

Evaporation, filtration and crystallisation

Education in Chemistry

July 2018

rsc.li/2KnJJRd



National curriculum links

Key stage	Working scientifically	Programme of study
KS1	Observing closely, using simple equipment; using observations and ideas to suggest answers to questions, gathering and recording data to help in answering questions.	Identify and name a variety of everyday materials, including wood, plastic, glass, metal, water and rock; describe the simple physical properties of a variety of everyday materials.
Lower KS2	Asking relevant questions; making observations; recording and presenting data; reporting findings from enquiry; using results to draw conclusions; using straightforward scientific evidence.	Compare and group rocks; compare and group materials (solids, liquids, gases); link to evaporation in the water cycle; rate of evaporation with temperature.
Upper KS2	Controlling variables; accurate and precise measurements (including repeats); labelled scientific diagrams; results → predictions → further tests.	Comparing materials based on solubility; formation of solutions; recovery of substance from solutions; separating mixtures by filtering, sieving, evaporating; idea of change of state as reversible change.
KS3	Relating phenomena/observations to scientific explanations; use modelling and abstract ideas to develop and evaluate explanations; objectivity (quality of data collection); evaluating risks; synthesising observations and knowledge into enquiry, and making predictions; evaluate reliability of methods; reasoned explanations, evaluating data (random/systematic errors).	Chemistry: particulate model; changing state of particle model; purity; separation of materials (filtration, evaporation). Physics: conservation of material and of mass, and reversibility in evaporation and dissolving.
KS4	Applications of science; personal, social, economic and environmental implications; evaluation of risk (including perception of risk); planning experiments; selecting equipment; carrying out experiments; making and recording measurements; evaluating methods; presenting reasoned explanations; objective evaluation of data.	Chemistry: change of state; particle kinetics; energy transfers; strength of intermolecular forces; distinguishing pure/impure; separation (filtration, crystallisation); concentrations of solutions (mass of solute & volume of solvent). Physics: motion of particles in SLG phases; densities; evaporation as reversible change.

GCSE specification statements

Specification	Specification statement
AQA GCSE Chemistry (8462)	<p>4.1.1.2 Mixtures can be separated by physical processes such as filtration, crystallisation, simple distillation, fractional distillation and chromatography. These physical processes do not involve chemical reactions and no new substances are made.</p> <p>4.1.1.2 Students should be able to describe, explain and give examples of the specified processes of separation.</p> <p>4.1.1.2 Students should be able to suggest suitable separation and purification techniques for mixtures when given appropriate information.</p> <p>AT4 Safe use of a range of equipment to purify and/or separate chemical mixtures including evaporation, filtration, crystallisation, chromatography and distillation.</p>
Edexcel GCSE (9-1) Chemistry	<p>2.7 Explain the types of mixtures that can be separated by using the following experimental techniques: c – filtration; d – crystallisation.</p> <p>2.12 Describe how waste and ground water can be made potable, including the need for sedimentation, filtration and chlorination.</p> <p>3.17 Investigate the preparation of pure, dry hydrated copper sulfate crystals starting from copper oxide including use of a water bath.</p>
OCR GCSE (9-1) Gateway Chemistry A	<p>C2.1f Describe, explain and exemplify the processes of filtration, crystallisation, simple distillation, and fractional distillation (knowledge of the techniques of filtration, crystallisation, simple distillation and fractional distillation).</p> <p>C6.3g Describe the principal methods for increasing the availability of potable water in terms of the separation techniques used (to including ease of treatment of waste, ground and salt water).</p> <p>PAG3: Separation techniques & PAG7: production of salts (safe use of a range of equipment to purify and/or separate chemical mixtures including evaporation, filtration, crystallisation, chromatography and distillation).</p>
OCR GCSE (9-1) Twenty First Century Science Chemistry B	<p>C1.4.1 Describe the principal methods for increasing the availability of potable water, in terms of the separation techniques used, including the ease of treating waste, ground and salt water including filtration and membrane filtration; aeration, use of bacteria; chlorination and distillation (for salt water).</p> <p>C5.1.7 Describe, explain and exemplify the processes of filtration, crystallisation, simple distillation, and fractional distillation; PAG3, PAG7.</p> <p>C5.1.8 Suggest suitable purification techniques given information about the substances involved; PAG3, PAG7.</p> <p>C6.1.2 Describe practical procedures to make salts to include appropriate</p>

	<p>use of filtration, evaporation, crystallisation and drying; PAG7.</p> <p>PAG3: Separation techniques & PAG7: Production of salts (safe use of a range of equipment to purify and/or separate chemical mixtures including evaporation, filtration, crystallisation, chromatography and distillation).</p>
WJEC Eduqas GCSE (9-1) Chemistry	<p>1(e) Describe, explain and exemplify the processes of filtration, crystallisation, simple distillation and fractional distillation.</p> <p>7(h) Prepare crystals of soluble salts from insoluble bases and carbonates.</p> <p>7(i) Use a titration method to prepare crystals of soluble salts and to determine relative concentrations of strong acids and strong alkalis.</p> <p>12(i) Describe the principal methods for increasing the availability of potable water in terms of the separation techniques used, including ease of treatment of waste water, ground water and salt water.</p> <p>Specified Practical 7A: Preparation of crystals of a soluble salt from an insoluble base or carbonate.</p> <p>Technique C4: Safe use of a range of equipment to purify and/or separate chemical mixtures including evaporation, filtration, crystallisation, chromatography and distillation.</p>

A-level specification statements

Specification	Specification statements
AQA (7404/7405)	<p>AT d: Use laboratory apparatus for a variety of experimental techniques including: filtration, including use of fluted filter paper, or filtration under reduced pressure.</p> <p>AT g: Purify a solid product by recrystallization.</p> <p>RPA 10: Preparation of a pure organic solid and test of its purity.</p>
Edexcel	<p>Appendix 5c:</p> <p>5 - Use laboratory apparatus for a variety of experimental techniques including: filtration, including use of fluted filter paper, or filtration under reduced pressure.</p> <p>7 - Purify a solid product by recrystallization.</p> <p>Core practical 16: The preparation of aspirin.</p>
OCR A (H432)	<p>1.2.2(d)(iv) Use laboratory apparatus for a variety of experimental techniques including: filtration, including use of fluted filter paper, or</p>

	<p>filtration under reduced pressure.</p> <p>1.2.2(g)(i) Purify a solid product by recrystallization.</p> <p>PAG6: Synthesis of an organic solid.</p>
OCR B Salters (H433)	<p>1.2.2(d)(iv) Use laboratory apparatus for a variety of experimental techniques including: filtration, including use of fluted filter paper, or filtration under reduced pressure.</p> <p>1.2.2(g)(i) Purify a solid product by recrystallization.</p> <p>PAG6: Synthesis of an organic solid.</p>
WJEC Eduqas	<p>C3.4(b) Preparation of ethanol and other alcohols by fermentation followed by distillation, and issues relating to the use of biofuels.</p> <p>C3.4(i) Separation by distillation.</p> <p>Specified practical work C3.4: Preparation of an ester and separation by distillation.</p>

Download a copy of the article as a pdf or MS Word document at rsc.li/EiC317-carbon-capture