



Sturminster Newton High School Sixth Form

Chemistry Transition Project

Board: OCR
Type: GCE A Level
School: Sturminster Newton High School
Contact: Dr King

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This pack contains a programme of activities and resources to prepare you to start your OCR H432 Chemistry A level in September. It is aimed to help ensure that you have all the background knowledge that you need for a smooth transition into A level study.

The website for your course is:

<http://www.ocr.org.uk/qualifications/as-a-level-gce/as-a-level-gce-chemistry-a-h032-h432-from-2015/>

From here you can download the specification which tells you everything you need to know about the course.

Please complete the transition activities in time for your first lesson in September.

'A successful student is one who is aware of their strengths, knows how to work on their weaknesses and takes advantage of the many opportunities available at Post-16 level.'

Introduction

This pack contains a programme of activities and resources to prepare you to start your A levels in September. It is aimed to be used for remainder of the Summer term and over the Summer holidays to ensure you are ready to start your course in September.

Induction pack contents

1. Textbooks and Information resources
 - Textbooks and possible reading list
 - Interesting websites
 - Internet and social media lists
2. Research activities (TO BE SUBMITTED IN SEPTEMBER)
3. Confirming the basics – skills and knowledge activities (TO BE SUBMITTED IN SEPTEMBER)
4. Note taking and Folders
5. Command words



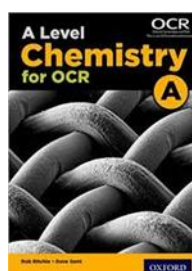
1. Textbooks and information resources

Reading lists

At AS, A level and beyond, it is expected that you can demonstrate to the examiners that you have been partaking in wider reading. Within your first couple of weeks of the course, you will be provided with a copy of the course textbook (pictured below), that you will use for the 2 years of the course (you do not need to buy this book!).

OCR A - A Level Chemistry A for OCR Student Book (Year 1 & 2 - complete course) (Oxford University Press)

<http://bit.ly/2MHcrm0>



Below is a list of text books, general reading and websites you may also wish use over the next two years and beyond in university. They are all optional, although I highly recommend the first book (Head start to A level) as a precursor to the course.

Head start to A level Chemistry (CGP)

<http://bit.ly/2KfhrMG>

OCR A – A-Level Chemistry Revision & Practice Book (CGP)

<http://bit.ly/2wQc0uS>

General Reading

- Periodic Tales: The Curious Lives of the Elements (Paperback) Hugh Aldersey-Williams ISBN-10: 0141041455

- The Science of Everyday Life: Why Teapots Dribble, Toast Burns and Light Bulbs Shine (Hardback) Marty Jopson ISBN-10: 1782434186
- Bad Science (Paperback) Ben Goldacre ISBN-10: 000728487X
- The Disappearing Spoon...and other true tales from the Periodic Table (Paperback) Sam Kean ISBN-10: 0552777501

Interesting websites

Periodic Table of Videos (Martyn Poliakoff) -

<https://www.youtube.com/user/periodicvideos/videos>

Compound interest – Everyday chemistry infographics - <https://www.compoundchem.com/>

Internet and social media lists

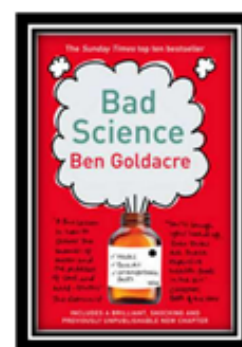
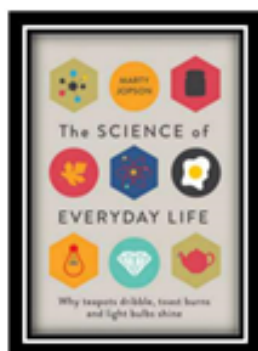
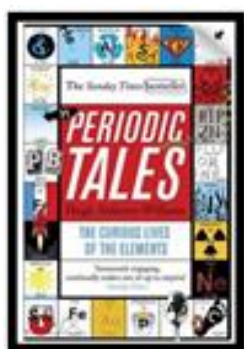
<http://www.docbrown.info/page13/page13.htm> - Chemistry notes and quizzes

<http://www.chemguide.co.uk/> - An Online textbook

<https://learnah.org/samplemenu> - Chemistry Notes and Videos

<https://www.physicsandmathstutor.com/chemistry-revision/> - Chemistry exam questions

<https://www.facebook.com/ChemistryWorld/> - Chemical sciences journal



2. Research Activities

Research, reading and note making are essential skills for studying any A level. For the following links, read the articles and look up any key words which you are unfamiliar with, then write a short summary of the key ideas from each article (MAX 100 words for each article).

Activity 1: From orange peel to chewing gum

Available at:

<http://bit.ly/2wQD1hS>

Compounds with the same formula but different smells. How does this arise and where may you have come across them. A brief look at Isomerism in every day substances.



Activity 2: Fireworks – An explosive business

Available at:

<http://bit.ly/2I9piZK>

Fireworks have been known for many hundreds of years. What gives them their particular colour or effect? How are they made and how are they set off?



Activity 3: Investigating Poisoning

Available at:

<http://bit.ly/2R7nALq>

Investigating serious crimes such as murder, rape and terrorism requires forensic science experts. These people work alongside the police to find the evidence that will bring the culprit to court. An interesting article on the role chemistry has to play on detecting poisons.



3. Confirming the basics – get off to a flying start!

Chemical equations

Balancing chemical equations is the stepping stone to using equations to calculate masses in chemistry.

There are loads of websites that give ways of balancing equations and lots of exercises in balancing.

Some of the equations to balance may involve strange chemicals.

Don't worry about that, the key idea is to get balancing right.

- **Watch this GCSE video to remind yourself about balancing equations**

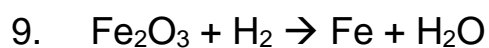
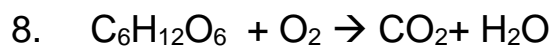
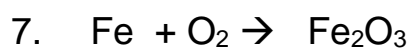
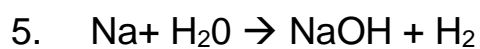
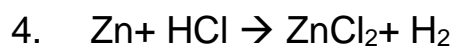
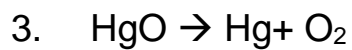
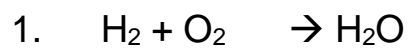
<https://www.youtube.com/watch?v=uxMw3Rual5c>

- **This website has a download; it is safe to do download it and well worth it:**

<https://phet.colorado.edu/en/simulation/balancing-chemical-equations>

Now test that you understand:

Task 1 Balance the following equations:



Naming common ions and compounds

Task 2

- What are the names of these ions:
 - OH^-
 - H^+
 - SO_4^{2-}
 - NO_3^-
 - Cl^-
 - CO_3^{2-}
 - NH_4^+
- For covalent compounds we show how many atoms are present using the suffix mono- for 1, di for 2 and tri for 3, e.g. carbon monoxide (CO) and Carbon dioxide (CO₂). Write the names of the following compound:
 - SO_2
 - SO_3
 - PCl_3
 - PCl_5
 - CCl_4
- For each of the following ionic formulae write the full chemical name and for transition metals show the oxidation state, e.g. $\text{Cu}(\text{OH})_2$ would be copper (II) hydroxide.
 - MgCl_2
 - Na_2O
 - PbCl_2
 - PbCl_4
 - CuO
 - Cu_2O

Oxidation and reduction

At GCSE you know that oxidation is adding oxygen to an atom or molecule and that reduction is removing oxygen, or that oxidation is removing hydrogen and reduction is adding hydrogen. You may have also learned that oxidation is removing electrons and reduction is adding electrons.

Recap half equations on the BBC revision website:

http://www.bbc.co.uk/schools/gcsebitesize/science/add_aqa/electrolysis/electrolysisrev6.shtml

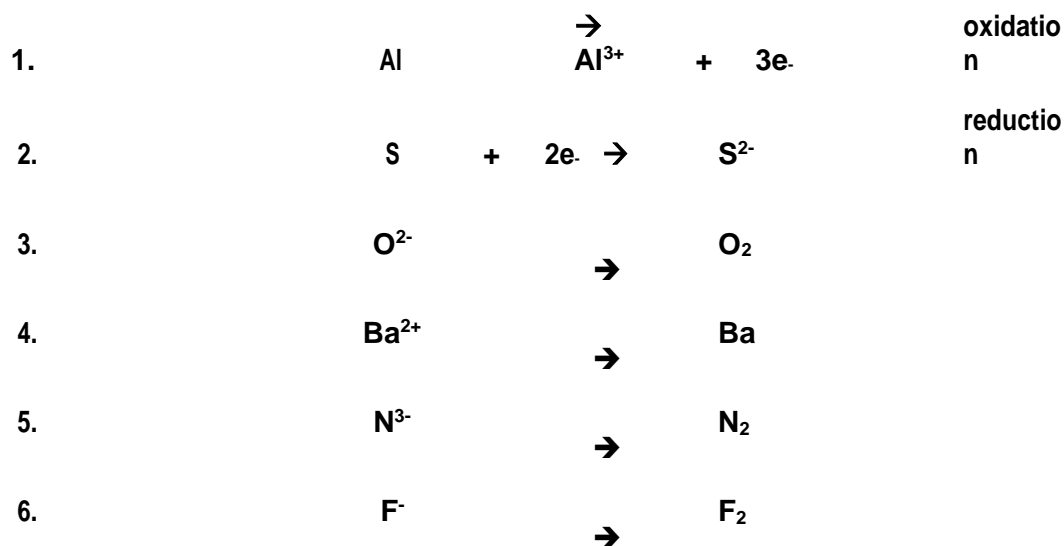
Recap redox reactions by watching this video:

<https://www.youtube.com/watch?v=eZbj29jQCKI>

Task 3: Define each of the following terms

1. Oxidation:
2. Reduction:
3. Oxidising agent:
4. Reducing agent:

Task 4: Complete half reactions for each of the following atoms or ions. Label each reaction as oxidation or reduction. *The first 2 have been done for you.*



Isotopes and mass

Isotopes occur naturally, so in a sample of an element you will have a mixture of these isotopes. We can accurately measure the amount of an isotope using a machine called a mass spectrometer. You will learn about this early on in the course.

An A level periodic table has the masses of elements recorded much more accurately than at GCSE. Most elements have isotopes and these have been recorded using mass spectrometers.

GCSE

11 B boron 5	12 C carbon 6	14 N nitrogen 7	16 O oxygen 8	19 F fluorine 9
27 Al aluminium 13	28 Si silicon 14	31 P phosphorus 15	32 S sulfur 16	35.5 Cl chlorine 17

A level

10.8 B 5 boron	12.0 C 6 carbon	14.0 N 7 nitrogen	16.0 O 8 oxygen	19.0 F 9 fluorine
27.0 Al 13 aluminium	28.1 Si 14 silicon	31.0 P 15 phosphorus	32.1 S 16 sulphur	35.5 Cl 17 chlorine

Given the percentage of each isotope you can calculate the mean mass which is the accurate atomic mass for that element. This is why the A level Periodic Table is more accurate than that given for GCSE. The website below reminds you how to calculate relative atomic mass.

http://www.bbc.co.uk/schools/gcsebitesize/science/add_edexcel/atomic_structure/periodictablerev6.shtml

Task 5:

1. Define the term *isotope*.

2. Now calculate the relative atomic mass of the following elements:

a) Antimony has 2 isotopes: Sb-121 57.25% and Sb-123 42.75%

b) Gallium has 2 isotopes: Ga-69 60.2% and Ga-71 39.8%

c) Silver has 2 isotopes: Ag-107 51.35% and Ag-109 48.65%

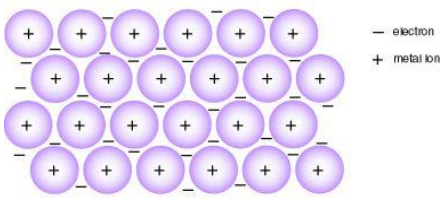
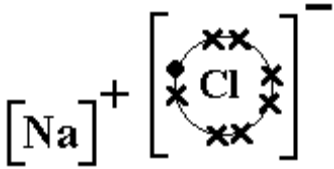

d) Strontium has 4 isotopes: Sr-84 0.56%, Sr-86 9.86%, Sr-87 7.02% and Sr-88 82.56%

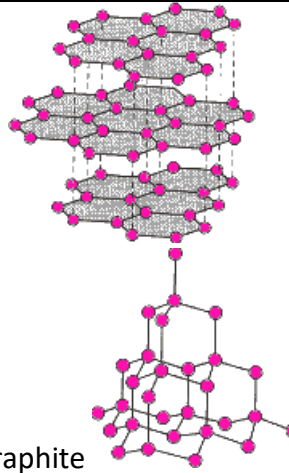
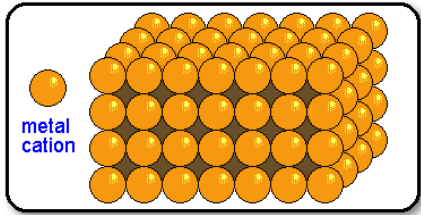
Bonding

<https://www.chemguide.co.uk/atoms/bondingmenu.html>

Task 6:

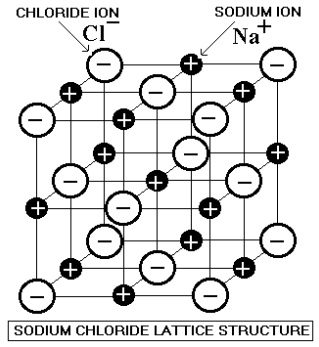
Look at the boxes below and shade those that describe ionic bonding in red, those that describe covalent bonding in blue and those that relate to metallic bonding in yellow.

Ionic Bonds	Covalent Bonds	Metallic Bonds
Form between metal and a non-metal.	Form between metal atoms	Form between two non-metallic elements.
Atoms are joined by electrons being shared.	Positive ions are joined by a delocalised sea of electrons.	Atoms are joined by electrons being donated / received.
		
Bonds within molecules are strong but forces between molecules are weak.	Bonds between cations are strong.	Bonds between oppositely charged ions are strong.
They form lattice structures. These are extremely strong so require large amounts of energy to break them up	They form either simple molecular structures that have weak intermolecular forces and hence low melting points. Or they form giant covalent structures with strong bonds between all atoms and hence these have the highest melting points of all.	These compounds form lattice structures. They get stronger across a period because there are more electrons in the valence shell and hence more electrons in the delocalised sea of electrons. This means that melting points rise across a period.



Graphite

Diamond



Measuring chemicals – the mole

From this point on you need to be using an Alevel periodic table, not a GCSE one. Print one from the A level OCR specification (link on first page of this booklet).

Once we have our chemical equations balanced, we need to be able to use them in order to work out masses of chemicals we need or we can produce.

For example: magnesium + sulphur → magnesium sulfide



From the periodic table: Mg = 24.3 and S = 32.1

If I weigh out exactly 24.3g of magnesium this will be 1 mole of magnesium, if we counted how many atoms were present in this mass it would be a huge number (6.02×10^{23} !!!!). If I weigh out 32.1g of sulfur then I would have 1 mole of sulfur atoms.

So 24.3g of Mg will react precisely with 32.1g of sulfur, and will make 56.4g of magnesium sulfide.

Watch this tutorial and then attempt the questions. Make sure you show your workings and set out your calculation clearly.

<https://www.youtube.com/watch?v=RxFggBNv5U>

Task 7: Answer the following questions on moles.

1. How many moles of phosphorus pentoxide (P_4O_{10}) are in 85.2g?
2. How many moles of potassium in 73.56g of potassium chlorate (V) ($KClO_3$)?
3. How many moles of water are in 249.6g of hydrated copper sulfate (VI) ($CuSO_4 \cdot 5H_2O$)? For this one, you need to be aware the dot followed by $5H_2O$ means that the molecule comes with 5 water molecules so these have to be counted in as part of the molecule's mass.
4. What is the mass of 0.125 moles of tin sulfate ($SnSO_4$)?
5. If I have 2.4g of magnesium, how many g of oxygen (O_2) will I need to react completely with the magnesium? $2Mg + O_2 \rightarrow MgO$

Solutions and concentrations

In chemistry a lot of the reactions we carry out involve mixing solutions rather than solids, gases or liquids.

You will have used bottles of acids in science that have labels saying 'Hydrochloric acid 1M', this is a solution of hydrochloric acid where 1 mole of HCl, hydrogen chloride (a gas) has been dissolved in 1 dm³ of water.

The dm³ is a cubic decimetre. It is equal to 1 litre, but from this point on as an A level chemist you will use the dm³ as your volume measurement.

Have a look through the website below and then answer the questions.

http://www.docbrown.info/page04/4_73calcs11msc.htm

Task 8:

1. What is the concentration (in mol dm⁻³) of 9.53g of magnesium chloride (MgCl₂) dissolved in 100cm³ of water?

2. What is the concentration (in mol dm⁻³) of 13.248g of lead nitrate (Pb(NO₃)₂) dissolved in 2dm³ of water?

3. If I add 100cm^3 of 1.00 mol dm^{-3} HCl to 1.9dm^3 of water, what is the molarity of the new solution?
4. What mass of silver is present in 100cm^3 of 1mol dm^{-3} silver nitrate (AgNO_3)?
5. The Dead Sea, between Jordan and Israel, contains $0.0526\text{ mol dm}^{-3}$ of bromide ions (Br^-). What mass of bromine is in 1dm^3 of Dead Sea water?

4. Taking Notes and folders

The way you study at AS and Alevel is quite different to GCSE, both in terms of the organisation of your notes and the level of independent study. If you don't organise yourself properly you will be likely to be at risk of underperforming!

You will be required to keep your notes in a folder (A4, Lever arch etc.) and write your notes on lined, A4 paper. This allows you to add worksheets, PLC's, revision tasks, exam questions and topic tests, into each topic area (dividers are therefore a sensible way to help this).

Each lesson your notes should have the following as a minimum requirement:

- Date
- Title of work
- Lesson notes
- Lesson activities
- Self study/homework

This will allow you to file you work successfully and you will be able to replace/refile any work that might be temporarily removed.

It is expected that for every hour of contact time, you spend the equivalent time in self study consolidating your learning. You MUST keep on top of the workload and make sure your work doesn't have any gaps. If you miss a lesson, it is your responsibility to catch up.



5. Glossary of command words

Key words and subject specific terminology will be given to you at the beginning of the year but being familiar with the A-level command words should help with your transition into Alevel study.

Command words are words and phrases used in exams and other assessment tasks that tell students how they should answer the question. The following command words are taken from Ofqual's official list of command words and their meanings. In addition we have included our own command words :

Analyse Break down concepts, information and/or issues to convey an understanding of them by finding connections and causes and/or effects.

Compare Describe the similarities and differences of at least two phenomena.

Comment on Make a statement that arises from a factual point made – add a view, or an opinion, or an interpretation. In data/stimulus response questions, examine the stimulus material provided and then make statements about the material and its content that are relevant, appropriate and geographical, but not directly evident

Contrast Point out the differences between at least two phenomena

Deduce Arrive at (a fact or a conclusion) by reasoning; draw as a logical conclusion

Define State the precise meaning of an idea or concept

Describe Give an account in words of a phenomenon which may be an entity, an event, a feature, a pattern, a distribution or a process. For example, if describing a landform say what it looks like, give some indication of size or scale, what it is made of, and where it is in relation to something else (field relationship)

Discuss Set out both sides of an argument (for /against) and come to a conclusion related to the content and emphasis of the discussion. There should be evidence of balance, though not always of equal weighting

Distinguish between Give the meaning of two (or more) phenomena and make it clear how they are different from each other.

Evaluate Consider several options, ideas or arguments and form a view based on evidence about their importance/ validity/merit

Examine Consider carefully and provide a detailed account of the indicated topic

Explain Set out causes of a phenomenon and/or factors which influence its form/nature - usually requires understanding of processes

Justify Give reasons for the validity of a view or idea or why some action should be undertaken. This might reasonably involve discussing and discounting alternative views or actions

Label Add to a diagram, image or graphic a number of words that identify features it contains.

Outline/Summarise Provide a brief account of relevant information

State To assert definitely or specifically