighing boat after the material has been transferred. It is a common way to weigh materials accurately.

SP 2.1b - Determination of an Enthalpy Change of Combustion

Enthalpy change (ΔH): The heat energy change measured under constant pressure.

Flammable: A substance that ignites easily.

Standard enthalpy of combustion ($\Delta_c H^\ominus$): The enthalpy change when one mole of a substance is burned in excess oxygen under standard conditions.

Toxic: A substance which is poisonous.

SP 2.2a - Investigation of a Rate of Reaction by a Gas Collection Method

Irritant: A substance which causes an inflammation or discomfort to the body. Contact with these substances should be avoided.

Rate of reaction: The measure of the amount of product formed or reactant used over time. The units of rate of reaction may be given as g/s, cm^3/s or mol/s.

Standard solution: A solution with a known concentration of a compound/element.

SP 2.2b - Study of an 'Iodine Clock' Reaction

Brønsted-Lowry acid: Proton donors. These species release hydrogen ions in solution.

Irritant: A substance which causes an inflammation or discomfort to the body. Contact with these substances should be avoided.

Oxidation: The loss of electrons/increase in oxidation number.

SP 2.6 - Nucleophilic Substitution Reaction

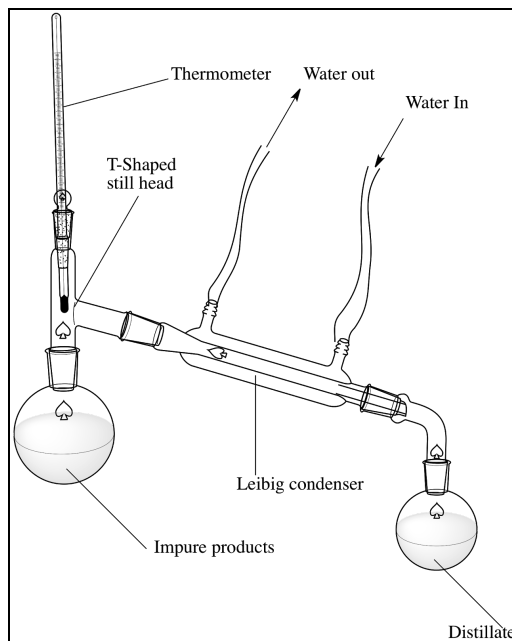
Anti-bumping granules: Added to a mixture being heated to prevent the formation of large gas bubbles that cause violent boiling.





Distillation apparatus: A technique used to purify a liquid by heating and cooling. When the liquid evaporates it moves into a condenser where it cools and recondenses and is collected.

Diagram - Distillation



Flammable: A substance that ignites easily.

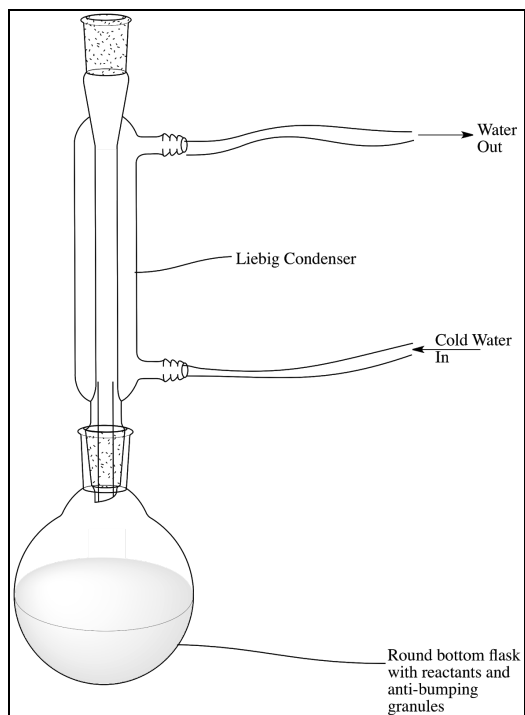
Irritant: A substance which causes an inflammation or discomfort to the body. Contact with these substances should be avoided.

Pure: A substance that consists of only one type of compound/element. This is not a mixture.

Reflux: The continual boiling and condensing of a reaction mixture. This technique is often used to make sure a volatile liquid reaches a high enough temperature to ensure that the reaction goes to completion.

Diagram - Reflux





SP 2.7 - Preparation of an Ester and Separation by Distillation

Anti-bumping granules: Added to a mixture being heated to prevent the formation of large gas bubbles that cause violent boiling.

Corrosive: A substance which breaks down/destroys another material.

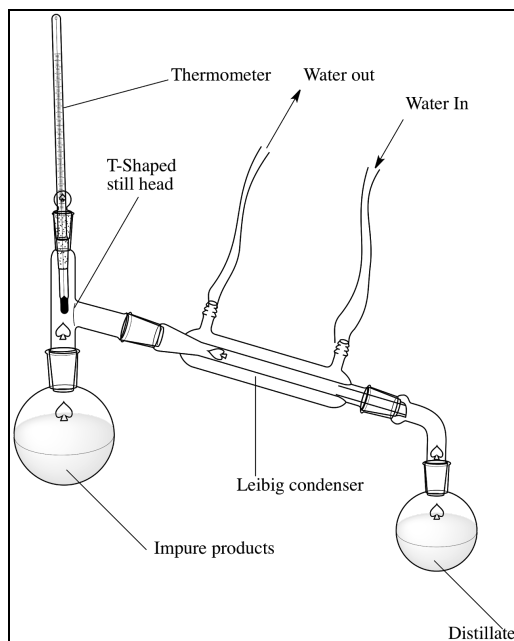
Decant: To gradually pour a liquid from one container to another.

Distillation apparatus: A technique used to purify a liquid by heating and cooling. When the liquid evaporates it moves into a condenser where it cools and recondenses and is collected.





Diagram - Distillation



Flammable: A substance that ignites easily.

Irritant: A substance which causes an inflammation or discomfort to the body. Contact with these substances should be avoided.

Pure: A substance that consists of only one type of compound/element. This is not a mixture.

Water bath: A piece of laboratory equipment which is filled with water and carefully heated to keep samples at a constant, specified temperature.

SP 3.1 - Construction of Electrochemical Cells and Measurement of E_{cell}

Cell potential: A measure of the potential difference between two half cells, calculated by combining two standard electrode potentials. The calculated cell potential can be used to predict the feasibility of a reaction, although this doesn't consider concentration or kinetics.

Dangerous to the environment: Something that will cause damage to the environment.

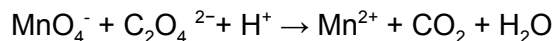
Electrochemical cell: Combination of two half cells; consists of two electron conductors (electrodes) separated by an ionic conductor (electrolyte). Cells are used to measure electrode potentials by reference to the standard hydrogen electrode.

E.M.F: Electromotive force, measured in volts. The difference between the potential differences of the cathode and anode in an electrochemical cell.

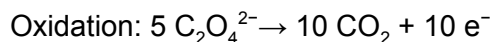
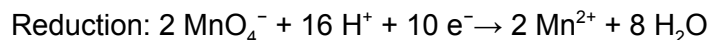




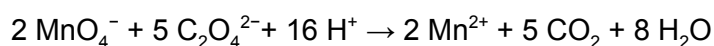
Half equation: A full redox equation can be split into two half-equations, one involving oxidation and the other involving reduction. This is useful for balancing complex redox reactions, such as:



Can be split into:



And combined to give the balanced redox equation:



Harmful: Something that causes damage.

Irritant: A substance which causes an inflammation or discomfort to the body. Contact with these substances should be avoided.

Oxidising agent: A substance that can oxidise another species by being reduced.

Salt bridge: A porous substance soaked with a solution of an inert, strong electrolyte, e.g. a filter paper soaked in $\text{KNO}_3(\text{aq})$. The salt ions flow through the bridge to complete the circuit and balance charges in solutions.

SP 3.2a - Simple Redox Titration

Accuracy: Relates to how closely the measured value in an experiment corresponds to the true value.

Harmful: Something that causes damage.

Irritant: A substance which causes an inflammation or discomfort to the body. Contact with these substances should be avoided.

Oxidising agent: A substance that can oxidise another species by being reduced.

Redox reaction: A reaction in which reduction and oxidation occur simultaneously.

Relative molecular mass: Average mass of a molecule relative to 1/12 of the mass of an atom of carbon-12.





Standard solution: A solution with a known concentration of a compound/element.

Titration: The addition of a solution with a known concentration to a solution with a known volume and an unknown concentration until the reaction reaches neutralization. This is often indicated by the colour change of an indicator.

SP 3.2b - Estimation of Copper in Copper(II) Salts

Accuracy: Relates to how closely the measured value in an experiment corresponds to the true value.

Harmful: Something that causes damage.

Irritant: A substance which causes an inflammation or discomfort to the body. Contact with these substances should be avoided.

Dangerous to the environment: Something that will cause damage to the environment.

Standard solution: A solution with a known concentration of a compound/element.

Titration: The addition of a solution with a known concentration to a solution with a known volume and an unknown concentration until the reaction reaches neutralization. This is often indicated by the colour change of an indicator.

SP 3.5 - Determination of the Order of a Reaction

First order reactant: A substance in the reactant mixture where the rate of reaction is directly proportional to the concentration of this substance.

Harmful: Something that causes damage.

Irritant: A substance which causes an inflammation or discomfort to the body. Contact with these substances should be avoided.

Order of reaction: Tells you how the reactant's concentration will affect the rate of reaction. In the rate equation, it is the power to which the concentration of the reagent is raised.
e.g. rate = $k [A]^2[B]$.

Oxidation: The loss of electrons/increase in oxidation number.

Oxidising agent: A substance that can oxidise another species by being reduced.





Rate of reaction: The measure of the amount of product formed or reactant used over time. The units of rate of reaction may be given as g/s, cm^3/s or mol/s.

Second order reactant: A substance in the reactant mixture where the rate of reaction is directly proportional to the square of the concentration of this reactant.

Zero order reactant: A substance in the reactant mixture where the rate of reaction is independent of the concentration of this reacting substance.

SP 3.8 - Determination of an Equilibrium Constant

Concordant results: Results are said to be concordant if they are within 0.20 cm^3 of each other.

Equilibrium constant (K): A value that relates the amount of products and reactants at equilibrium in a reversible reaction at a specific temperature. K is unaffected by pressure and presence of a catalyst but is affected by temperature.

Flammable: A substance that ignites easily.

Indicator: Chemical solutions whose colour depends on the pH of the solution they are in.

Irritant: A substance which causes an inflammation or discomfort to the body. Contact with these substances should be avoided.

Phenolphthalein: A type of pH indicator. It is colourless in an acidic solution and pink in a basic solution. This indicator changes colour between pH 8.3 and 10.

Standard solution: A solution with a known concentration of a compound/element.

Titration: The addition of a solution with a known concentration to a solution with a known volume and an unknown concentration until the reaction reaches neutralization. This is often indicated by the colour change of an indicator.

SP 3.9 - Titration Using a pH Probe

Buffer: A solution that is able to resist changes in pH when small volumes of acid or base are added.

Electrode: A conductor through which electricity enters or leaves the electrolyte in an electrochemical cell.





End point: The point during the titration when the indicator changes colour. A suitable indicator should change colour near the equivalence point (so should have a pH range within the pH change during the equivalence point).

Equivalence point: The point when full neutralisation occurs. In acid-base titrations, it is the point where all the acid/base has been neutralised and $[H^+] = [OH^-]$. This is the vertical section of an acid/base titration curve.

Irritant: A substance which causes an inflammation or discomfort to the body. Contact with these substances should be avoided.

pH: A value that represents the acidity or alkalinity of a solution. Acidic solutions have a pH of less than 7 while alkali solutions have a pH of greater than 7. Neutral solutions have a pH of 7.

$$pH = -\log[H^+]$$

$$[H^+] = 10^{-pH}$$

pH meter: An instrument that measures the pH of a solution. A digital pH meter is used in preference to a universal indicator as it can give a more precise value.

Strong acid: An acid which dissociates/ionises almost completely in water. This means nearly all the H^+ ions will be released. E.g. HCl.

Strong base: A base which dissociates/ionises almost completely in water. E.g. NaOH.

Titration: The addition of a solution with a known concentration to a solution with a known volume and an unknown concentration until the reaction reaches neutralization. This is often indicated by the colour change of an indicator.

Weak acid: Acids which only dissociate/ionise very slightly in water so that only a small number of H^+ ions are released. E.g. Ethanoic acid.

Weak base: A base which only slightly dissociates/ionises in water. E.g. NH_3 .

SP 4.8a - Synthesis of a Liquid Organic Product

Anhydrous: A compound which contains no water.

Anti-bumping granules: Added to a mixture being heated to prevent the formation of large gas bubbles that cause violent boiling.

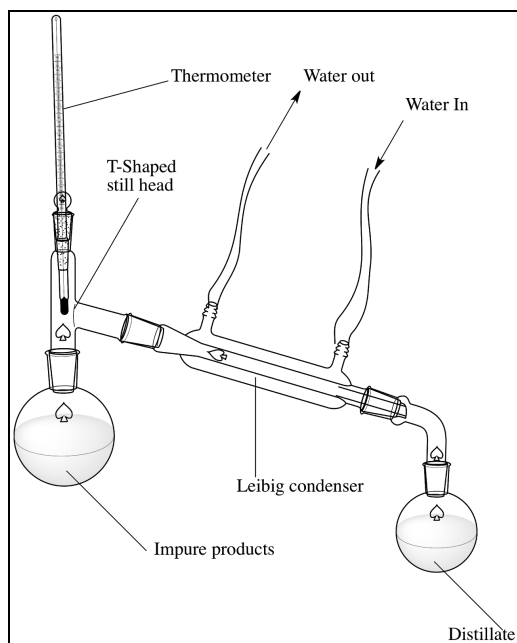
Corrosive: A substance which breaks down/destroys another material.





Distillation apparatus: A technique used to purify a liquid by heating and cooling. When the liquid evaporates it moves into a condenser where it cools and recondenses and is collected.

Diagram - Distillation



Drying agent: A substance used to remove water from an organic molecule in a solution.

Flammable: A substance that ignites easily.

Irritant: A substance which causes an inflammation or discomfort to the body, contact with these substances should be avoided.

Percentage yield: The percentage ratio of the actual yield of product from a reaction compared with the theoretical yield.

$$\text{Percentage yield} = \frac{\text{Actual yield}}{\text{Theoretical Yield}} \times 100$$

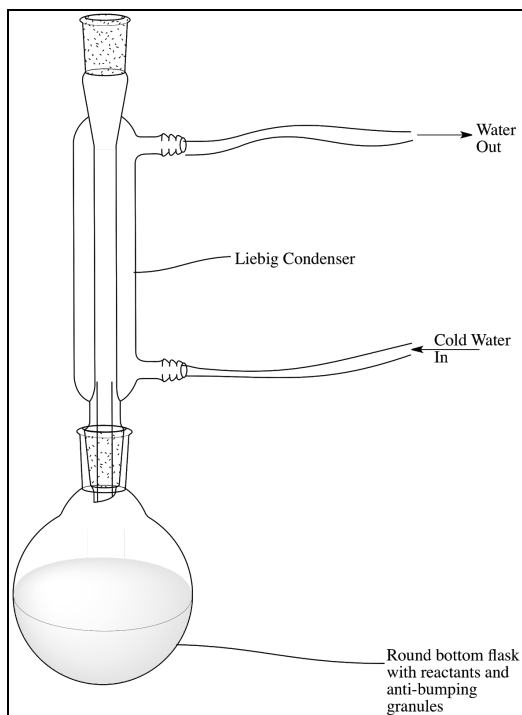
Pure: A substance that consists of only one type of compound/element. This is not a mixture.

Reflux: The continual boiling and condensing of a reaction mixture. This technique is often used to make sure a volatile liquid reaches a high enough temperature to ensure that the reaction goes to completion.





Diagram - Reflux



Synthesis: The process of combining different elements and compounds to build new molecules.

SP 4.8b - Synthesis of an Organic Solid Product

Corrosive: A substance which breaks down/destroys another material.

Flammable: A substance that ignites easily.

Harmful: Something that causes damage.

Melting temperature: The melting point of a substance is the temperature at which it changes from solid state to liquid state.

Percentage yield: The percentage ratio of the actual yield of product from a reaction compared with the theoretical yield.

$$\text{Percentage yield} = \frac{\text{Actual yield}}{\text{Theoretical Yield}} \times 100$$

Precipitation: The formation of a solid from a solution.



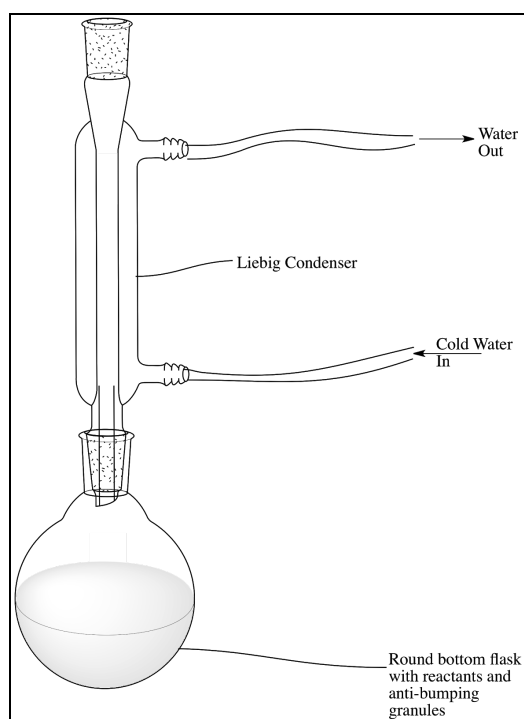
Pure: A substance that consists of only one type of compound/element. This is not a mixture.

Purification: The process of removing impurities or contaminants from a product.

Recrystallisation: A purification technique used to purify a compound by dissolving the impurities and the compound in a particular solvent. The compound or impurities can be removed from this solution, leaving the other behind. The compound no longer contains the impurities.

Reflux: The continual boiling and condensing of a reaction mixture. This technique is often used to make sure a volatile liquid reaches a high enough temperature to ensure that the reaction goes to completion.

Diagram - Reflux



Synthesis: The process of combining different elements and compounds to build new molecules.

SP 4.8c - Two-Step Synthesis

Anti-bumping granules: Added to a mixture being heated to prevent the formation of large gas bubbles that cause violent boiling.

Corrosive: A substance which breaks down/destroys another material.



Flammable: A substance that ignites easily.

Functional group: An atom/group of atoms responsible for the characteristic reactions of a particular compound.

Irritant: A substance is an irritant if it causes an inflammation or discomfort to the body. Contact with these substances should be avoided.

Melting temperature: The melting point of a substance is the temperature at which it changes from solid state to liquid state.

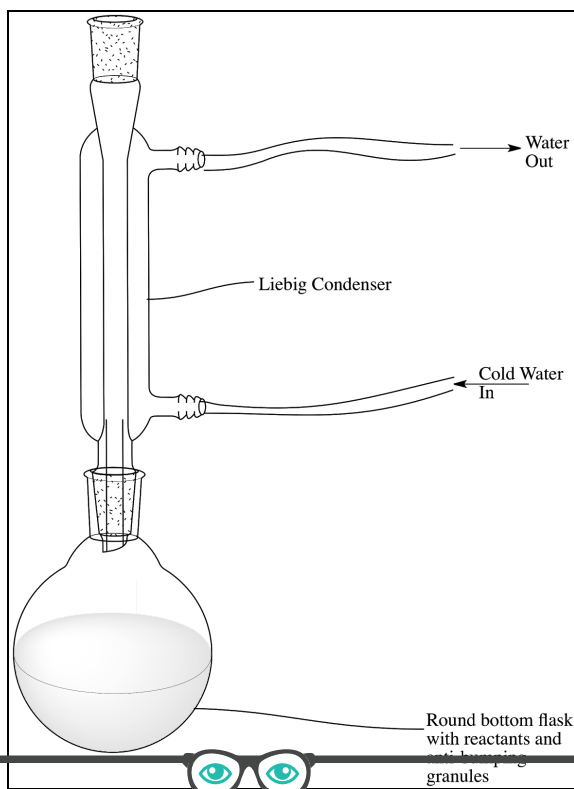
Percentage yield: The percentage ratio of the actual yield of product from a reaction compared with the theoretical yield.

$$\text{Percentage yield} = \frac{\text{Actual yield}}{\text{Theoretical Yield}} \times 100$$

Recrystallisation: A purification technique used to purify a compound by dissolving the impurities and the compound in a particular solvent. The compound or impurities can be removed from this solution, leaving the other behind. The compound no longer contains the impurities.

Reflux: The continual boiling and condensing of a reaction mixture. This technique is often used to make sure a volatile liquid reaches a high enough temperature to ensure that the reaction goes to completion.

Diagram - Reflux





Synthesis: The process of combining different elements and compounds to build new molecules.

Toxic: A substance which is poisonous.

Water bath: A piece of laboratory equipment which is filled with water and carefully heated to keep samples at a constant, specified temperature.

SP 4.8d - Planning a Series of Tests to Identify Organic Compounds

Carcinogenic: A compound that has the potential to cause cancer.

Dangerous to the environment: Something that will cause damage to the environment.

Effervescence: The bubbling of a liquid as gas is released, also known as fizzing.

Flammable: A substance that ignites easily.

Harmful: Something that causes damage.

Iodoform test: A chemical test used to identify carbonyl compounds with the structure $R-CO-CH_3$ or alcohols with the structure $R-CH(OH)-CH_3$.

Irritant: A substance is an irritant if it causes an inflammation or discomfort to the body. Contact with these substances should be avoided.

Litmus paper: An indicator that can be used to determine whether a solution is acidic or alkali. The paper turns red in acidic conditions and purple/blue in alkali conditions.

Organic molecules: These molecules contain carbon and hydrogen atoms but often also include additional elements like oxygen and nitrogen.

Precipitation: The formation of a solid from a solution.

Tollens' Reagent: Also known as ammoniacal silver nitrate, this reagent forms a silver mirror in the presence of an aldehyde and can be used to distinguish between aldehydes and ketones. An aldehyde is oxidised to a carboxylic acid while silver ions in Tollens' are reduced to silver, forming a silver mirror on the wall of the test tube.

Toxic: A substance which is poisonous.





SP 4.8e - Paper Chromatography

Chromatography: A technique used to separate and identify components in a mixture. There are several different types of chromatography, including thin-layer chromatography and gas chromatography. Separation during chromatography depends on the balance between each individual compound's solubility in the mobile phase and retention by the stationary phase.

Flammable: A substance that ignites easily.

Paper chromatography: A technique used to separate coloured compounds/molecules.

