

Why A Level Chemistry?

Sixth Form Open Evening 2022



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Because you enjoy it

- Chemistry A level is designed to follow on from GCSE Chemistry.
- There is a greater emphasis on formulas, equations and chemical calculations
- Re-visit familiar topics like Rates of Reaction and Bonding and Structure



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For the future

- A good (and often required) choice for students considering careers in the health and clinical professions, including medicine, veterinary science, nursing, dentistry and forensic science.
- Prepares students for numerous other careers as it develops a number of desirable skills, (allowing you to keep your options open!)
- Follow the QR code above for further information on the careers that Chemistry can lead to.



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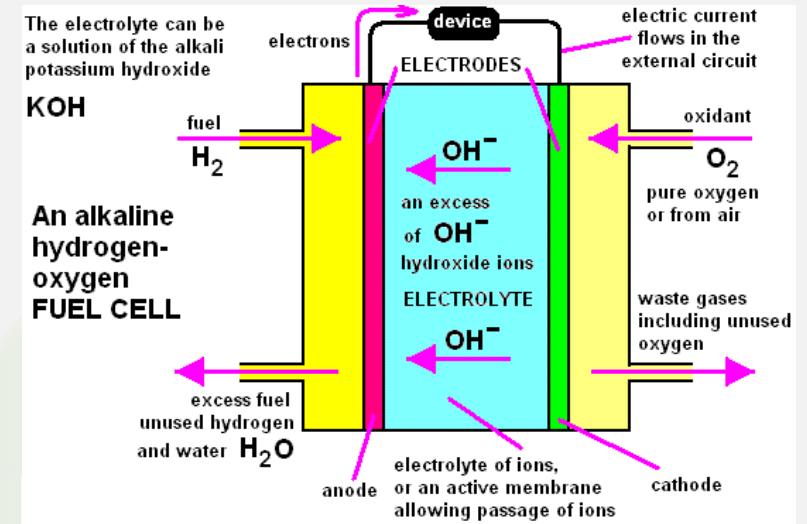


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For the challenge

- A-level Chemistry is designed to be rigorous, while maintaining fair and balanced question papers. This includes testing synoptic understanding, knowledge of How Science Works and providing stretch and challenge.
- The problem-solving skills developed will be applicable to **many career pathways** in or outside science



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Because it fits

- Chemistry fits well with other Science A levels and most boys take Chemistry in combination with at least one of Biology, Physics and Mathematics.
- There is some overlap in content with Biology A level and also with Physics .



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For the practical

- Students are required to complete a number of standard practical experiments (at least 6 per year) along with many other practicals that we also carry out.
- The required practicals are assessed during the written exam papers.
- Typically 15% of lessons would be related to practical tasks and double lessons are assigned.



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For the teaching

- We are fortunate to possess a very experienced and settled staff.
- All A level teachers have in excess of 16 years experience teaching AQA Chemistry at A level.
- You will be taught by 2 teachers from Dr Berry, Mr Elwell or Mr Gwyer



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For the grades

- Consistently among the best in the college.
- Over the 9 years prior to the Pandemic the average A* to B pass rate was 80%.
- In the most recent exam year (2022) the average was 82% - An increase despite the national figure decreasing.



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Think its for you?

- You will need at least a **grade 7 in GCSE Chemistry** or 7,7 in Combined Science
- The high level of numeracy required suggests that you will also have a **grade 7 in GCSE Mathematics.**
- Be prepared to work hard.



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Group Sizes

- Currently around 50 boys in 3 groups in both year 12 and 13.



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Course Structure

- A Level
 - Paper 1 Physical and Inorganic Chemistry (105 marks) 2 hours
 - Paper 2 Physical and Organic Chemistry(105 marks) 2 hours
 - Paper 3 Any content (90 marks) 2 hours
 - 12 compulsory practicals to be assessed in the written papers
- ALL EXAMS IN SUMMER SESSION

ALKANES

GENERAL FORMULA
The general formula of alkanes is C_nH_{2n+2}

FRACTIONAL DISTILLATION
Petroleum is used as a fuel for cars. It is obtained from crude oil, which is a mixture containing mostly alkanes, ranging in length from one carbon (methane) to over 300 carbons.

HYDROCARBONS
Alkanes are hydrocarbons, because they are made up of only carbon and hydrogen atoms.

SATURATED
Alkanes are saturated because their carbon-carbon bonds are all single bonds (unlike alkenes, which also have C=C bonds).

As these alkanes have different boiling points, they can be separated using fractional distillation.

- Crude oil enters the bottom of the fractional distillation column and boils.
- Higher in the column, the temperature is lower.
- Alkanes of different lengths condense at different points in the column, depending on their boiling points.
- Shorter alkanes have lower boiling points and condense higher in the column.
- Several fractions are obtained, which are mixtures of alkanes with chains of a similar length.
- Fractional distillation may be repeated to separate these further.

Petroleum contains alkanes between 5 and 30 carbons in length.

CRACKING
Cracking is the process of breaking alkanes into shorter-chain alkanes and alkenes. Carbon-carbon bonds are broken in the process.

ECONOMIC REASONS FOR CRACKING

- There is less demand for long alkanes.
- Shorter alkanes are useful for fuels, which are in high demand and, therefore, more profitable.
- The alkanes can be used to synthesise other molecules such as:
 - monomers for plastics
 - new pharmaceuticals

	Thermal	Catalytic
Conditions	<ul style="list-style-type: none"> High temperature High pressure No catalyst 	<ul style="list-style-type: none"> High temperature Slight pressure ZnO catalyst
Products	High percentage of alkanes	High percentage of aromatic hydrocarbons (used as petrol fuels)

COMBUSTION
Alkanes are often used as fuels, and so combustion is an important reaction of alkanes.

COMPLETE COMBUSTION
The complete combustion of alkanes forms CO_2 and H_2O only.

$$C_nH_{2n+2} + 3nO_2 \rightarrow nCO_2 + (n+1)H_2O$$

INTERNAL COMBUSTION ENGINE
SULFUR DIOXIDE
Fuels containing sulfur form SO_2 when burned. This reacts with water vapor to form acid rain.

$$CH_4 + 2SO_2 \rightarrow CO + 2H_2O$$

Carbon monoxide, CO , or carbon, C , are produced instead of CO_2 . Carbon monoxide is an odourless, tasteless and invisible gas which is highly toxic. It is very dangerous and hard to detect.

INTERNAL COMBUSTION ENGINE
Sulfur dioxide is removed from factory chimneys by being the chimney with a base to neutralise acidic SO_2 . For example:

$$CaO + SO_2 \rightarrow CaSO_3$$

$$CaCO_3 + SO_2 \rightarrow CaSO_3 + CO_2$$

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CHLORINATION OF ALKANES
Alkanes react with halogen radicals to form haloalkanes.

Chlorine radicals are produced by UV light via homolytic fission:

$$Cl_2 \rightarrow Cl\cdot + Cl\cdot$$

$$C_2H_6 + Cl\cdot \rightarrow C_2H_5\cdot + HCl$$

$$C_2H_5\cdot + Cl_2 \rightarrow C_2H_5Cl + Cl\cdot$$

These two steps are a cycle which produces the product HCl and C_2H_5Cl , and regenerates $Cl\cdot$. $Cl\cdot$ causes thousands of times over in a chain reaction.

M
Termination steps form a non radical from two radicals.

$$Cl\cdot + C_2H_5\cdot \rightarrow C_2H_5Cl$$

$$C_2H_5\cdot + C_2H_5\cdot \rightarrow C_4H_{10}$$

$$Cl\cdot + Cl\cdot \rightarrow Cl_2$$

The C_2H_5Cl can then react further with another $Cl\cdot$ generated $C_2H_4Cl_2$, and then further substituted products. The substitution can also occur at any point on the chain.

Because many different products can be formed, radical substitution is not a very useful reaction for synthesising a pure compound.

DEFINITION
When alkane fuels are burned, pollutants are formed, including:

- nitrogen oxides (NO_x) - cause respiratory problems
- carbon monoxide (CO) - poisonous
- carbonic forms acid
- unsaturated hydrocarbons - cause respiratory problems

To minimise the effects of pollutants from internal combustion engines, they are reacted in a catalytic converter. For example:




$$2CO + 2NO \rightarrow 2CO_2 + N_2$$


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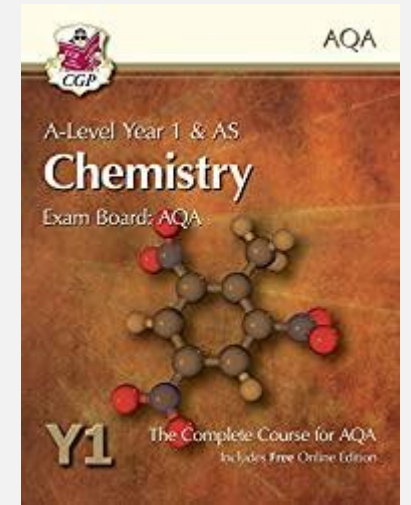
A-level assessment in more detail

Paper 1: Inorganic and Physical chemistry	Paper 2: Organic and Physical chemistry	Paper 3: Practical skills, data handling and synopsis
<p>Content</p> <ul style="list-style-type: none">• Inorganic chemistry• Relevant practical skills• Relevant physical chemistry topics eg:<ul style="list-style-type: none">– Atomic structure– Amount of substance– Bonding– Energetics– Equilibria– Acids and bases– Redox	<p>Content</p> <ul style="list-style-type: none">• Organic chemistry• Relevant practical skills• Relevant physical chemistry topics eg:<ul style="list-style-type: none">– Amount of substance– Bonding– Energetics– Equilibria– Kinetics	<p>Content</p> <ul style="list-style-type: none">• All content• All practical skills
<p>Questions</p> <ul style="list-style-type: none">• 105 marks, with a mixture of short and long answer questions 	<p>Questions</p> <ul style="list-style-type: none">• 105 marks, with a mixture of short and long answer questions <p>St Ambrose College</p> 	<p>Questions</p> <ul style="list-style-type: none">• 40 marks of questions on practical techniques and data analysis• 20 marks of questions testing across the specification• 30 marks of multiple choice questions 

Support

- Self-completion notes and past exam questions on shared area
- AQA specific textbook
- Regular assessment using past paper questions
- Individual intervention packs for students struggling to meet target grades
- After-school help sessions
- Drop in clinic available on Monday lunchtime
- Individual support as and when needed – just ask

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