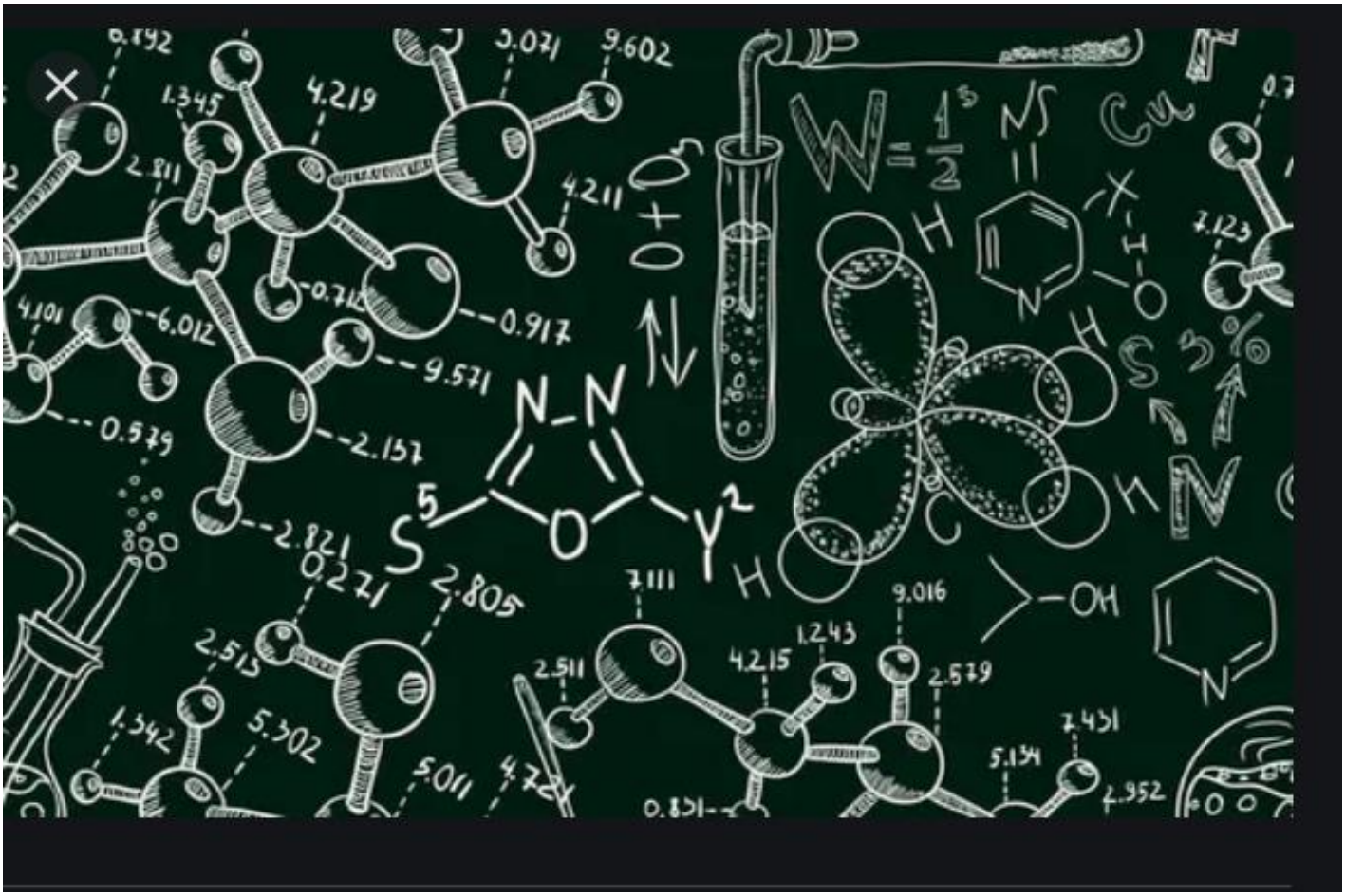
HILLCREST SIXTH FORM



Chemistry Welcome Pack

Why study Chemistry?

Chemistry is an incredibly fascinating field of study. It plays a role in everyone's lives and touches almost every aspect of our existence in some way. Chemistry is essential for meeting our basic needs of food, clothing, shelter, health, energy, and clean air, water, and soil. Chemical technologies enrich our quality of life in numerous ways by providing new solutions to problems in health, materials, and energy usage. Thus, studying chemistry is useful in preparing us for the real world.

Chemistry is often referred to as the central science because it joins together physics and mathematics, biology and medicine, and the earth and environmental sciences. Knowledge of the nature of chemicals and chemical processes therefore provides insights into a variety of physical and biological phenomena. Knowing something about chemistry is worthwhile because it provides an excellent basis for understanding the physical universe we live in. For better or for worse, everything is chemical!

Employability skills

Studying chemistry provides you with a whole range of useful skills and knowledge that are highly valued by employers in all sectors and in lots of different jobs.

- Scientific and technical knowledge
- Numeracy
- Handing data, software and technology
- Logical thought process and problem solving
- Communication

Career options

A qualification in chemistry opens doors to a wide range of careers. Chemistry is involved in our everyday lives and there is a vast range of jobs and careers open to those who have studied chemistry at any level; great career opportunities exist both inside and outside the lab. From finding solutions to climate change to finding new medicines and even creating new materials chemistry is vital.

- Environmental chemist
- Astrochemist
- Forensic scientist
- Senior scientist, household goods
- Consumer products technician
- Science publicist
- Analytical chemist
- Science communicator
- Patent attorney
- Policy advisor, UK government
- Sports scientist

This list is by no means exhaustive and chemistry is an essential subject for entry into traditional and very well respected fields of medicine, dentistry and pharmaceuticals.

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The Basics

Exam board and course information

AQA AS Chemistry (7404). AQA A-level Chemistry (7405).

Equipment

Students of subject are expected to bring the following to every lesson:

- An A4 folder, to be kept well organised by specification heading and inspected every half term
- A4 lined paper to make notes on
- Plastic wallets for handouts
- Plastic wallet/A4 envelope folder for homework assignments
- Pen, pencil, ruler (30 cm is best).
- Scientific calculator

What you can expect in this course

- Interesting lessons
- A range of resources to help you learn effectively and stay organised
- Lots of opportunity to share your ideas and challenge each other
- Homework tasks which help you to progress
- Excellent exam preparation

Expectations of all students

- Excellent attendance and punctuality
- A positive attitude and good concentration in lessons
- Turning up fully-equipped to all lessons
- Homework completed on time and to the best of your ability; any homework completed on a computer should be printed by you *before* the lesson unless you are given directions to the contrary.
- Taking on board feedback you are given and using it to improve your work
- Constant review and revision throughout the course

Remember: there is a direct relationship between your effort and your final grade.

In short, we expect 100% commitment. You will be treated like a young adult in lessons and you are expected to behave like one: with maturity, conscientiousness, politeness and common sense.

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Subject content

Sections 3.1.1 to 3.1.7 of the Physical chemistry content, sections 3.2.1 to 3.2.3 of the Inorganic chemistry content and sections 3.3.1 to 3.3.6 of the Organic chemistry content are designed to be covered in the first year of the A-level and are also the AS subject content.

3.1 **Physical chemistry**

3.1.1 Atomic structure

The chemical properties of elements depend on their atomic structure and in particular on the arrangement of electrons around the nucleus. The arrangement of electrons in orbitals is linked to the way in which elements are organised in the Periodic Table. Chemists can measure the mass of atoms and molecules to a high degree of accuracy in a mass spectrometer. The principles of operation of a modern mass spectrometer are studied.

- Fundamental particles
- Mass number and isotopes
- Electron configuration

3.1.2 Amount of substance

When chemists measure out an amount of a substance, they use an amount in moles. The mole is a useful quantity because one mole of a substance always contains the same number of entities of the substance. An amount in moles can be measured out by mass in grams, by volume in dm^3 of a solution of known concentration and by volume in dm^3 of a gas.

- Relative atomic mass and relative molecular mass
- The mole and the Avogadro's constant
- The ideal gas equation
- Empirical and molecular formula
- Balanced equations and associated equations

3.1.3 Bonding

The physical and chemical properties of compounds depend on the ways in which the compounds are held together by chemical bonds and by intermolecular forces. Theories of bonding explain how atoms or ions are held together in these structures. Materials scientists use knowledge of structure and bonding to engineer new materials with desirable properties. These new materials may offer new applications in a range of different modern technologies.

- Ionic bonding
- Nature of covalent and dative covalent bonds
- Metallic bonding
- Bonding and physical properties
- Shapes of simple molecules and ions
- Bond polarity
- Forces between molecules

3.1.4 Energetics

The enthalpy change in a chemical reaction can be measured accurately. It is important to know this value for chemical reactions that are used as a source of heat energy in applications such as domestic boilers and internal combustion engines.

- Enthalpy change
- Calorimetry
- Applications of Hess's law

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- Bond enthalpies

3.1.5 Kinetics

The study of kinetics enables chemists to determine how a change in conditions affects the speed of a chemical reaction. Whilst the reactivity of chemicals is a significant factor in how fast chemical reactions proceed, there are variables that can be manipulated in order to speed them up or slow them down.

- Collision theory
- Maxwell-Boltzmann distribution
- Effect of temperature on reaction rate
- Effect of concentration and pressure
- Catalysts

3.1.6 Chemical equilibria, Le Chatelier's principle and K_c

In contrast with kinetics, which is a study of how quickly reactions occur, a study of equilibria indicates how far reactions will go. Le Chatelier's principle can be used to predict the effects of changes in temperature, pressure and concentration on the yield of a reversible reaction. This has important consequences for many industrial processes. The further study of the equilibrium constant, Kc, considers how the mathematical expression for the equilibrium constant enables us to calculate how an equilibrium yield will be influenced by the concentration of reactants and products.

- Chemical equilibrium and Le Chatelier's principle
- Equilibrium constant Kc for homogenous systems

3.1.7 Oxidation, reduction and redox equations

Redox reactions involve a transfer of electrons from the reducing agent to the oxidising agent. The change in the oxidation state of an element in a compound or ion is used to identify the element that has been oxidised or reduced in a given reaction. Separate half-equations are written for the oxidation or reduction processes. These half-equations can then be combined to give an overall equation for any redox reaction.

3.1.8 Thermodynamics (A-level only)

The further study of thermodynamics builds on the Energetics section and is important in understanding the stability of compounds and why chemical reactions occur. Enthalpy change is linked with entropy change enabling the free-energy change to be calculated.

- Born-Haber cycle
- Gibbs free-energy change and entropy change

3.1.9 Rate equations (A-level only)

In rate equations, the mathematical relationship between rate of reaction and concentration gives information about the mechanism of a reaction that may occur in several steps.

- Rate equations
- Determination of rate equation

3.1.10 Equilibrium constant K_p for homogeneous systems (A-level only)

The further study of equilibria considers how the mathematical expression for the equilibrium constant K p enables us to calculate how an equilibrium yield will be influenced by the partial pressures of reactants and products. This has important consequences for many industrial processes.

3.1.11 Electrode potentials and electrochemical cells (A-level only)

Redox reactions take place in electrochemical cells where electrons are transferred from the reducing agent to the oxidising agent indirectly via an external circuit. A potential difference is created that can drive an electric current to do work. Electrochemical cells have very

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important commercial applications as a portable supply of electricity to power electronic devices such as mobile phones, tablets and laptops. On a larger scale, they can provide energy to power a vehicle.

- Electrode potentials and cells
- Commercial applications of electrochemical cells

3.1.12 Acids and bases (A-level only)

Acids and bases are important in domestic, environmental and industrial contexts. Acidity in aqueous solutions is caused by hydrogen ions and a logarithmic scale, pH, has been devised to measure acidity. Buffer solutions, which can be made from partially neutralised weak acids, resist changes in pH and find many important industrial and biological applications.

- Brønsted–Lowry acid–base equilibria in aqueous solution
- Definition and determination of pH
- The ionic product of water, Kw
- Weak acids and bases Ka for weak acids
- pH curves, titrations and indicators
- Buffer action

3.2 Inorganic chemistry

3.2.1 Periodicity

The Periodic Table provides chemists with a structured organisation of the known chemical elements from which they can make sense of their physical and chemical properties. The historical development of the Periodic Table and models of atomic structure provide good examples of how scientific ideas and explanations develop over time.

- Classification
- Physical properties of Period 3 elements

3.2.2 Group 2, the alkaline earth metals

The elements in Group 2 are called the alkaline earth metals. The trends in the solubilities of the hydroxides and the sulfates of these elements are linked to their use. Barium sulfate, magnesium hydroxide and magnesium sulfate have applications in medicines whilst calcium hydroxide is used in agriculture to change soil pH, which is essential for good crop production and maintaining the food supply.

3.2.3 Group 7(17), the halogens

The halogens in Group 7 are very reactive non-metals. Trends in their physical properties are examined and explained. Fluorine is too dangerous to be used in a school laboratory but the reactions of chlorine are studied. Challenges in studying the properties of elements in this group include explaining the trends in ability of the halogens to behave as oxidising agents and the halide ions to behave as reducing agents.

- Trends in properties
- Uses of chlorine and chlorate(I)

3.2.4 Properties of Period 3 elements and their oxides (A-level only)

The reactions of the Period 3 elements with oxygen are considered. The pH of the solutions formed when the oxides react with water illustrates further trends in properties across this period. Explanations of these reactions offer opportunities to develop an in-depth understanding of how and why these reactions occur.

3.2.5 Transition metals (A-level only)

The 3d block contains 10 elements, all of which are metals. Unlike the metals in Groups 1 and 2, the transition metals Ti to Cu form coloured compounds and compounds where the transition metal exists in different oxidation states. Some of these metals are familiar as catalysts. The properties of these elements are studied in this section with opportunities for a wide range of practical investigations.

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- General properties of transition metals
- Substitution reactions
- Shapes of complex ions
- Formation of coloured ions
- Variable oxidation states
- Catalysts

3.2.6 Reactions of ions in aqueous solution (A-level only)

The reactions of transition metal ions in aqueous solution provide a practical opportunity for students to show and to understand how transition metal ions can be identified by test-tube reactions in the laboratory.

3.3 Organic chemistry

3.3.1 Introduction to organic chemistry

Organic chemistry is the study of the millions of covalent compounds of the element carbon. These structurally diverse compounds vary from naturally occurring petroleum fuels to DNA and the molecules in living systems. Organic compounds also demonstrate human ingenuity in the vast range of synthetic materials created by chemists. Many of these compounds are used as drugs, medicines and plastics. Organic compounds are named using the International Union of Pure and Applied Chemistry (IUPAC) system and the structure or formula of molecules can be represented in various different ways. Organic mechanisms are studied, which enable reactions to be explained. In the search for sustainable chemistry, for safer agrochemicals and for new materials to match the desire for new technology, chemistry plays the dominant role.

- Nomenclature
- Reaction mechanisms
- Isomerism

3.3.2 Alkanes

Alkanes are the main constituent of crude oil, which is an important raw material for the chemical industry. Alkanes are also used as fuels and the environmental consequences of this use are considered in this section.

- Fractional distillation of crude oil
- Modification of alkanes by cracking
- Combustion of alkanes
- Chlorination of alkanes

3.3.3 Halogenoalkanes

Halogenoalkanes are much more reactive than alkanes. They have many uses, including as refrigerants, as solvents and in pharmaceuticals. The use of some halogenoalkanes has been restricted due to the effect of chlorofluorocarbons (CFCs) on the atmosphere.

- Nucleophilic substitution
- Elimination
- Ozone depletion

3.3.4 Alkenes

In alkenes, the high electron density of the carbon–carbon double bond leads to attack on these molecules by electrophiles. This section also covers the mechanism of addition to the double bond and introduces addition polymers, which are commercially important and have many uses in modern society

- Structure, bonding and reactivity
- Addition reactions of alkenes

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- Addition polymers

3.3.5 Alcohols

Alcohols have many scientific, medicinal and industrial uses. Ethanol is one such alcohol and it is produced using different methods, which are considered in this section. Ethanol can be used as a biofuel.

- Alcohol production
- Oxidation of alcohols
- Elimination

3.3.6 Organic analysis

Our understanding of organic molecules, their structure and the way they react, has been enhanced by organic analysis. This section considers some of the analytical techniques used by chemists, including test-tube reactions and spectroscopic techniques.

- Identification of functional groups by test-tube reactions
- Mass spectrometry
- Infrared spectroscopy

3.3.7 Optical isomerism (A-level only)

Compounds that contain an asymmetric carbon atom form stereoisomers that differ in their effect on plane polarised light. This type of isomerism is called optical isomerism.

3.3.8 Aldehydes and ketones (A-level only)

Aldehydes, ketones, carboxylic acids and their derivatives all contain the carbonyl group which is attacked by nucleophiles. This section includes the addition reactions of aldehydes and ketones.

3.3.9 Carboxylic acids and derivatives (A-level only)

Carboxylic acids are weak acids but strong enough to liberate carbon dioxide from carbonates. Esters occur naturally in vegetable oils and animal fats. Important products obtained from esters include biodiesel, soap and glycerol.

- Carboxylic acids and esters
- Acylation

3.3.10 Aromatic chemistry (A-level only)

Aromatic chemistry takes benzene as an example of this type of molecule and looks at the structure of the benzene ring and its substitution reactions.

- Bonding
- Electrophilic substitution

3.3.11 Amines (A-level only)

Amines are compounds based on ammonia where hydrogen atoms have been replaced by alkyl or aryl groups. This section includes their reactions as nucleophiles.

- Preparation
- Base properties
- Nucleophilic properties

3.3.12 Polymers (A-level only)

The study of polymers is extended to include condensation polymers. The ways in which condensation polymers are formed are studied, together with their properties and typical uses. Problems associated with the reuse or disposal of both addition and condensation polymers are considered.

- Condensation polymers

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- Biodegradability and disposal of polymers

3.3.13 Amino acids, proteins and DNA (A-level only)

Amino acids, proteins and DNA are the molecules of life. In this section, the structure and bonding in these molecules and the way they interact is studied. Drug action is also considered.

- Amino acids
- Proteins
- Enzymes
- DNA
- Action of anticancer drugs

3.3.14 Organic synthesis (A-level only)

The formation of new organic compounds by multi-step syntheses using reactions included in the specification is covered in this section

3.3.15 Nuclear magnetic resonance spectroscopy (A-level only)

Chemists use a variety of techniques to deduce the structure of compounds. In this section, nuclear magnetic resonance spectroscopy is added to mass spectrometry and infrared spectroscopy as an analytical technique. The emphasis is on the use of analytical data to solve problems rather than on spectroscopic theory.

3.3.16 Chromatography (A-level only)

Chromatography provides an important method of separating and identifying components in a mixture. Different types of chromatography are used depending on the composition of mixture to be separated.

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Study Skills

You can find detail about study skills in your study skills booklet.

You can also find detail about practical skills in your Chemistry practical handbook. **You must review this carefully.**

Demonstrate knowledge and understanding of scientific ideas, processes, techniques and procedures

Learning and recalling knowledge is very important in Chemistry and is assessed in your A-level course. Throughout the course you will need to recall prior knowledge from GCSE study and from earlier in the course.

- **State** This is directly testing your subject knowledge.
- **Describe** This links subject knowledge from different parts of the course.

***Study tip**: Try going through your notes in intervals. Returning to previous knowledge and linking ideas as you progress through the course is essential for success.*

Apply knowledge and understanding of scientific ideas, processes, techniques and procedures: in a theoretical context; in a practical context; when handling qualitative data; when handling quantitative data

Simply recalling and stating facts is not sufficient at A-level. You will need to use your knowledge to explain a variety of situations including those that are theoretical, experimental and include data. This skill will be most heavily assessed during the course.

- **Explain** This is where you will link your understanding and knowledge to unfamiliar situations.
- **Calculate/show that** This is where you will have to apply theoretical or experimental quantitative data to calculate values of interest.

***Study tip**: Practice as many examination questions as possible to familiarise yourself with as wide a variety of physical situations as possible. Practice, practice and more practice is crucial for success in Chemistry.*

Analyse, interpret and evaluate scientific information, ideas and evidence, including in relation to issues, to: make judgements and reach conclusions; develop and refine practical design and procedures.

You will need to review information presented to you in order to make a judgement, reach a conclusion or adapt practical experimental designs. Drawing judgements from processed data is a vital skill in Chemistry.

- **Analyse** This is where you will consider data, process it and then draw a reasoned conclusion.
- **Comment/suggest** This is where you will have to make an adjustment to a practical design based upon analysis of evidence and data provided.

***Study tip**: Continue linking your practical skills to your theoretical knowledge as you progress through the course.*

Mathematics

Mathematics is central to the study of Chemistry. Overall, at least 20% of the marks in assessments for chemistry will require the use of mathematical skills. These skills will be applied in the context of chemistry and will be at least the standard of higher tier GCSE Mathematics.

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How should I revise for Chemistry?

Examination Question Practice

Practice, practice, practice! You can never do too many past examination questions in Chemistry. These will help you to apply your knowledge in a variety of ways and become familiar with the expected responses to Chemistry terminology.

Practical work

Continually review your practical notes and lab book. This will help you develop your analytical skills alongside your ability to apply experimental data in familiar and unfamiliar contexts.

Retrieval Practice

This is a learning strategy that aims to pull information from your memory. This usually involves recalling information you have previously studied.

- *Try creating flash cards from your notes*
- *Try regularly quizzing yourself to check your knowledge of a previous topic from a while ago*

Revision Guides

Your revision guide contains the *basic information* you need to know to pass your exams. You should learn the knowledge content in your revision guide.

- *Try creating your own version of the revision guide as a revision task. This could incorporate dual coding*
- *Quiz yourself on key pieces of knowledge (look, say, cover, write, check)*

Dual Coding

Turning text into images, symbols or diagrams. These are mental aids to help your learning as you have verbal and visual information at the same time.

- *Try summarising your Chemistry notes into images and key words to help you remember the content*

Self-Quizzing

Self-quizzing means testing yourself on your subject knowledge.

- *Try writing your own quizzes using your revision guide or based on your class notes*
- *You could swap quizzes with your classmates*

Videos and Podcasts

Visual aids can be really helpful for revision. Search YouTube, BBC iPlayer and Netflix for some helpful revision videos, documentaries and video lectures. Podcasts are easy to listen to whilst doing something you enjoy such as sport or drawing. *See the 'useful resources and taking your work further' section for some recommendations.*

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Scheme of Work

	Specification reference	Practical
Year 12 Autumn Term	3.1.1 Atomic structure 3.1.2 Amount of substance 3.1.3 Bonding 3.3.1 Introduction to organic chemistry 3.3.2 Alkanes 3.3.3 Halogenoalkanes	Required practical 1 Make up a volumetric solution and carry out a simple acid–base titration.
Year 12 Spring Term	3.1.4 Energetics 3.1.5 Kinetics 3.1.6 Chemical equilibria 3.1.7 Oxidation, reduction and redox equations. 3.3.4 Alkenes 3.3.5 Alcohols 3.3.6 Organic analysis 3.2.1 Periodicity 3.2.2 Group 2, the alkaline earth metals	Required practical 2 Measurement of an enthalpy change. Required practical 3 Investigation of how the rate of a reaction changes with temperature. Required practical 5 Distillation of a product from a reaction. Required practical 6 Tests for alcohol, aldehyde, alkene and carboxylic acid.
Year 12 Summer Term	3.2.3 Group 7, the halogens Revision and AS exams 3.2.5 Transition metals 3.3.7 Optical isomerism 3.3.13 Amino acids, proteins and DNA	Required practical 4 Carry out simple test-tube reactions to identify: • cations – Group 2, NH_4^+ • anions – Group 7 (halide ions), OH^- , CO_3^{2-}, SO_4^{2-}
Year 13 Autumn Term	3.2.6 Reactions of ions in aqueous solutions 3.1.9 Rate equations 3.1.11 Electrode potentials and electrochemical cells 3.3.8 Aldehydes and ketones 3.3.9 carboxylic acids and derivatives	Required practical 7 Measuring the rate of reaction: • by an initial rate method • by a continuous monitoring method. Required practical 8 Measuring the EMF of an electrochemical cell. Required practical 10 Preparation of: • a pure organic solid and test of its purity • a pure organic liquid.
Year 13 Spring Term	3.1.10 Equilibrium constant Kp 3.3.12 Acids and bases 3.3.10 Aromatic chemistry 3.3.11 Amines 3.3.12 Polymers 3.3.14 Organic synthesis 3.3.1 NMR 3.3.16 Chromatography	Required practical 9 Investigate how pH changes when a weak acid reacts with a strong base and when a strong acid reacts with a weak base. Required practical 11 Carry out simple test-tube reactions to identify transition metal ions in aqueous solution. Required practical 12 Separation of species by thin-layer chromatography
Year 13 Summer Term	Revision, consolidation and examination preparation.	

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Assessment

AS

Your AS grade in this subject will come from two examinations taken at the end of year 12. You may or may not be entered for AS certification. Discuss this further with your teacher.

Assessments

Paper 1	+	Paper 2
What's assessed • 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** • 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 • written exam: 1 hour 30 minutes • 80 marks • 50% of the AS		**How it's assessed** • written exam: 1 hour 30 minutes • 80 marks • 50% of the AS
Questions 65 marks of short and long answer questions 15 marks of multiple choice questions		**Questions** 65 marks of short and long answer questions 15 marks of multiple choice questions

A-level

Your final A-level grade in this subject will come from three examinations taken at the end of Year 13.

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Assessments

Paper 1	Paper 2	Paper 3
What's assessed • 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** • 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** • Any content • Any practical skills
How it's assessed • written exam: 2 hours • 105 marks • 35% of A-level	**How it's assessed** • written exam: 2 hours • 105 marks • 35% of A-level	**How it's assessed** • 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

Assessment objectives

AO1	Demonstrate knowledge and understanding of scientific ideas, processes, techniques and procedures.	*AO1 is assessed in all exams*
AO2	Apply knowledge and understanding of scientific ideas, processes, techniques and procedures: • in a theoretical context • in a practical context • when handling qualitative data • when handling quantitative data.	*AO2 is assessed in all exams*
AO3	Analyse, interpret and evaluate scientific information, ideas and evidence, including in relation to issues, to: • make judgements and reach conclusions • develop and refine practical design and procedures.	*AO3 is assessed in all exams*

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Weighting of assessment objectives for AS Chemistry

Assessment objectives (AOs)	Component weightings (approx %)		Overall weighting (approx %)
	Paper 1	Paper 2	
AO1	35	35	35
AO2	43	43	43
AO3	22	22	22
Overall weighting of components	50	50	100

20% of the overall assessment of AS Chemistry will contain mathematical skills equivalent to Level 2 or above.

At least 15% of the overall assessment of AS Chemistry will assess knowledge, skills and understanding in relation to practical work.

Throughout the course, you will be assessed in the following ways:

- Weekly examined questions
- Knowledge quizzes
- Online learning assignments
- Ongoing assessment in class, including in discussions and group calculations
- During practical work via the Common Practical Assessment Criteria (CPAC) – see Chemistry practical handbook for further information
- End of unit assessments, which will be a combination of all type of examination question

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Tracking your progress

Note on target grades: these are generated automatically by an organisation called LPUK, based on national averages about what people with similar GCSE grades to you go on to achieve in sixth form ***if they push themselves****. They are* ***not what you will automatically get****, they are* ***not necessarily what you will be predicted on your UCAS or any other applications*** *and they are absolutely* ***not the maximum you can achieve****. What you achieve in sixth form will depend on* ***how much work you put in****. Your target grade is intended to be something for you to work towards: for you to try to do as good as or better than.*

Your LPUK target grade:

Date	Assessment title	Mark/grade	Focus for improvement
Y 12 Term 1	Physical Chemistry 1		
Y 12 Term 1	Organic Chemistry 1		
Y 12 Term 2	Physical Chemistry 2		
Y 12 Term 2	Organic Chemistry 2		
Y 12 Term 2	Inorganic Chemistry 1		
Y 12 Term 3	AS Examination		
Y 13 Term 1	Inorganic Chemistry 1		
Y 13 Term 1	Organic Chemistry 1		
Y 13 Term 1	Physical Chemistry 1		
Y 13 Term 2	Inorganic Chemistry 2		
Y 13 Term 2	Organic Chemistry 2		
Y 13 Term 2	Physical Chemistry 2		
Y 13	A-level mock examination		
	A-level mock examination		
	A-level mock examination		

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Useful resources and taking your work further

With Sixth Form studies, there is no such thing as "finished all your work".

Below details resources which may be useful to you during your studies:

AQA Website

The AQA website is a great place to start. The Chemistry webpages are aimed at teachers, but you may find them useful too (https://www.aqa.org.uk/subjects/science/as-and-a-level/chemistry-7404-7405). Information includes:

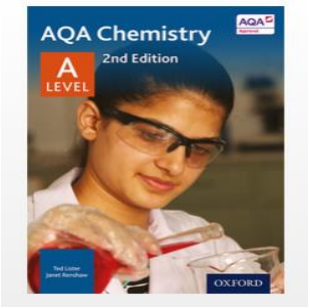
- The specification – this explains exactly what you need to learn for your exams (https://filestore.aqa.org.uk/resources/chemistry/specifications/AQA-7404-7405-SP-2015.PDF).
- Practice exam papers (https://www.aqa.org.uk/subjects/science/as-and-a-level/chemistry-7404-7405/assessment-resources
- Lists of command words and subject specific vocabulary – so you understand the words to use in exams (https://www.aqa.org.uk/resources/science/as-and-a-level/teach/subject-specific-vocabulary)
- Practical handbooks explain the practical work you need to know (https://filestore.aqa.org.uk/resources/chemistry/AQA-7404-7405-PHBK.PDF)
- Past papers from the old specification. Some questions won't be relevant to the new AS and A-level, so please check with your teacher.
- Maths skills support (https://www.aqa.org.uk/resources/science/as-and-a-level/teach/maths-skills-briefings)

Royal Society of Chemistry

RSoC connect scientists with each other and society as a whole, so they can do their best work and make discoveries and innovation happen. You will be able to find very useful links to educational resources, career guidance, university learning and student magazine (https://www.rsc.org/)

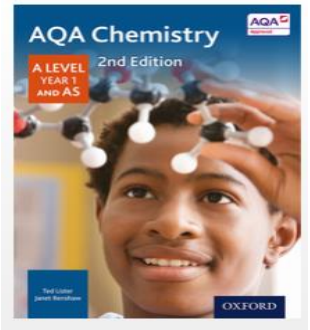
Textbooks & workbooks

AQA approved textbooks are published by Collins, Hodder and Oxford University Press. I recommend the following textbook for AS and year 1 of A-level:



Authors: Ted Lister, Janet Renshaw
Publisher: Oxford University Press (including Nelson Thornes)

Available free of charge through Kerboodle



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Available free of charge through Kerboodle

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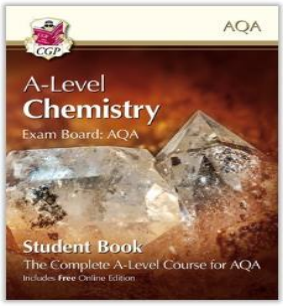
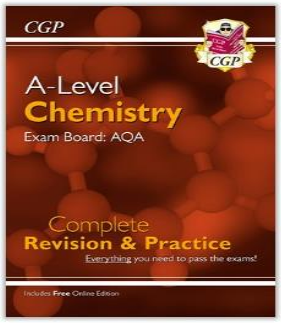
These are great if you want a quick overview of the course when you're revising for your exams. Remember to use other tools as well, as these aren't detailed enough on their own.



A-Level Chemistry student book for Year 1 and 2 by CGP

Retail price: £38:00

School price £18.00



A-Level Chemistry revision guide for Year 1 and 2 by CGP

Retail price: £19:99

School price £10.00

YouTube

YouTube has thousands of Chemistry videos. Just be careful to look at who produced the video and why because some videos distort the facts. Check the author, date and comments – these help indicate whether the clip is reliable. If in doubt, ask me.

Useful websites

Chemrevise

This website contains revision sheets, revision guides and lots of practice questions.

https://chemrevise.org/

Chemguide

Useful website for more detailed explanations. Easy to read and understand.

https://www.chemguide.co.uk/

Knockhardy

This website contains a lot of useful information in presentations and one page notes

http://www.knockhardy.org.uk/sci.htm

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Data Sheet

You will be given data sheet with your examination paper. It will be very useful if you use this booklet on a regular basis to become familiar with its contents and layout.

The Periodic Table of the Elements

1	2											3	4	5	6	7	0
							1.0 H hydrogen 1										4.0 He helium 2
(1)	(2)		Key: relative atomic mass, symbol, name, atomic (proton) number									(13)	(14)	(15)	(16)	(17)	(18)
6.9 Li lithium 3	9.0 Be beryllium 4											10.8 B boron 5	12.0 C carbon 6	14.0 N nitrogen 7	16.0 O oxygen 8	19.0 F fluorine 9	20.2 Ne neon 10
23.0 Na sodium 11	24.3 Mg magnesium 12	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	27.0 Al aluminium 13	28.1 Si silicon 14	31.0 P phosphorus 15	32.1 S sulfur 16	35.5 Cl chlorine 17	39.9 Ar argon 18
39.1 K potassium 19	40.1 Ca calcium 20	45.0 Sc scandium 21	47.9 Ti titanium 22	50.9 V vanadium 23	52.0 Cr chromium 24	54.9 Mn manganese 25	55.8 Fe iron 26	58.9 Co cobalt 27	58.7 Ni nickel 28	63.5 Cu copper 29	65.4 Zn zinc 30	69.7 Ga gallium 31	72.6 Ge germanium 32	74.9 As arsenic 33	79.0 Se selenium 34	79.9 Br bromine 35	83.8 Kr krypton 36
85.5 Rb rubidium 37	87.6 Sr strontium 38	88.9 Y yttrium 39	91.2 Zr zirconium 40	92.9 Nb niobium 41	96.0 Mo molybdenum 42	[97] Tc technetium 43	101.1 Ru ruthenium 44	102.9 Rh rhodium 45	106.4 Pd palladium 46	107.9 Ag silver 47	112.4 Cd cadmium 48	114.8 In indium 49	118.7 Sn tin 50	121.8 Sb antimony 51	127.6 Te tellurium 52	126.9 I iodine 53	131.3 Xe xenon 54
132.9 Cs caesium 55	137.3 Ba barium 56	138.9 La * lanthanum 57	178.5 Hf hafnium 72	180.9 Ta tantalum 73	183.8 W tungsten 74	186.2 Re rhenium 75	190.2 Os osmium 76	192.2 Ir iridium 77	195.1 Pt platinum 78	197.0 Au gold 79	200.6 Hg mercury 80	[286] Nh nihonium 113	[289] Fl flerovium 114	[289] Mc moscovium 115	[293] Lv livermorium 116	[294] Ts tennessine 117	[294] Og oganesson 118
[223] Fr francium 87	[226] Ra radium 88	[227] Ac † actinium 89	[267] Rf rutherfordium 104	[270] Db dubnium 105	[269] Sg seaborgium 106	[270] Bh bohrium 107	[270] Hs hassium 108	[278] Mt meitnerium 109	[281] Ds darmstadtium 110	[281] Rg roentgenium 111	[285] Cn copernicium 112	[286] Nh nihonium 113	[289] Fl flerovium 114	[289] Mc moscovium 115	[293] Lv livermorium 116	[294] Ts tennessine 117	[294] Og oganesson 118

140.1 Ce cerium 58	140.9 Pr praseodymium 59	144.2 Nd neodymium 60	[145] Pm promethium 61	150.4 Sm samarium 62	152.0 Eu europium 63	157.3 Gd gadolinium 64	158.9 Tb terbium 65	162.5 Dy dysprosium 66	164.9 Ho holmium 67	167.3 Er erbium 68	168.9 Tm thulium 69	173.0 Yb ytterbium 70	175.0 Lu lutetium 71
232.0 Th thorium 90	231.0 Pa protactinium 91	238.0 U uranium 92	[237] Np neptunium 93	[244] Pu plutonium 94	[243] Am americium 95	[247] Cm curium 96	[247] Bk berkelium 97	[251] Cf californium 98	[252] Es einsteinium 99	[257] Fm fermium 100	[258] Md mendelevium 101	[259] No nobelium 102	[262] Lr lawrencium 103

* **58 – 71** Lanthanides

† **90 – 103** Actinides

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Data Sheet

Table A
Infrared absorption data

Bond	Wavenumber /cm^{-1}
N—H (amines)	3300 – 3500
O—H (alcohols)	3230 – 3550
C—H	2850 – 3300
O—H (acids)	2500 – 3000
C≡N	2220 – 2260
C=O	1680 – 1750
C=C	1620 – 1680
C—O	1000 – 1300
C—C	750 – 1100

Table B
^{1}H NMR chemical shift data

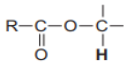
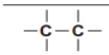
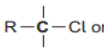
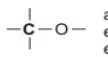
Type of proton	δ/ppm
ROH	0.5 – 5.0
RCH$_3$	0.7 – 1.2
RNH$_2$	1.0 – 4.5
R$_2$CH$_2$	1.2 – 1.4
R$_3$CH	1.4 – 1.6
	2.1 – 2.6
	3.1 – 3.9
RCH$_2$Cl or Br	3.1 – 4.2
	3.7 – 4.1
	4.5 – 6.0
	9.0 – 10.0
	10.0 – 12.0

Table C
^{13}C NMR chemical shift data

Type of carbon	δ/ppm
	5 – 40
	10 – 70
	20 – 50
	25 – 60
 alcohols, ethers or esters	50 – 90
	90 – 150
	110 – 125
	110 – 160
 esters or acids	160 – 185
 aldehydes or ketones	190 – 220

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