

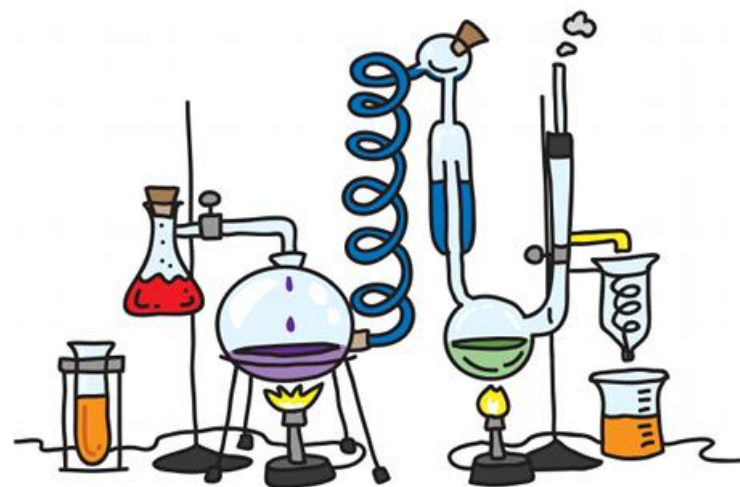
CHEMISTRY



INDUCTION 2023

CONTENTS:

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CHEMISTRY



SUITABILITY:

- APS 5.2
- Grade 6 in GCSE Sciences. If more than one Science at least two must be at a grade 6 (one must be Chemistry).
- Grade 6 in GCSE Maths (discussion with department if a grade 5 is achieved)
- Pass the entry exam.

In all topics, you will need to learn facts and build a body of knowledge but also to understand and apply the ideas. Many topics include calculations and so you should feel comfortable rearranging equations and using numbers.

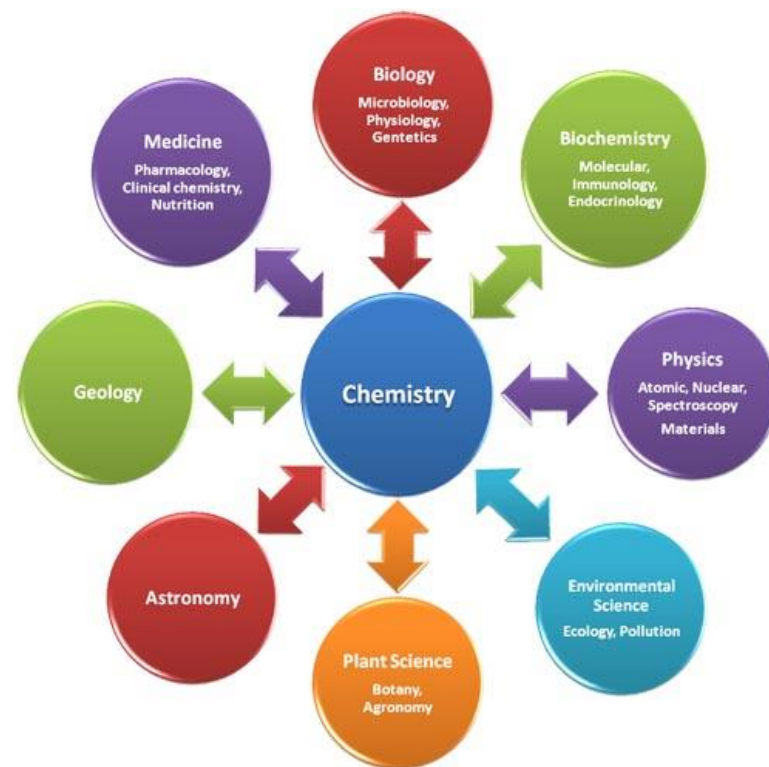
Importantly, chemistry is a hands-on science and you will carry out experiments on a regular basis. This is to consolidate your theory work, but also provide you with the opportunity to use new apparatus and build your skills and confidence to complete safe and accurate practical work.

CHEMISTRY



WHY CHOOSE IT?

- Chemistry A level is a highly respected A level, with its broad variety of tested skills, and it is a good choice for many degrees and careers. Chemistry has been described as the 'central science' and is often combined with either physics or biology. It is usually a compulsory choice for anyone wishing to pursue medicine, dentistry and veterinary science, as well as chemistry-based degrees such as pharmacy, pharmacology and biochemistry.
- It has both theoretical and practical aspects which keeps lessons interesting and varied.
- It is taught by very experienced members of staff.
- It enables you to develop crucial employability skills including researching, problem solving and analysing. Chemistry often requires teamwork and communication skills too, which is great for project management.

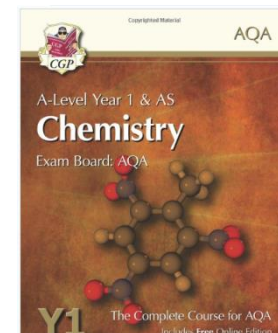


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EXPECTATIONS:

- **ATTENDANCE-** needs to be extremely high otherwise you won't do well. A level chemistry is tough and every year we have students who find the transition difficult. What ever the topic, activity, or task you are set you will have to give your **FULL** commitment.
- **DEADLINES-** always must be met.
- **RECORD KEEPING-** you need to keep your study notes/work in an organised folder. You will also need to buy an A4 hardback lab book to write up your experiments in. You will have a minimum of 12 experiments over the two years. If your lab book is assessed as up to standard you will also be accredited with the experimental award on your final certificate.
- **TEXTBOOKS-** we strongly advise you to purchase the recommended book(s).



https://www.amazon.co.uk/New--Level-Chemistry-AQA-Student/dp/1782943218/ref=sr_1_3?s=books&ie=UTF8&qid=1467284369&sr=1-3&keywords=aqa+chemistry+as+year+1

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SPECIFICATION:

<https://filestore.aqa.org.uk/resources/chemistry/specifications/AQA-7404-7405-SP-2015.PDF>



AS AND A-LEVEL CHEMISTRY

AS (7404)
A-level (7405)

Specifications

For teaching from September 2015 onwards
For AS exams in May/June 2016 onwards
For A-level exams in May/June 2017 onwards

Version 1.1 December 2015



CHEMISTRY



CONTENT:

3 main topics:

1. Physical Chemistry
2. Inorganic Chemistry
3. Organic Chemistry

3.1 [Physical chemistry](#) page 11

3.1.1 [Atomic structure](#) page 11

3.1.2 [Amount of substance](#) page 13

3.1.3 [Bonding](#) page 16

3.1.4 [Energetics](#) page 19

3.1.5 [Kinetics](#) page 20

3.1.6 [Chemical equilibria, Le Chatelier's principle and \$K_c\$](#) page 22

3.1.7 [Oxidation, reduction and redox equations](#) page 24

3.1.8 [Thermodynamics \(A-level only\)](#) page 25

3.1.9 [Rate equations \(A-level only\)](#) page 27

3.1.10 [Equilibrium constant \$K_c\$ for homogeneous systems \(A-level only\)](#) page 29

3.1.11 [Electrode potentials and electrochemical cells \(A-level only\)](#) page 30

3.1.12 [Acids and bases \(A-level only\)](#) page 32

3.2 [Inorganic chemistry](#) page 34

3.2.1 [Periodicity](#) page 34

3.2.2 [Group 2, the alkaline earth metals](#) page 35

3.2.3 [Group 7\(17\), the halogens](#) page 36

3.2.4 [Properties of Period 3 elements and their oxides \(A-level only\)](#) page 38

3.2.5 [Transition metals \(A-level only\)](#) page 39

3.2.6 [Reactions of ions in aqueous solution \(A-level only\)](#) page 44

3.3 [Organic chemistry](#) page 45

3.3.1 [Introduction to organic chemistry](#) page 45

3.3.2 [Alkanes](#) page 47

3.3.3 [Halogenoalkanes](#) page 48

3.3.4 [Alkenes](#) page 49

3.3.5 [Alcohols](#) page 51

3.3.6 [Organic analysis](#) page 53

3.3.7 [Optical isomerism \(A-level only\)](#) page 54

3.3.8 [Aldehydes and ketones \(A-level only\)](#) page 55

3.3.9 [Carboxylic acids and derivatives \(A-level only\)](#) page 56

3.3.10 [Aromatic chemistry \(A-level only\)](#) page 57

3.3.11 [Amines \(A-level only\)](#) page 58

3.3.12 [Polymers \(A-level only\)](#) page 59

3.3.13 [Amino acids, proteins and DNA \(A-level only\)](#) page 60

3.3.14 [Organic synthesis \(A-level only\)](#) page 63

3.3.15 [Nuclear magnetic resonance spectroscopy \(A-level only\)](#) page 64

3.3.16 [Chromatography \(A-level only\)](#) page 65

CHEMISTRY



EXAMS:

Content that will be taught and internally examined in year 12 but will not count to your overall grade.

Assessments

Paper 1	+	Paper 2
What's assessed <ul style="list-style-type: none"> Relevant Physical chemistry topics (sections 3.1.1 to 3.1.4, 3.1.6 and 3.1.7) Inorganic chemistry (Section 3.2.1 to 3.2.3) Relevant practical skills 		What's assessed <ul style="list-style-type: none"> Relevant Physical chemistry topics (sections 3.1.2 to 3.1.6) Organic chemistry (Section 3.3.1 to 3.3.6) Relevant practical skills
How it's assessed <ul style="list-style-type: none"> written exam: 1 hour 30 minutes 80 marks 50% of the AS 		How it's assessed <ul style="list-style-type: none"> written exam: 1 hour 30 minutes 80 marks 50% of the AS
Questions <p>65 marks of short and long answer questions</p> <p>15 marks of multiple choice questions</p>		Questions <p>65 marks of short and long answer questions</p> <p>15 marks of multiple choice questions</p>

CHEMISTRY



A-level

EXAMS:

Content that will be taught and externally examined in year 13 and will count to your overall grade.

Assessments

Paper 1	+	Paper 2	+	Paper 3
What's assessed <ul style="list-style-type: none"> Relevant Physical chemistry topics (sections 3.1.1 to 3.1.4, 3.1.6 to 3.1.8 and 3.1.10 to 3.1.12) Inorganic chemistry (Section 3.2) Relevant practical skills 		What's assessed <ul style="list-style-type: none"> Relevant Physical chemistry topics (sections 3.1.2 to 3.1.6 and 3.1.9) Organic chemistry (Section 3.3) Relevant practical skills 		What's assessed <ul style="list-style-type: none"> Any content Any practical skills
How it's assessed <ul style="list-style-type: none"> written exam: 2 hours 105 marks 35% of A-level 		How it's assessed <ul style="list-style-type: none"> written exam: 2 hours 105 marks 35% of A-level 		How it's assessed <ul style="list-style-type: none"> written exam: 2 hours 90 marks 30% of A-level
Questions 105 marks of short and long answer questions		Questions 105 marks of short and long answer questions		Questions 40 marks of questions on practical techniques and data analysis 20 marks of questions testing across the specification 30 marks of multiple choice questions

	AS		A2		
	Paper 1	Paper 2	Paper 1	Paper 2	Paper 3
Weighting (%)	50	50	35	35	30
3.1 Physical chemistry					
3.1.1 Atomic structure					
3.1.2 Amount of substance					
3.1.3 Bonding					
3.1.4 Energetics					
3.1.5 Kinetics					
3.1.6 Chemical equilibria, Le Chatelier's principle and K _c					
3.1.7 Oxidation, reduction and redox equations					
3.1.8 Thermodynamics					
3.1.9 Rate equations					
3.1.10 Equilibrium constant K _p for homogeneous systems					
3.1.11 Electrode potentials and electrochemical cells					
3.1.12 Acids and bases					
3.2 Inorganic chemistry					
3.2.1 Periodicity					
3.2.2 Group 2, the alkaline earth metals					
3.2.3 Group 7(17), the halogens					
3.2.4 Properties of Period 3 elements and their oxides					
3.2.5 Transition metals					
3.2.6 Reactions of ions in aqueous solution					
3.3 Organic chemistry					
3.3.1 Introduction to organic chemistry					
3.3.2 Alkanes					
3.3.3 Halogenoalkanes					
3.3.4 Alkenes					
3.3.5 Alcohols					
3.3.6 Organic analysis					
3.3.7 Optical isomerism					
3.3.8 Aldehydes and ketones					
3.3.9 Carboxylic acids and derivatives					
3.3.10 Aromatic chemistry					
3.3.11 Amines					
3.3.12 Polymers					
3.3.13 Amino acids, proteins and DNA					
3.3.14 Organic synthesis					
3.3.15 Nuclear magnetic resonance spectroscopy					
3.3.16 Chromatography					

EXAMS:

GCSE CHEMISTRY PAPER 1

<https://filestore.aqa.org.uk/resources/chemistry/specifications/AQA-8462-SP-2016.PDF>

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GCSE CHEMISTRY PAPER 2

<https://filestore.aqa.org.uk/resources/chemistry/specifications/AQA-8462-SP-2016.PDF>

[illegible]

First lesson in september.
We would expect you to know this as a minimum.
Including 'triple' (chemistry only) topics.

<https://filestore.aqa.org.uk/resources/chemistry/specifications/AQA-8462-SP-2016.PDF>

Paper	Section	Chapter	Topic	Chemistry spec	Trilogy BP 1	Chemistry BP 2	
Paper 1	1	4.1 Atomic Structure and the periodic table	4.1.1.1 Atoms, elements and compounds				
			4.1.1.2 Mixtures				
			4.1.1.3 The development of the model of the atom (common content with physics)				
			4.1.1.4 Relative electrical charges of subatomic particles				
			4.1.1.5 Size and mass of atoms				
			4.1.1.6 Relative atomic mass				
			4.1.1.7 Electronic structure				
			4.1.2 The periodic table	4.1.2.1 The periodic table			
			4.1.2.2 Development of the periodic table				
			4.1.2.3 Metals and non-metals				
Paper 1	1	4.2 Bonding, structure and the properties of matter	4.1.2.4 Group 0				
			4.1.2.5 Group 1				
			4.1.2.6 Group 7				
			4.1.3 Properties of transition metals	4.1.3.1 Comparison with Group 1 elements			
				4.1.3.2 Typical properties			
			4.2.1 Chemical bonds, ionic, covalent and metallic	4.2.1.1 Chemical bonds			
			4.2.1.2 Ionic bonding				
			4.2.1.3 Ionic compounds				
			4.2.1.4 Covalent bonding				
			4.2.1.5 Metallic bonding				
Paper 1	1	4.3 Quantitative chemistry	4.2.2 The three states of matter				
			4.2.2.1 State symbols				
			4.2.2.2 Properties of ionic compounds				
			4.2.2.3 Properties of ionic compounds				
			4.2.2.4 Properties of small molecules				
			4.2.2.5 Polymers				
			4.2.2.6 Giant covalent structures				
			4.2.2.7 Properties of metals and alloys				
			4.2.2.8 Metals as conductors				
			4.2.3 Structure and bonding of carbon	4.2.3.1 Diamond			
Paper 1	1	4.4 Chemical changes	4.2.3.2 Graphite				
			4.2.3.3 Graphene and fullerenes				
			4.2.4 Bulk and surface properties of matter including nanoparticles	4.2.4.1 Sizes of particles and their properties			
				4.2.4.2 Use of nanoparticles			
			4.3.1 Chemical measurements, conservation of mass and the quantitative interpretation of chemical equations	4.3.1.1 Conservation of mass and balanced chemical equations			
			4.3.1.2 Relative formula mass				
			4.3.1.3 Mass changes when a reactant or product is a gas				
			4.3.1.4 Chemical measurements				
			4.3.2 Use of amount of substance in relation to masses of pure substances	4.3.2.1 Moles (HT ONLY)			
			4.3.2.2 Amounts of substances in equations (HT ONLY)				
Paper 1	1	4.5 Energy changes	4.3.2.3 Using moles to balance equations (HT ONLY)				
			4.3.2.4 Limiting reactions (HT ONLY)				
			4.3.2.5 Concentration of solutions				
			4.3.3 Yield and atom economy of chemical reactions	4.3.3.1 Percentage yield			
				4.3.3.2 Atom economy			
			4.3.4 Using concentrations of solutions in mol/dm ³ (HT ONLY)				
			4.3.4.1 Use of amount of substance in relation to volumes of gases (HT ONLY)				
			4.4.1 Reactivity of metals	4.4.1.1 Metal oxides			
			4.4.1.2 The reactivity series				
			4.4.1.3 Extraction of metals and reduction				
Paper 1	1	4.6 Chemical changes	4.4.1.4 Oxidation and reduction in terms of electrons (HT ONLY)				
			4.4.2 Reactions of acids with metals	4.4.2.1 Reactions of acids with metals			
			4.4.2.2 Neutralisation of acids and salt production				
			4.4.2.3 Soluble salts				
			4.4.2.4 The pH scale and neutralisation				
			4.4.2.5 Strong and weak acids (HT ONLY)	4.4.2.5 Titrations			
			4.4.3 The process of electrolysis				
			4.4.3.1 Electrolysis of molten ionic compounds				
			4.4.3.2 Using electrolysis to extract metals				
			4.4.3.3 Electrolysis of aqueous solutions				
Paper 1	1	4.7 Chemical cells and fuel cells	4.4.3.4 Electrolysis of aqueous solutions				
			4.4.3.5 Representation of reactions at electrodes as half equations (HT ONLY)				
			4.4.3.6 Energy transfer during exothermic and endothermic reactions				
			4.4.3.7 Reaction profiles				
			4.4.3.8 The energy changes of reactions (HT ONLY)				
			4.5.1 Exothermic and endothermic reactions	4.5.1.1 Energy transfer during exothermic and endothermic reactions			
			4.5.1.2 Reaction profiles				
			4.5.1.3 The energy changes of reactions (HT ONLY)				
			4.5.2 Chemical cells	4.5.2.1 Cells and batteries			
			4.5.2.2 Fuel cells				

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CHEMISTRY



INDUCTION TEST:

First lesson in September.

We would expect you to know the following as a minimum:

- **4.1 Atomic Structure and the periodic table:**
 - subatomic particles, electronic structure, noble gases, halogens, alkali metals
- **4.2 Bonding, structure and the properties of matter :**
 - bonding x3, properties of small molecules/alloys/ionic/covalent compounds
- **4.3 Quantitative chemistry:**
 - balancing equations, Mr, moles, amount of substances in equations, limiting reactions
- **4.4 Chemical changes:**
 - reactivity series, metal extraction, salts, electrolysis, metal+acid reactions,
- **4.5 Energy changes:**
 - exothermic and endothermic reactions, reaction profiles
- **4.6 The rate and extent of chemical change:**
 - calculating rate, factors, reversibility/equilibrium
- **4.7 Organic chemistry :**
 - crude oil, hydrocarbons, alkanes, fractional distillation, cracking
- **4.8 Chemical analysis:**
 - chromatography, gas tests,
- **4.9 Chemistry of the atmosphere:**
 - atmosphere composition, atmosphere evolution, climate change, pollutants
- **4.10 Using resources:**
 - sustainable development, potable water, waste water treatment

<https://filestore.aqa.org.uk/resources/chemistry/specifications/AQA-8462-SP-2016.PDF>

**INCLUDING 'TRIPLE'
(CHEMISTRY ONLY)
TOPICS**

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SUMMER PREP WORK:

booklet



The most important thing you can do to prepare over summer is to know GCSE Chemistry like the back of your hand. You cannot build a tower block on shaky foundations. If you were a 'triple' student then revise all Chemistry you were ever taught for GCSE. If you were a 'combined' student then it is expected that you to **learn the extra 'triple' content** before the induction test in September....on top of revising the 'combined' content.

<https://filestore.aqa.org.uk/resources/chemistry/specifications/AQA-8462-SP-2016.PDF>

Pre-reading:

'Head Start to A-Level Chemistry' - GCP

'Essential Maths Skills for A-Level Chemistry' - GCP

List of good A-Level Chemistry websites: (with the caveat that I cannot check every web page that appears on these websites)

<http://www.chemguide.co.uk>

<http://www.s-cool.co.uk/a-level/chemistry>

<http://www.a-levelchemistry.co.uk>

<http://www.physicsandmathstutor.com/chemistry-revision/a-level-aqa/>

http://www.rsc.org/learn-chemistry/wiki/A-Level_Chemistry_Revision

<http://www.docbrown.info/page13/page13.htm>

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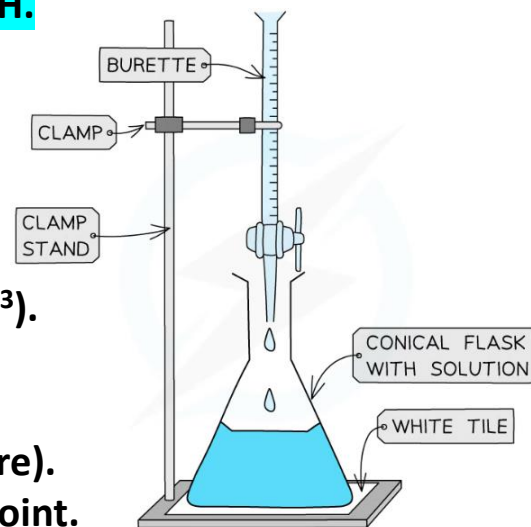
INDUCTION TASK

COMBINED KIDS PAIR UP WITH TRIPLE AS YOU'VE NOT DONE TITRATIONS...watch a video if you're struggling

1. 25 cm^3 of NaOH (unknown concentration) and few drops of indicator in conical flask.
2. H_2SO_4 in burette
3. Titrate the alkali with acid and find unknown concentration of the NaOH.

EXTRA HELP

1. Use the volumetric pipette to measure 25 cm^3 of alkali.
2. Transfer the alkali to a conical flask and place on a white tile.
3. Add a few drops of indicator to the conical flask.
4. Using a funnel fill a burette with acid and record the starting volume (cm^3).
5. Add the acid to the alkali whilst swirling the conical flask.
6. Keep adding alkali until the colour changes (end point).
7. Record the final volume of acid and calculate the total volume added (titre).
8. Repeat steps 1-6 but add the acid drop by drop when you near the end point.
9. Repeat the process until you get at least two concordant results ($\pm 0.10\text{ cm}^3$).
10. Use the concordant results to calculate an average titre.
11. Use the titre volume to calculate the unknown concentration of the alkali.



IN FOLDER IF NECESSARY

3-Info---Titration-steps.pdf

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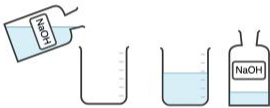
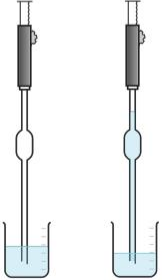
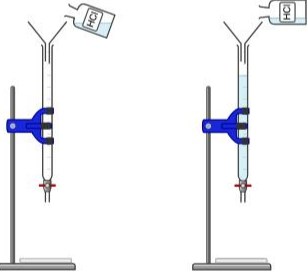
Google GCSE Science - BBC... ExamPro K! Log in - Kahoot!

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TITRATION STEPS

Steps to carry out a titration:

1. Pour some of the known concentration of alkali into a beaker.

2. Using a volumetric pipette and a pipette filler draw up exactly 25 cm³ of alkali.

5. Set up the retort & burette then fill the burette with acid of an unknown concentration using a funnel. Be careful not to overfill the burette. Run a small amount of acid through the tap of the burette and discard. Record the starting volume of acid in the burette e.g. 01.20 cm³. **NOTE:** Burette readings must end in 0 or 5.

6. Place the conical flask on a white tile under the tap of the burette. Allow acid to run into the alkali whilst swirling the conical flask.
7. Reduce the flow to drop-by-drop of

16°C Partly sunny 10:34 05/07/2022