DURHAM JOHNSTON
COMPREHENSIVE SCHOOL
DARE TO BE WISE

Chemistry Department

An Introduction to A-Level Chemistry

Dear Students,

Congratulations on choosing to study A-Level Chemistry at Durham Johnston. We study OCR Chemistry A, which takes a content led approach to the material. The specification is divided into topics, each covering different key concepts of chemistry. Teaching of practical skills is integrated into the theoretical topics and they are assessed throughout the course, both in written examinations and, for A-Level, the practical endorsement. While post-16 chemistry is challenging, it's also one of the most rewarding subjects for students who enjoy thinking deeply, solving problems and understanding the world at a molecular level. It provides students with a broad skill set which helps prepare them for many careers and not just for the laboratory.

In this booklet you will find a link to the course information, some tips and tricks for managing your time and workload in september, resources to help you improve your knowledge, both in and around the curriculum and the tasks we expect you to complete over the summer holidays. These tasks have been chosen to help you begin to use your existing chemistry knowledge like an A Level student.

Course Information:

OCR Website AS and A Level - Chemistry A - H032, H432. Here you will find the specifications for both AS and A Level Chemistry, as well as information on the Mathematical and Practical skills you will develop over the course.

<table>
<tr><th>Content Overview</th><th colspan="2">Assessment Overview</th></tr>
<tr><td rowspan="4">Content is split into six teaching modules:
• Module 1 – Development of practical skills in chemistry
• Module 2 – Foundations in chemistry
• Module 3 – Periodic table and energy
• Module 4 – Core organic chemistry
• Module 5 – Physical chemistry and transition elements
• Module 6 – Organic chemistry and analysis
Component 01 assesses content from modules 1, 2, 3 and 5.
Component 02 assesses content from modules 1, 2, 4 and 6.
Component 03 assesses content from all modules (1 to 6).</td><td>Periodic table, elements and physical chemistry (01)
100 marks
2 hours 15 minutes written paper</td><td>37%
of total A level</td></tr>
<tr><td>Synthesis and analytical techniques (02)
100 marks
2 hours 15 minutes written paper</td><td>37%
of total A level</td></tr>
<tr><td>Unified chemistry (03)
70 marks
1 hour 30 minutes written paper</td><td>26%
of total A level</td></tr>
<tr><td>Practical Endorsement in chemistry (04)
(non exam assessment)</td><td>Reported separately
(see Section 5)</td></tr>
</table>

Managing your time

Studying A-level chemistry should form part of a full time program of study. You are in school for 25 hours of lesson time, if you take 4 AS levels you will have 5 hours free time, if you have 3 then you will have 10 hours of free.

That time should be used productively. You should spend some time organising your week into focused sessions which have a particular purpose. **In a normal week** we would expect you to do the following for chemistry:

1. Attend 5 hours of lessons – ASK FOR HELP IF YOU DON'T UNDERSTAND.
2. Spend 5 hours studying chemistry outside of the classroom. This is broken down below:
3. Consolidate your notes from lessons. Spend some time looking over the work from class. Make sure you understand it, highlight areas you think are most important, be certain you understand the content. Work out which key information needs to be memorised. Then Memorise it! Write out your notes in a more concise fashion if you think this helps, don't if you don't.

   ASK FOR HELP IF YOU DON'T UNDERSTAND

4. Look at the textbook pages for the lessons you have completed this week, and look at the pages for the lessons you will be completing the next week (we always complete the topic in order). If you have a question ask for help.
5. Complete your homework – *if you get stuck, ask for help – don't just not complete it!*
6. Do some practice – use the resources you have to find some exam questions on this topic – complete them purposefully (more on this later).
7. Keep your file organised – separate each topic with its own subheadings – in order with the topic checklist at the front use dividers and even separate notes from exam questions/homeworks for easy reference.
8. If you have time left over – read around the subject. Try to gain an in depth knowledge of the topic.

How to ask for help

There are six experienced and well qualified teachers of chemistry in our department, all of which would like to help you with your studies. Of course, you will naturally feel more comfortable speaking directly to your class teacher, and if you get stuck you should do so, preferably during the lesson. BUT if you get stuck on homework, or during your consolidation, you are welcome to ask any member of the department. We are here to help, please do not hesitate to approach any one of us.

If you have specific questions, write them down so that you don't forget them.

Those people who ask for help are MUCH more likely to succeed than those who do not. This CANNOT be underestimated.

We run chemistry drop in sessions for A-level after school on Tuesday and Thursday.

If you would like some specific help with your work, please see your class teacher during a lesson, or send a message via TEAMS or email to arrange a convenient time. We are happy to do this!

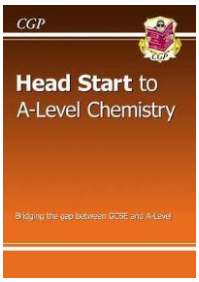
Useful Resources:

Khan Academy Khan Academy | Free Online Courses, Lessons & Practice . This is an excellent resource for improving your knowledge, finding practice questions or additional explanations

ChemGuide chemguide: helping you to understand Chemistry - Main Menu. A website written by a highly experienced A-Level chemistry teacher with clear explanations of most concepts.

Knockhardy sci. Another website with sets of notes and practice questions, divided into topics by syllabus.

MaChem Guy. MaChem Guy's videos are rightly lauded by A Level Chemistry teachers and students alike as an invaluable remote learning resource. He's put together a playlist of videos to act as preparation for A Level Chemistry, as well as an index of the videos mapped to the Chemistry A course. These start from the basics, then move on to examining topics which build on GCSE knowledge.



Head Start to A-Level Chemistry. This is an excellent primer which will help you improve and refine your skills from GCSE ready for A-Level.

These resources should help students who feel they have gaps in their knowledge and understanding make a confident start to this years A Level course.

Further Reading:

FutureLearn Exploring Everyday Chemistry - Online Course - FutureLearn. This MOOC will show you how your knowledge of Chemistry can be applied to concepts including medicine, sport and perfume. Working through MOOCs like this one are excellent for developing your independent study skills, furthering your knowledge and understanding beyond the exam syllabus and helping you to develop interests in possible degree and employment pathways.

New Scientist. This website, and journal of the same name gives information on current research areas across many scientific disciplines. Again, keeping an eye on developments in research will help you deepen your understanding of the material, give you interesting insights into the course material and pique your interest in future education or employment.

Periodic Tales: The Curious Lives of the Elements (Hugh Aldersley-Williams)

This book covers the chemical elements, where they come from and how they are used. There are lots of fascinating insights into uses for chemicals you have never even thought about.

The Science of Everyday Life: Why Teapots Dribble, Toast Burns and Light Bulbs Marty Jopson

Title says it all really, lots of interesting information about the things around your home

Bad Science Ben Goldacre

Here Ben Goldacre takes apart anyone who published bad/misleading or dodgy science. This book will make you think about everything the advertising industry tries to sell you by making it sound "sciency".

Fundamental Information to Memorise

You will need to know the formulae of common ions, with their charges. Please memorise this over the summer in preparation for september.

Cations (Positive Ions)				Anions (Negative Ions)			
Group 1 elements	+1	e.g.	Na^+ K^+	Group 7 elements	-1	e.g.	Cl^- Br^-
Group 2 elements	+2	e.g.	Mg^{2+} Ba^{2+}	Group 6 elements	-2	e.g.	O^{2-} S^{2-}
Group 3 elements	+3	e.g.	Al^{3+}	Group 5 elements	-3	e.g.	N^{3-}
Ammonium	NH_4^+			Nitrate	NO_3^-	Dichromate	$Cr_2O_7^{2-}$
Zinc	Zn^{2+}	Manganese(II)	Mn^{2+}	Carbonate	CO_3^{2-}	Manganate(VII)	MnO_4^-
Silver	Ag^+	Chromium(III)	Cr^{3+}	Hydrogen carbonate	HCO_3^-	Thiosulfate	$S_2O_3^{2-}$
Iron(II)	Fe^{2+}	Chromium(VI)	Cr^{6+}	Sulfate	SO_4^{2-}	Cyanide	CN^-
Iron(III)	Fe^{3+}	Hydrogen ion	H^+	Hydroxide	OH^-	Carboxylate	$RCOO^-$
Copper(I)	Cu^+			Chlorate (I)	ClO^-	Bromate (I)	BrO^-
Copper(II)	Cu^{2+}			Chlorate (V)	ClO_4^-	Bromate (V)	BrO_4^-

In addition, you will need to know the names and formulae of the common acids and bases:

Hydrochloric Acid – HCl

Nitric Acid – HNO_3

Sulfuric Acid – H_2SO_4

Phosphoric Acid – H_3PO_4

Sodium Hydroxide – NaOH

Calcium Hydroxide – $Ca(OH)_2$

Calcium Carbonate – $CaCO_3$

Three Summer Tasks

Task 1

Read through each of the ten statements below. With a partner or in a small group, discuss whether you think each statement is true or false and make a note of your answers.

1. The total number and type of atoms present are the same at the start and end of a reaction.

2. The amount of substance, measured in moles, is the same at the start and end of a reaction.

3. The total mass of reactants is equal to the total mass of products for any reaction.

4. The total volume of gas is the same at the start and the end of a reaction.

5. The amount in moles is proportional to the number of particles for that substance.

6. One mole of methane molecules (CH_4) contains 1/5 mole of carbon atoms and 4/5 mole of hydrogen atoms.

7. One mole of methane molecules (CH_4) contains 1 mole of carbon atoms and 4 moles of hydrogen atoms.

8. 100 cm^3 of methane gas contains the same number of molecules as 100 cm^3 hydrogen gas at room temperature and pressure.

9. 100 cm^3 of methane gas at room temperature and pressure has the same mass as 100 cm^3 of hydrogen gas under the same conditions.

10. If 0.1 mol of magnesium atoms reacts with a solution containing 0.1 mol of hydrochloric acid, 0.1 mol of hydrogen molecules will be produced. (Hint – you may need to look up or work out the balanced equation for this reaction.)

Task 2

Now for the difficult bit! For each of the statements you will need to justify your true/false answer with an explanation or example. If you have decided that a statement is true, try to give an explanation using the chemical concepts and definitions you know. If you have decided that a statement is false, you could find an example of a chemical process, reaction or balanced equation where it is not the case. You are free to look up information using whatever resources you have available to assist you with your explanations.

Task 3

Use your online searching abilities to find out as much about one of the topics below as you can. Remember you are a prospective A level chemist, you should aim to push your knowledge. You can make a 1-page summary sheet/ poster for the one you research:

Option 1: The chemistry of fireworks

What are the component parts of fireworks? What chemical compounds cause fireworks to explode? What chemical compounds are responsible for the colour of fireworks?

Option 2: Why is copper sulfate blue?

Copper compounds like many of the transition metal compounds have got vivid and distinctive colours – but why?

Option 3: Aspirin

What was the history of the discovery of aspirin, how do we manufacture aspirin in a modern chemical process?

Option 4: The hole in the ozone layer

Why did we get a hole in the ozone layer? What chemicals were responsible for it? Why were we producing so many of these chemicals? What is the chemistry behind the ozone destruction?

Option 5: ITO and the future of touch screen devices

ITO – indium tin oxide is the main component of touch screen in phones and tablets. The element indium is a rare element and we are rapidly running out of it. Chemists are desperately trying to find a more readily available replacement for it. What advances have chemists made in finding a replacement for it?