

Chemistry GCSE practicals guide for England

From September 2016 there are new practical requirements for GCSE science in England and Wales.

Are you concerned about introducing one of the new experimental techniques? or just looking for an interesting way to approach a particular topic - in either case this document is for you.

To support the teaching of chemistry practical work, we have mapped the GCSE chemistry specifications from [AQA](#), [OCR](#), [Edexcel](#), and [Eduqas](#) to practical activities and linked these to Learn Chemistry resources

Table 1 - Required practical apparatus and techniques for chemistry as specified by the English National Curriculum:

Apparatus and techniques	
1	Use of appropriate apparatus to make and record a range of measurements accurately, including mass, time, temperature, and volume of liquids and gases.
2	Safe use of appropriate heating devices and techniques, including use of a Bunsen burner and a water bath or electric heater.
3	Use of appropriate apparatus and techniques for conducting and monitoring chemical reactions, including appropriate reagents and/or techniques for the measurement of pH in different situations.
4	Safe use of a range of equipment to purify and/or separate chemical mixtures, including evaporation, filtration, crystallisation, chromatography, and distillation.
5	Making and recording of appropriate observations during chemical reactions, including changes in temperature and the measurement of rates of reaction by a variety of methods such as the production of gas or a colour change.
6	Safe use and careful handling of gases, liquids and solids, including careful mixing of reagents under controlled conditions, using appropriate apparatus to explore chemical changes and/or products.
7	Use of appropriate apparatus and techniques to draw, set up and use electrochemical cells for separation and production of elements and compounds.
8	Use of appropriate qualitative reagents and techniques to analyse and identify unknown samples or products, including gas tests, flames tests, precipitation reactions, and the determination of concentrations of strong acids and strong alkalis.

NB: Practical technique 8 is only required in the single sciences

Single science chemistry:

In England, for the single sciences, students need to complete 8 experiments in each of Biology, Chemistry and Physics.

Table 2 – Practical techniques and exam board experiments numbers; England

Practical techniques	Edexcel topic links	AQA practical numbers	OCR A and B practical activity groups	Eduqas topic references
1	4.6, 6.10, 9.2c, 13.1, 20.3c	2, 4, 5	C4, C6, C7, C8	1, 7, 8, 9, 11
2	3.7, 4.17, 17.6, 20.3	1, 5, 7, 8	C4, C5	1, 7, 11
3	4.6, 4.17, 9.2c	1, 3, 5	C6	6, 7, 9
4	3.7, 4.17	1, 5, 6, 8	C3, C4, C7	1, 7
5	4.17, 13.1, 20.3c	4, 5, 7	C8	6, 8, 9
6	4.6, 4.17, 9.2, 13.1	1, 3, 5	C1, C7	1, 4, 6, 7, 8, 9, 11
7	6.10	3	C2	6
8	9.2c, 17.6c	2, 7	C2, C5, C6	4

Table 3 - Exam board experiments for English GCSEs mapped to suitable Learn Chemistry resources

All the Learn Chemistry resources linked in the table are intended to be used to support teaching GCSE science, rather than to provide direction on teaching or schemes of work.

Edexcel	AQA	OCR-A	OCR-B	Eduqas	Learn Chemistry Resources
Investigate the preparation of pure, dry, hydrated copper sulfate crystals starting from copper oxide including the use of a water bath	Preparation of a pure, dry sample of a soluble salt from an insoluble oxide or carbonate using a Bunsen burner to heat dilute acid in a water bath (or) electric heater	Production of pure dry sample of a salt	Production of pure dry sample of an insoluble and soluble salt	Preparation of crystals of a soluble salt from an insoluble base or carbonate	www.rsc.org/learn-chemistry/resource/res00001762/preparin www.rsc.org/learn-chemistry/resource/res00001760/preparin www.rsc.org/learn-chemistry/resource/res00001917/reacting www.rsc.org/learn-chemistry/resource/res00001761/preparin

	to evaporate the solution				
Investigate the composition of inks using paper chromatography	Investigate how paper chromatography can be used to separate and tell the difference between coloured substances. Students should calculate Rf values	Using chromatography to identify the mixtures of dyes in an unknown ink	Using chromatography to identify mixtures of dyes in a sample of an unknown composition	Separation of liquids by paper chromatography	www.rsc.org/learn-chemistry/resource/res00001612/outreach www.rsc.org/learn-chemistry/resource/res00000620/chromat www.rsc.org/learn-chemistry/resource/res00000389/chromat
Investigate the effect of changing conditions of a reaction on the rates of reaction by; a) measuring the production of gas (in the reaction between hydrochloric acid and marble chips) and b) observing colour change (in the reaction between sodium thiosulfate and hydrochloric acid)	Investigate how changes in concentration affect the rates of reactions by methods involving measuring the production of a gas produced and a method involving a colour change or turbidity. This should be an investigation involving the developing a hypothesis	Investigation of the effect of surface area or concentration on the rate of an acid / carbonate reaction	Investigate the effect of surface area, concentration and temperature on the rate of a chemical reaction	Investigation into the effect of one factor on the rate of a reaction using a gas collection method AND Investigation into the effect of one factor on the rate of the reaction between dilute hydrochloric acid and sodium thiosulfate	www.rsc.org/learn-chemistry/resource/res00000448/the-effect www.rsc.org/learn-chemistry/resource/res00000743/the-effect www.rsc.org/learn-chemistry/resource/res00001916/the-rate www.rsc.org/learn-chemistry/resource/res00000413/the-effect www.rsc.org/learn-chemistry/resource/res00000744/iodine-cl
Investigate the electrolysis of copper sulfate solution with inert electrodes and copper electrodes	Investigate what happens when aqueous solutions are electrolysed using inert electrodes. This should be an investigation involving developing a hypothesis	Electrolysis of aqueous sodium chloride or aqueous copper sulfate solution testing for the gases produced	Electrolysis of aqueous sodium chloride or aqueous copper sulfate solution testing for the gases produced	Investigation into electrolysis of aqueous solutions and electroplating	www.rsc.org/learn-chemistry/resource/res00000476/electroly www.rsc.org/learn-chemistry/resource/res00000466/the-elect www.rsc.org/learn-chemistry/resource/res00000839/turning-c
Carry out an accurate acid-alkali titration, using burette, pipette and a suitable indicator	Determination of the reacting volumes of solutions of a strong acid and a strong alkali by titration. For higher tier only determination of the concentration of one of the solutions in mol/dm ³ and g/dm ³ from the reacting volumes and the known concentration of the other solution	Titration of a strong acid and strong alkali to find the concentration of the acid using an appropriate pH indicator	Titration of a strong acid and strong alkali to find the concentration of the acid using an appropriate pH indicator	Titration of a strong acid against a strong base using an indicator	www.rsc.org/learn-chemistry/resource/res00002077/titration-f www.rsc.org/learn-chemistry/resource/res00000697/titrating-f
Identify the ions in unknown salts, using the tests for the specified cations and	Use of chemical tests to identify the ions in unknown single ionic	Identification of an unknown compound using cation tests, anion	Identification of an unknown compound using cation tests, anion	Identification of unknown substances using flame tests and	www.rsc.org/learn-chemistry/resource/res00001807/colourful www.rsc.org/learn-chemistry/resource/res00000758/testing-f www.rsc.org/learn-chemistry/resource/res00000759/flame-te www.rsc.org/learn-chemistry/resource/res00002201/qualitativ

anions	compounds covering the ions from topics 'Flame tests' to 'Sulfates'	tests and flame tests.	tests and flame tests.	chemical tests for ions and gases	
Investigate the composition of inks using simple distillation	Analysis and purification of water samples from different sources, including pH, dissolved salts and distillation	Distillation of a mixture, for example orange juice, cherry cola, hydrocarbons and inks	Distillation of a mixture, for example orange juice, cherry cola, hydrocarbons and inks	Separation of liquids by distillation, e.g. ethanol from water	www.rsc.org/learn-chemistry/resource/res00001070/distillation www.rsc.org/learn-chemistry/resource/res00001343/fractionation www.rsc.org/learn-chemistry/resource/res00000754/the-fractionation www.rsc.org/learn-chemistry/resource/res00001767/recovery
Investigate the temperature rise produced in a known mass of water by the combustion of the alcohols, ethanol, propanol, butanol and pentanol				Determination of the amount of energy released by a fuel	www.rsc.org/learn-chemistry/resource/res00002094/heat-of-combustion www.rsc.org/learn-chemistry/resource/res00001733/heat-energy www.rsc.org/learn-chemistry/resource/res00001166/which-fuel
		Using displacement reactions to identify the reaction trend of the halogen elements	Using displacement reactions to identify the reaction trend of the halogen elements	Determination of relative reactivities of metals through displacement reactions	www.rsc.org/learn-chemistry/resource/res00000720/displacement www.rsc.org/learn-chemistry/resource/res00000791/displacement www.rsc.org/learn-chemistry/resource/res00000733/reactions www.rsc.org/learn-chemistry/resource/res00001126/ri-christian
Investigate the change in pH on adding powdered calcium hydroxide/calcium oxide to a fixed volume of dilute hydrochloric acid					www.rsc.org/learn-chemistry/resource/res00001457/acid-base www.rsc.org/learn-chemistry/resource/res00001756/neutralisation
	Investigate the variables that affect temperature changes in reacting solutions such as, e.g. acid plus metals, acid plus carbonates, neutralisations and displacements of metals				www.rsc.org/learn-chemistry/resource/res00000525/energy-change www.rsc.org/learn-chemistry/resource/res00000406/exothermic
				Investigation into the effect of various catalysts on the decomposition of hydrogen peroxide	www.rsc.org/learn-chemistry/resource/res00000831/hydrogen-peroxide www.rsc.org/learn-chemistry/resource/res00001712/catalysis
				Determination of a melting point e.g. for naphthalene (pure substance) or candle wax (impure substance)	www.rsc.org/learn-chemistry/resource/res00001068/melting-point
				Determination of the percentage of water in a hydrated salt,	www.rsc.org/learn-chemistry/resource/res00000436/finding-the

e.g. copper(II) sulfate

Combined sciences:

For the combined sciences the students need to complete 16 experiments across Biology, Chemistry, and Physics. The split of the 16 experiments are five each for Biology and Chemistry and six for Physics.

Table 4 – Required practical technique and specification experiment numbers

Practical techniques	Edexcel topic links	AQA Synergy practical numbers	AQA Trilogy practical number	OCR A(Gateway)	OCR B (21st Century)	Eduqas topic references
1	4.5, 6.10, 13.1	5, 13, 14	8	C3, C4, C5	C2, C4, C5	7, 8, 9
2	3.7, 4.17	13, 14	6, 8, 10	C3	C2, C4	1, 7
3	4.5, 4.17		6, 7, 8			6, 7, 9
4	3.7, 4.17	14, 16	6, 8, 9, 10	C2, C3, C4	C2, C3, C4	1, 7
5	4.17, 13.1	5, 7, 13, 14, 16	8	C5	C5	6, 8, 9
6	4.5, 4.17, 13.1	7, 13	6, 7, 8	C4	C4	6, 7, 8, 9
7	6.10	5, 13	7	C1	C1	6

Table 5 - English specification experiments mapped to suitable Learn Chemistry resources

Edexcel	AQA (trilogy and synergy)	OCR-A	OCR-B	Eduqas	Learn Chemistry Resources
Investigate the preparation of pure, dry, hydrated copper sulfate crystals starting from copper oxide using a water bath	Preparation of a pure, dry sample of a soluble salt from an insoluble oxide or carbonate using a Bunsen burner to heat dilute acid in a water bath (or) electric heater to evaporate the solution	Production of pure dry sample of a salt	Production of pure dry sample of an insoluble and soluble salt	Preparation of crystals of a soluble salt from an insoluble base or carbonate	www.rsc.org/learn-chemistry/resource/res00001762/preparin www.rsc.org/learn-chemistry/resource/res00001760/preparin www.rsc.org/learn-chemistry/resource/res00001917/reacting www.rsc.org/learn-chemistry/resource/res00001761/preparin
Investigate the composition of inks using simple distillation and paper chromatography	Investigate how paper chromatography can be used to separate and tell the difference between coloured substances. Students should calculate Rf values	Using chromatography to identify the mixtures of dyes in an unknown ink	Using chromatography to identify the mixtures of dyes in a sample of an unknown composition	Separation of liquids by paper chromatography	www.rsc.org/learn-chemistry/resource/res00001612/outreach www.rsc.org/learn-chemistry/resource/res00000620/chromat www.rsc.org/learn-chemistry/resource/res00000389/chromat
Investigate the effects of changing the conditions of a reaction on the rates of chemical reactions by; a) measuring the production of a gas (in the reaction between hydrochloric acid and marble chips) and b) observing	Investigation of how changes in concentration affect the rates of reactions by a method involving measuring the volume of a gas produced and a method involving a change in colour or	Investigation the effect of surface area or concentration on the rate of an acid / carbonate reaction	Investigate the effect of surface area, concentration and temperature on the rate of a chemical reaction	Investigation into the effect of one factor on the rate of a reaction using a gas collection method AND Investigation into the effect of one factor on the rate of the reaction between dilute hydrochloric	www.rsc.org/learn-chemistry/resource/res00000448/the-effec www.rsc.org/learn-chemistry/resource/res00000449/the-effec www.rsc.org/learn-chemistry/resource/res00001916/the-rate www.rsc.org/learn-chemistry/resource/res00000413/the-effec www.rsc.org/learn-chemistry/resource/res00000744/iodine-cl

colour change (in the reaction between sodium thiosulfate and hydrochloric acid)	turbidity. This should be an investigation involving developing a hypothesis			acid and sodium thiosulfate	
Investigate the electrolysis of copper sulfate solution with inert electrodes and copper electrodes	Investigate what happens when aqueous solutions are electrolysed using inert electrodes. This should be an investigation involving developing a hypothesis	Electrolysis of aqueous sodium chloride or aqueous copper sulfate solution testing for the gases produced	Electrolysis of aqueous sodium chloride or aqueous copper sulfate solution testing for the gases produced	Investigation into electrolysis of aqueous solutions and electroplating	www.rsc.org/learn-chemistry/resource/res00000476/electrolysis www.rsc.org/learn-chemistry/resource/res00000466/the-electrolysis-of-copper-sulfate www.rsc.org/learn-chemistry/resource/res00000839/turning-copper
Investigate the composition of inks using simple distillation and paper chromatography	Analysis and purification of water samples from different sources, including pH, dissolved salts and distillation	Distillation of a mixture, for example orange juice, cherry cola, hydrocarbons, inks	Distillation of a mixture, for example orange juice, cherry cola, hydrocarbons, inks	Separation of liquids by distillation, e.g. ethanol from water,	www.rsc.org/learn-chemistry/resource/res00001070/distillation www.rsc.org/learn-chemistry/resource/res00001343/fractional-distillation www.rsc.org/learn-chemistry/resource/res00000754/the-fractionation-of-air www.rsc.org/learn-chemistry/resource/res00001767/recovery-of-ethanol
Investigate the change in pH on adding powdered calcium hydroxide/calcium oxide to a fixed volume of dilute hydrochloric acid					www.rsc.org/learn-chemistry/resource/res00001457/acid-base-titrations www.rsc.org/learn-chemistry/resource/res00001756/neutralisation
				Titration of a strong acid against a strong base using an indicator	www.rsc.org/learn-chemistry/resource/res00002077/titration-of-a-strong-acid-against-a-strong-base www.rsc.org/learn-chemistry/resource/res00000697/titrating-a-weak-acid
				Determination of relative reactivities of metals through displacement reactions	www.rsc.org/learn-chemistry/resource/res00000720/displacement-reactions
	Investigate the variables that affect the temperature changes of a series of reactions in solutions, e.g. acid plus metals, acid plus carbonates, neutralisations and displacement of metals				www.rsc.org/learn-chemistry/resource/res00000406/exothermic-reactions www.rsc.org/learn-chemistry/resource/res00000525/energy-changes-in-reactions
				Determination of the amount of energy released by a fuel	www.rsc.org/learn-chemistry/resource/res00002094/heat-of-combustion www.rsc.org/learn-chemistry/resource/res00001733/heat-energy www.rsc.org/learn-chemistry/resource/res00001166/which-fuel
				Investigation into the effect of various catalysts on the decomposition of hydrogen peroxide	www.rsc.org/learn-chemistry/resource/res00000831/hydrogen-peroxide www.rsc.org/learn-chemistry/resource/res00001712/catalysis

This resource contains public sector information from each awarding body on their draft science GCSE specifications.

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