

## What to watch:



### Chemistry in the Movies

Dantes Peak 1997: Volcano disaster movie.

Use the link to look at the Science of acids and how this links to the movie.

<http://www.open.edu/openlearn/science-maths-technology/science/chemistry/dantes-peak>

<http://www.flickclip.com/flicks/dantespeak1.html>

<http://www.flickclip.com/flicks/dantespeak5.html>

Fantastic 4 2005 & 2015: Superhero movie

Michio Kaku explains the “real” science behind fantastic four [http://nerdist.com/michio-kaku-explains-the](http://nerdist.com/michio-kaku-explains-the-real-science-behind-fantastic-four/) real-science-behind-fantastic-four/

<http://www.flickclip.com/flicks/fantastic4.html>

### Rough science – the Open University – 34 episodes available

Real scientists are ‘stranded’ on an island and are given scientific problems to solve using only what they can find on the island.

Great fun if you like to see how science is used in solving problems.

There are six series in total

<http://bit.ly/pixlchemvid1a>

[http://www.dailymotion.com/playlist/x2iqjq\\_Rough-Science\\_rough-science-full-series/1#video=xxw6pr](http://www.dailymotion.com/playlist/x2iqjq_Rough-Science_rough-science-full-series/1#video=xxw6pr)

or

<http://bit.ly/pixlchemvid1b>

<https://www.youtube.com/watch?v=IUoDWAAt259I>

### 10 weird and wonderful chemical reactions

10 good demonstration reactions, can you work out the chemistry of .... any... of them?

<http://bit.ly/pixlchemvid3>

<https://www.youtube.com/watch?v=0Bt6RPP2ANI>

## What to read:

Useful website to review all the topics covered in GCSE:

<https://chemrevise.org/gcse-aqa-guides/>

<https://www.bbc.co.uk/bitesize/examspecs/z8xtmnb>

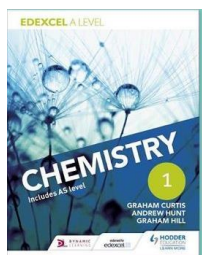
Useful websites for a review of all the topics covered in the A Level course:

<https://chemrevise.org/3-edexcel-revision-guides/>



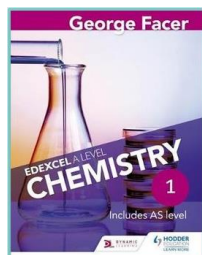
## A Level preparation work- CHEMISTRY

Recommended text books:



### Edexcel A Level Chemistry Student Book 1

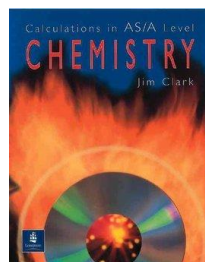
A **Paperback** edition by [Andrew Hunt](#) and [Graham Curtis](#) (30 Apr 2015)



### George Facer's Edexcel A Level Chemistry Student Book 1

A **Paperback** edition by [George Facer](#) (27 Mar 2015)

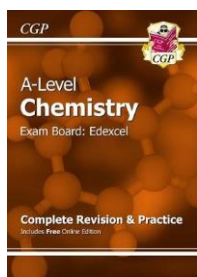
Calculations in AS/A Level Chemistry (Paperback) Jim Clark



ISBN-10: 0582411270

<http://bit.ly/pixlchembook4>

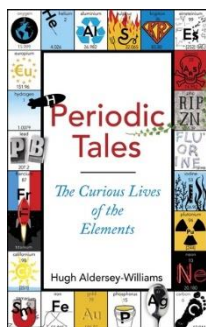
If you struggle with the calculations side of chemistry, this is the book for you. Covers all the possible calculations you are ever likely to come across. Brought to you by the same guy who wrote the excellent chemguide.co.uk website.



### A-Level Chemistry: Edexcel Year 1 & 2 Complete Revision & Practice with Online Edition (Paperback)

**CGP Books** (author, editor)

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



ISBN-10: 0141041455

<http://bit.ly/pixlchembook1>

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

## A Level preparation work- CHEMISTRY

What to listen to:

**The Royal society of Chemistry** has a series of podcasts you can listen to:

<https://www.chemistryworld.com/podcasts>

You can register for free for these



**The episodic table of elements:**

<https://episodictable.com/archive/> you can listen to a podcast about every element on the periodic table. Simply select the ones that interest you and listen! With each one there is also a fab video explaining some important concept covered in the podcast. E.g. with Carbon- a video on covalent bonding. They vary in length from 10 to 35 minutes long.

**Research tasks: Complete ONE from Task 1 to 3 and also Task 4**

### **Task 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?

### **Task 2: Why is copper sulfate blue?**

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

### **Task 3: Aspirin**

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

**THIS MUST BE COMPLETED: Task 4: Expanding C1 knowledge to A level (atomic structure and the periodic table)**

You will have discussed the trends in the 'sizes of atoms' down groups during your GCSE course. At A level we will continue to discuss this in greater depth. Some trends we will explore are:

- Atomic radii increase down a group.
- Atomic radii decrease across a period.

Using your existing knowledge and the resources available to you in this document, describe and **explain** the two trends stated above. There are three key factors you should try to discuss:

- Nuclear charge effect (how does nuclear charge change down groups/across periods?)
- The distance effect (does the distance from nucleus to outer electrons change?)
- Electron shielding (how do inner shell electrons affect outer shell electrons?)

These three factors are key to explaining a lot of what's going on in the first topic, so if you can grasp some of these ideas now, you'll be ahead of the game for next year.

**Complete the Open University Introduction to Chemistry Course:** This course would give you an excellent introduction to A level Chemistry. It will require you to setup an account and then complete the work. Bringing your certificate when you start Yr. 12 will show you have completed it.

<https://www.open.edu/openlearn/science-maths-technology/chemistry/discovering-chemistry/content-section-overview?active-tab=description-tab#>

**Work to be completed: The first topics you will cover at A level are**

- Atomic structure and the periodic table
- Formulae, equations and moles
- Calculations from chemical equations.

Relevant notes to support can be found at <https://chemrevise.org/3-edexcel-revision-guides/> where you can select the topic you want to read around and a summary guide of notes is given.

Try these tasks out to get started on the theory required

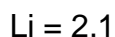
Chemistry topic 1 – Electronic structure, how electrons are arranged around the nucleus

A periodic table can give you the proton / atomic number of an element; this also tells you how many electrons are in the atom.

You will have used the rule of electrons shell filling, where:

The first shell holds up to 2 electrons, the second up to 8, the third up to 8 and the fourth up to 18 (or you may have been told 8).

Atomic number = 3, electrons = 3, arrangement 2 in the first shell and 1 in the second or



At A level you will learn that the electron structure is more complex than this, and can be used to explain a lot of the chemical properties of elements.

The 'shells' can be broken down into 'orbitals', which are given letters 's' orbitals, 'p' orbitals and 'd' orbitals.

You can read about orbitals here:

<http://bit.ly/pixlchem1>

<http://www.chemguide.co.uk/atoms/properties/atomorbs.html#top>

Now that you are familiar with s, p and d orbitals, try these problems; write your answer in the format:

$1s^2, 2s^2, 2p^6$  etc.

Q1.1 Write out the electron configuration of:

a) Ca b) Al c) S d) Cl e) Ar f) Fe g) V h) Ni i) Cu j) Zn k) As

Q1.2 Extension question, can you write out the electron arrangement of the following ions:

a)  $\text{K}^+$  b)  $\text{O}^{2-}$  c)  $\text{Zn}^{2+}$  d)  $\text{V}^{5+}$  e)  $\text{Co}^{2+}$

## A Level preparation work- CHEMISTRY

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

<http://bit.ly/pixlchem7>

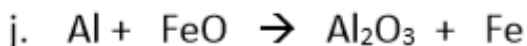
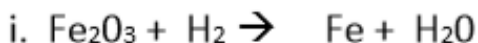
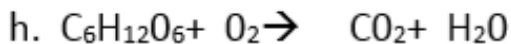
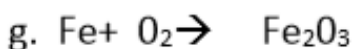
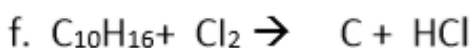
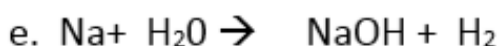
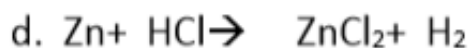
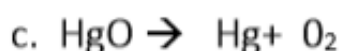
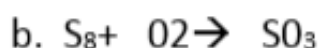
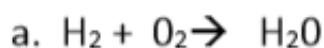
<http://www.chemteam.info/Equations/Balance-Equation.html>

This website has a download; it is safe to do so:

<http://bit.ly/pixlchem8>

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

Q5.1 Balance the following equations



You will remember that isotopes are elements that have differing numbers of neutrons. Hydrogen has 3 isotopes;  $\text{H}_1^1$        $\text{H}_1^2$        $\text{H}_1^3$

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 mass spectrometer. You will need to understand what a mass spectrometer is and how it works at A level. You can read about a mass spectrometer here:

<http://bit.ly/pixlchem3>

## A Level preparation work- CHEMISTRY

<http://www.kore.co.uk/tutorial.htm>

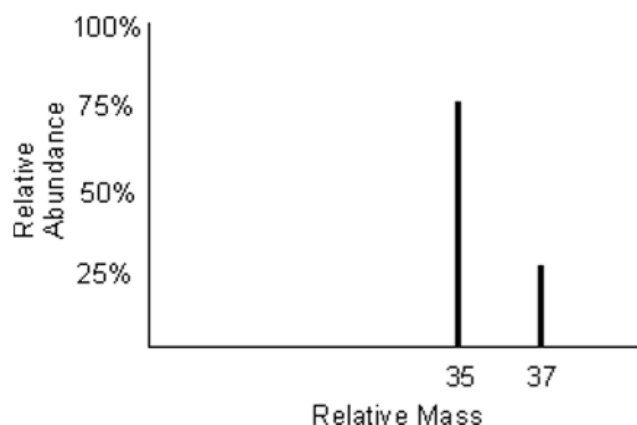
<http://bit.ly/pixlchem4>

<http://filestore.aqa.org.uk/resources/chemistry/AQA-74047405-TN-MASS-SPECTROMETRY.PDF>

Q3.1 What must happen to the atoms before they are accelerated in the mass spectrometer?

Q3.2 Explain why the different isotopes travel at different speeds in a mass spectrometer.

A mass spectrum for the element chlorine will give a spectrum like this:



75% of the sample consist of chlorine-35, and 25% of the sample is chlorine-37.

Given a sample of naturally occurring chlorine  $\frac{3}{4}$  of it will be Cl-35 and  $\frac{1}{4}$  of it is Cl-37. We can calculate what the **mean** mass of the sample will be:

$$\text{Mean mass} = \frac{75}{100} \times 35 + \frac{25}{100} \times 37 = 35.5$$

If you look at a periodic table this is why chlorine has an atomic mass of 35.5.

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

A level

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

Given the percentage of each isotope you can calculate the mean mass which is the accurate atomic mass for that element.

Q3.3 Use the percentages of each isotope to calculate the accurate atomic mass of the following elements.

- Antimony has 2 isotopes: Sb-121 57.25% and Sb-123 42.75%
- Gallium has 2 isotopes: Ga-69 60.2% and Ga-71 39.8%
- Silver has 2 isotopes: Ag-107 51.35% and Ag-109 48.65%
- Thallium has 2 isotopes: Tl-203 29.5% and Tl-205 70.5%
- Strontium has 4 isotopes: Sr-84 0.56%, Sr-86 9.86%, Sr-87 7.02% and Sr-88 82.56%

## A Level preparation work- CHEMISTRY

From this point on you need to be using an A level periodic table, not a GCSE one you can view one here:

<http://bit.ly/pixlpertab>

[https://secondaryscience4all.files.wordpress.com/2014/08/filestore\\_aqa\\_org\\_uk\\_subjects\\_aqa-2420-w-trbptds\\_pdf.png](https://secondaryscience4all.files.wordpress.com/2014/08/filestore_aqa_org_uk_subjects_aqa-2420-w-trbptds_pdf.png)

Now that 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.

The mole is the chemists equivalent of a dozen, atoms are so small that we cannot count them out individually, we weigh out chemicals.

For example: magnesium + sulfur → magnesium sulfide



We can see that one atom of magnesium will react with one atom of sulfur, if we had to weigh out the atoms we need to know how heavy each atom is.

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 ( $6.02 \times 10^{23}$ !!!!), 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.

Here is a comprehensive page on measuring moles, there are a number of descriptions, videos and practice problems.

You will find the first 6 tutorials of most use here, and problem sets 1 to 3.

<http://bit.ly/pixlchem9>

<http://www.chemteam.info/Mole/Mole.html>

Q6.1

Answer the following questions on moles.

- How many moles of phosphorus pentoxide ( $\text{P}_4\text{O}_{10}$ ) are in 85.2g?
- How many moles of potassium in 73.56g of potassium chlorate (V) ( $\text{KClO}_3$ )?
- How many moles of water are in 249.6g of hydrated copper sulfate(VI) ( $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ )? For this one, you need to be aware the dot followed by  $5\text{H}_2\text{O}$  means that the molecule comes with 5 water molecules so these have to be counted in as part of the molecules mass.
- What is the mass of 0.125 moles of tin sulfate ( $\text{SnSO}_4$ )?
- If I have 2.4g of magnesium, how many g of oxygen ( $\text{O}_2$ ) will I need to react completely with the magnesium?  $2\text{Mg} + \text{O}_2 \rightarrow 2\text{MgO}$

## A Level preparation work- CHEMISTRY

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 1dm<sup>3</sup> of water.

The dm<sup>3</sup> is a cubic decimetre, it is actually 1 litre, but from this point on as an A level chemist you will use the dm<sup>3</sup> as your volume measurement.

<http://bit.ly/pixlchem10>

[http://www.docbrown.info/page04/4\\_73calcs11msc.htm](http://www.docbrown.info/page04/4_73calcs11msc.htm)

### Q7.1

- What is the concentration (in mol dm<sup>-3</sup>) of 9.53g of magnesium chloride (MgCl<sub>2</sub>) dissolved in 100cm<sup>3</sup> of water?
- What is the concentration (in mol dm<sup>-3</sup>) of 13.248g of lead nitrate (Pb(NO<sub>3</sub>)<sub>2</sub>) dissolved in 2dm<sup>3</sup> of water?
- If I add 100cm<sup>3</sup> of 1.00 mol dm<sup>-3</sup> HCl to 1.9dm<sup>3</sup> of water, what is the molarity of the new solution?
- What mass of silver is present in 100cm<sup>3</sup> of 1mol dm<sup>-3</sup> silver nitrate (AgNO<sub>3</sub>)?
- The Dead Sea, between Jordan and Israel, contains 0.0526 mol dm<sup>-3</sup> of Bromide ions (Br<sup>-</sup>), what mass of bromine is in 1dm<sup>3</sup> of Dead Sea water?

### Titration:

Vinegar is a solution of ethanoic acid (CH<sub>3</sub>COOH) in water. A student carried out a titration of a sample of vinegar. He used a pipette to measure exactly 25.0cm<sup>3</sup> of vinegar into a flask, added an indicator and titrated it with a 1.00 mol dm<sup>-3</sup> solution of sodium hydroxide (NaOH). The reaction is:  
CH<sub>3</sub>COOH + NaOH → CH<sub>3</sub>COONa + H<sub>2</sub>O

The student found that his average titration was 27.50cm<sup>3</sup>

$c = n/v$  ( $c$  = concentration (mol dm<sup>-3</sup>),  $n$  = number of moles,  $v$  = volume (dm<sup>3</sup>))

$n = m/R_{fm}$  ( $n$  = number of moles,  $m$  = mass in grams,  $R_{fm}$  = formula mass)

1dm<sup>3</sup> = 1000 cm<sup>3</sup>



A Level preparation work- CHEMISTRY

a. Using the chemical equation, how many moles of sodium hydroxide will react with 1 mole of ethanoic acid?

\_\_\_\_\_ moles [1]

b. How many moles of sodium hydroxide are in  $27.50\text{cm}^3$  of  $1.00\text{mol dm}^{-3}$  sodium hydroxide?

\_\_\_\_\_ moles [2]

c. How many moles of ethanoic acid are in  $25.0\text{cm}^3$  of the vinegar sample?

\_\_\_\_\_ moles [1]

d. How many moles of ethanoic acid are in  $1\text{dm}^3$  of vinegar?

\_\_\_\_\_ moles [1]

e. Ethanoic acid has a formula mass of 48. What mass of ethanoic acid is present in  $1\text{dm}^3$  of vinegar?

\_\_\_\_\_ g [2]