WORCESTER
SIXTH FORM COLLEGE

# Progression - Chemistry

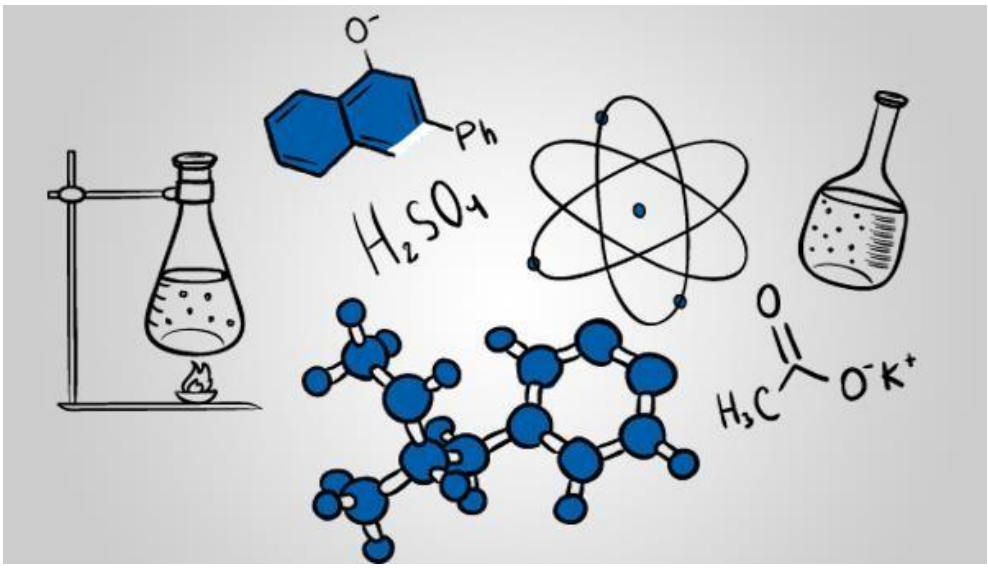
**Get ready for A-level!**
**A guide to help you get ready for A-level Chemistry, including everything from topic guides to days out and online learning courses.**

# So you are considering A level Chemistry?

This pack contains a programme of activities and resources to prepare you to start A level in Chemistry in September. It is aimed to be used after you complete your GCSE, throughout the remainder of the summer term and over the summer holidays to ensure you are readyto start your course in September.

It is split into 5 parts:

1. Thinking of studying A Level Chemistry at Worcester Sixth Form College?
2. Tasks to complete before September- to be marked as you go along
3. Baseline assessment- to be completed by September and marked by your new teacher
4. Optional tasks – useful if you are considering studying Chemistry/related subject at University and/or you are interested in a career involving Chemistry
5. Mark scheme for tasks




https://www.my-mooc.com/en/mooc/chemistry1/

# 1. Thinking of studying A Level Chemistry at Worcester Sixth Form College?

We teach the **OCR A** specification.

Here is a brief summary of the topics we cover over the two-year course. If you want to find out more about each of these topics, you can find the full specification on the OCR website:
https://www.ocr.org.uk/qualifications/as-and-a-level/chemistry-a-h032-h432-from-2015/specification-at-a-glance/

## Content overview:

Module 1: Development of practical skills in chemistry

- Practical skills assessed in the practical endorsement and written exam

Module 2: Foundations in chemistry

- Atoms, compounds, molecules and equations
- Amount of substance
- Acid–base and redox reactions
- Electrons, bonding and structure

Module 3: Periodic table and energy

- The periodic table and periodicity
- Group 2 and the halogens
- Qualitative analysis
- Enthalpy changes
- Reaction rates and equilibrium

Module 4: Core organic chemistry

- Hydrocarbons
- Alcohols and haloalkanes
- Organic synthesis
- Analytical techniques (IR and MS)

Year 2:
Module 5: Physical chemistry and transition elements

Module 6: Organic chemistry and analysis

## 2. Tasks to complete before September

In order to prepare for the course, you need to complete all of the tasks in section 2 and 3. Before you begin, find a folder to store this booklet and all the notes that you make on the tasks. **You need to bring in this folder at the start of the course.** Make sure that your notes are neat and well-organised!



# Pre-Knowledge Topics

A level chemistry will use your knowledge from GCSE and build on this to help you understand new and more demanding ideas. Complete the following tasks to make sure your knowledge is up to date and

**Chemistry Topic 1 – Ions and formulae (videos from Machemguy on youtube- PREP FOR A LEVEL CHEMISTRY playlist)**

You can predict the charge of some ions from the position of the element in the periodic table, whereas other ions you need to learn. Watch these 2 short videos on positive and negative ions and make a list of all the ones you need to know:

https://www.youtube.com/watch?v=sQmwOgNKIqE&list=PLi6oabjl6coxUlfu8syK3K0iFXQIjwDUM&index=4&t=0s

https://www.youtube.com/watch?v=zjL47gM6R8o&list=PLi6oabjl6coxUlfu8syK3K0iFXQIjwDUM&index=4

Then watch this video on common formulae and list those too.

https://www.youtube.com/watch?v=S3D7Wm25vmg&list=PLi6oabjl6coxUlfu8syK3K0iFXQIjwDUM&index=2

| Positive ions | Negative ions | Common formulae |
|---|---|---|
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**Chemistry Topic 2 – Oxidation and reduction**

At GCSE you learnt 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 learnt that oxidation is removing electrons and reduction is adding electrons.

At A level we use the idea of oxidation number a lot!

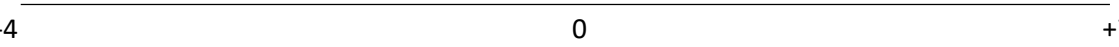
You know that the metals in group 1 react to form ions that are +1, i.e. Na+ and that group 7, the halogens, form -1 ions, i.e. Br -.

We say that sodium, when it has reacted, has an oxidation number of +1 and that bromide has an oxidation number of -1. All atoms that are involved in a reaction can be given an oxidation number.

An element, Na or $O_2$, is always given an oxidation state of zero (0). Any element that has reacted has an oxidation state of

+ or -.

As gaining electrons is reduction, if, in a reaction the element becomes more negative it has been reduced, if it becomes more positive it has been oxidised.




You can read about the rules for assigning oxidation numbers here:
http://www.dummies.com/how-to/content/rules-for-assigning-oxidation-numbers-to-elements.html

Or watch this video: https://www.youtube.com/watch?v=Ny5TGn9BV2Y

Elements that you expect to have a specific oxidation state actually have different states, so for example you would expect chlorine to be -1. It can have many oxidation states: NaClO, in this compound it has an oxidation state of +1 There are a few simple rules to remember:

- Metals have a + oxidation state when they react.
- Oxygen nearly always has an oxidation state of -2.
- Hydrogen has an oxidation state of +1 (except in metal hydrides when it is -1).
- The charges in a molecule must cancel.

Examples: Sodium nitrate, $NaNO_3$

Na $3x\ O^{2-}$
+1 -6
+1

sulfate ion, $SO_4^{2-}$

$4xO^{2-}$ and 2- charges 'showing'
-8

To cancel: N = +5 S = +6

Q2. Work out the oxidation state of the **underlined** atom in the following:

a) $Mg\underline{C}O_3$ b) $\underline{S}O_3$ c) $NaClO_3$ d) $\underline{Mn}O_2$ e) $\underline{Fe}_2O_3$ f) $\underline{V}_2O_5$

g) $K\underline{Mn}O_4$ h) $\underline{Cr}_2O_7$ i) $\underline{Cl}_2O_4$

**Chemistry Topic 3 – 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.

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

Q3. Balance the following equations:

a. $H_2 + O_2 \rightarrow H_2O$
b. $S_8 + O_2 \rightarrow SO_3$
c. $HgO \rightarrow Hg + O_2$
d. $Zn + HCl \rightarrow ZnCl_2 + H_2$
e. $Na + H_2O \rightarrow NaOH + H_2$
f. $C_{10}H_{16} + Cl_2 \rightarrow C + HCl$
g. $Fe + O_2 \rightarrow Fe_2O_3$
h. $C_6H_{12}O_6 + O_2 \rightarrow CO_2 + H_2O$
i. $Fe_2O_3 + H_2 \rightarrow Fe + H_2O$
j. $Al + FeO \rightarrow Al_2O_3 + Fe$

**Chemistry Topic 4 – Measuring chemicals – the mole**

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-trb-ptds_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
Mg + S → MgS
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

Q4. Answer the following questions on moles.

How many moles of phosphorus pentoxide ($P_4O_{10}$) are in 85.2g?

How many moles of potassium are in 73.56g of potassium chlorate (V) ($KClO_3$)?

How many moles of water are in 249.6g of hydrated copper sulfate(VI) ($CuSO_4.5H_2O$)? 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 molecules mass.

What is the mass of 0.125 moles of tin sulfate ($SnSO_4$)?

If I have 2.4g of magnesium, how many g of oxygen($O_2$) will I need to react completely with the magnesium?

$2Mg + O_2 \rightarrow MgO$

**Chemistry Topic 5 – 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 $1dm^3$ of water.
The $dm^3$ is a cubic decimetre, it is actually 1 litre but from this point on as an A level chemist you will use the $dm^3$ as your volume measurement.

http://bit.ly/pixlchem10
http://www.docbrown.info/page04/4_73calcs11msc.htm

Q5.

a. What is the concentration (in mol $dm^{-3}$) of 9.53g of magnesium chloride ($MgCl_2$) dissolved in $100cm^3$ of water?

b. What is the concentration (in mol $dm^{-3}$) of 13.248g of lead nitrate ($Pb(NO_3)_2$) dissolved in $2dm^3$ of water?

c. 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?

d. What mass of silver is present in $100cm^3$ of $1moldm^{-3}$ silver nitrate ($AgNO_3$)?

e. The Dead Sea, between Jordan and Israel, contains 0.0526 $moldm^{-3}$ of Bromide ions ($Br^-$). What mass of bromine is in $1dm^3$ of Dead Sea water?

**Chemistry topic 6 – Titrations**

One key skill in A level chemistry is the ability to carry out accurate titrations. You may well have carried out a titration at GCSE, at A level you will have to carry them out very precisely **and** be able to describe in detail how to carry out a titration - there will be questions on the exam paper about how to carry out practical procedures. You can read about how to carry out a titration here, the next page in the series (page 5) describes how to work out the concentration of the unknown.

http://bit.ly/pixlchem11
http://www.bbc.co.uk/schools/gcsebitesize/science/triple_aqa/further_analysis/analysing_substances/revision/4/

Remember for any titration calculation you need to have a balanced symbol equation; this will tell you the ratio in which the chemicals react.
E.g. a titration of an unknown sample of sulfuric acid with sodium hydroxide.
A 25.00$cm^3$ sample of the unknown sulfuric acid was titrated with 0.100$moldm^{-3}$ sodium hydroxide and required exactly 27.40$cm^3$ for neutralisation. What is the concentration of the sulfuric acid?

**Step 1**: the equation $2NaOH + H_2SO_4 \rightarrow Na_2SO_4 + 2H_2O$

**Step 2**: the ratios 2 : 1

**Step 3**: how many moles of sodium hydroxide $27.40cm^3 = 0.0274dm^3$

number of moles = c x v = 0.100 x 0.0274 = 0.00274 moles

**step 4**: using the ratio, how many moles of sulfuric acid

for every 2 NaOH there are 1 $H_2SO_4$ so, we must have 0.00274/2 =0.00137 moles of $H_2SO_4$

**Step 5**: calculate concentration. concentration = moles/volume in $dm^3$ = 0.00137/0.025 = ***0.0548 moldm$^{-3}$***

Here are some additional problems which are harder, ignore the questions about colour changes of indicators.

http://bit.ly/pixlchem12
http://www.docbrown.info/page06/Mtestsnotes/ExtraVolCalcs1.htm

Use the steps on the last page to help you.
Q6. A solution of barium nitrate will react with a solution of sodium sulfate to produce a precipitate of barium sulfate.

$Ba(NO_3)_2(aq) + Na_2SO_4(aq) \rightarrow BaSO_4(s) + 2NaNO_3(aq)$

What volume of 0.25$moldm^{-3}$sodium sulfate solution would be needed to precipitate all of the barium from 12.5$cm^3$ of 0.15 mol $dm^{-3}$ barium nitrate?

***Mark your work by checking the answers near the back of the booklet.***

# 3. A-Level Chemistry Baseline Assessment

The following 40 mark assessment is designed to test your recall, analysis and evaluative skills and knowledge.
Remember to use your exam technique: look at the command words and the number of marks each question is worth. This will be handed in to your chemistry teacher on your **first chemistry lesson**.

1. Write the formula of the ions:

a. potassium ion
b. silver ion
c. ammonium ion
d. zinc ion
e. magnesium ion [5]

2. Write the formula of the ions:

a. sulfate ion
b. hydride ion
c. bromide ion
d. suilfide ion
e. phosphate ion [5]

3. Write the formula of:

a. sulfuric acid
b. nitric acid
c. ammonia
d. calcium hydroxide
e. sodium carbonate [5]

4. Give the oxidation state of the underlined atom in the following chemicals.
Useful information: H=+1, K=+1, Na=+1, Mg=+2, O=-2, Cl=-1 [7]

a) $\underline{C}O_2$ b) $\underline{S}O_3$ c) $H_2\underline{S}O_4$ d) $\underline{Al}Cl_3$

e) $\underline{Cr}_2O_3$ f) $Na\underline{N}O_3$ g) $\underline{V}Cl_4$

5. Balance the following equations:

a) $C_3H_8$ + ___ $O_2$ → ___ $CO_2$ + ___ $H_2O$ [3]

b) ___ $HCl$ + $Mg(OH)_2$ → $MgCl_2$ + ___ $H_2O$ [2]

c) $Na_2CO_3$ + ___ $HCl$ → ___ $NaCl$ + ___ $H_2O$ + $CO_2$ [3]

6. Calculate the relative formula masses of the following:
Atomic masses: H=1, O=16, S=32.1, C=12, Ca=40.1, Na=23, Cl=35.5, Zn=64.4

a) $CaCl_2$ b) $H_2CO_3$ c) $Na_2SO_4$ d) $C_3H_7OH$ e) $Zn(NO_3)_2$ [5]

7. Vinegar is a solution of ethanoic acid ($CH_3COOH$) in water. A student carried out a titration of a sample of vinegar. He used a pipette to measure exactly 25.0 $cm^3$ of vinegar into a flask, added an indicator and titrated it with a 1.00 mol $dm^{-3}$ solution of sodium hydroxide (NaOH).

$$CH_3COOH + NaOH \rightarrow CH_3COONa + H_2O$$

The student found that his average titration was 27.50 $cm^3$

c= n/v c= concentration ($moldm^{-3}$), n=amount in moles, v=volume ($dm^3$)

n= m/M n= amount in moles, m=mass (g), M= formula mass

1 $dm^3$= 1000 $cm^3$

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

b. How many moles of sodium hydroxide are in 27.50 $cm^3$ of 1.00 mol $dm^{-3}$ sodium hydroxide? [1]

c. How many moles of ethanoic acid are in 25.0 $cm^3$ of the vinegar sample? [1]

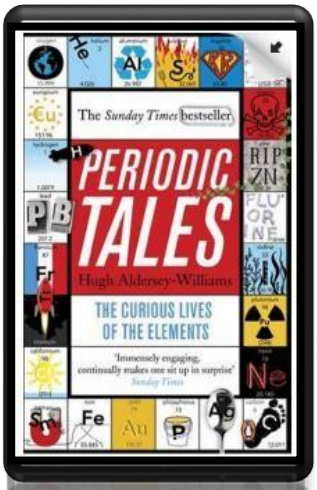
d. How many moles of ethanoic acid are in 1 $dm^3$ of vinegar? [1]

e. Ethanoic acid has a formula mass of 48. What mass of ethanoic acid is present in 1$dm^3$ of vinegar? [1]

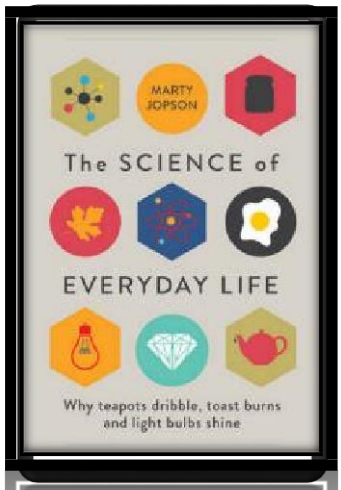
# 4. Optional activities that you may enjoy:

## Book Recommendations

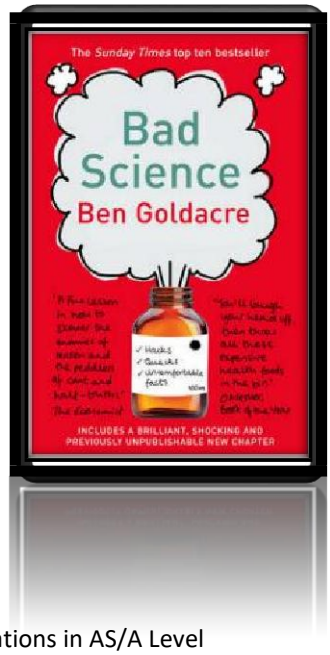
Kick back this summer with a good read. The books below are all popular science books and great for extending your understanding of chemistry



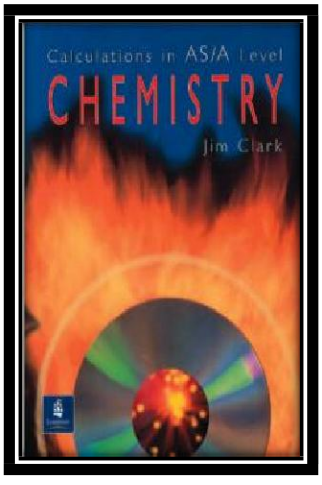

**Periodic Tales: The Curious Lives of the Elements**
This book covers the chemical elements, where they come from and how they are used. There are loads of fascinating insights into uses for chemicals you would have never even thought about.



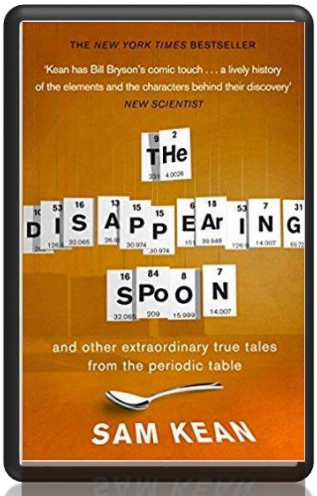

**The Science of Everyday Life: Why Teapots Dribble, Toast Burns and Light Bulbs Shine**
The title says it all really, lots of interesting stuff about the things around your home!




**Bad Science**
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 'sciencey'. Bad Medicine is also worth a read.




Calculations in AS/A Level Chemistry
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.




One of our crowning scientific achievements is also a treasure trove of passion, adventure, betrayal and obsession. **The Disappearing Spoon** follows the elements, their parts in human history, finance, mythology, conflict, the arts, medicine and the lives of the (frequently) mad scientists who discovered them.

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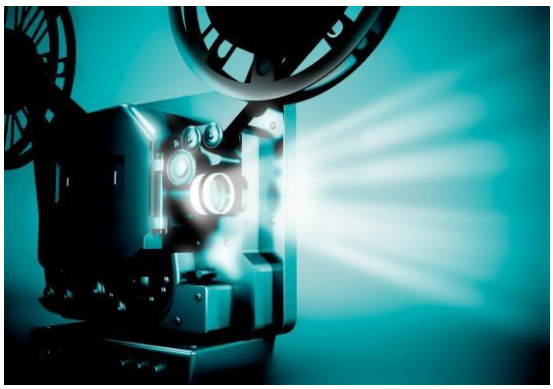
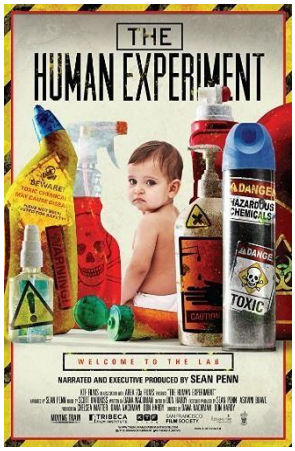
# Movie Recommendations

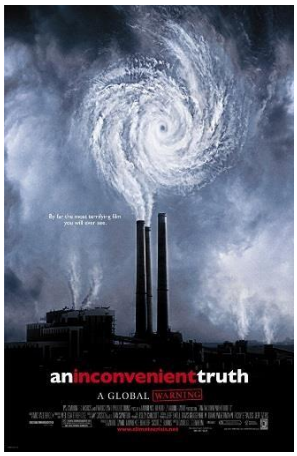
Everyone loves a good story and everyone loves some great science. Here are some of the picks of the best films based on real life scientists and discoveries. You won't find Jurassic Park on this list! Great watching for a rainy day.



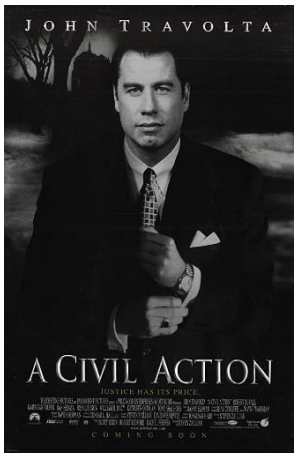


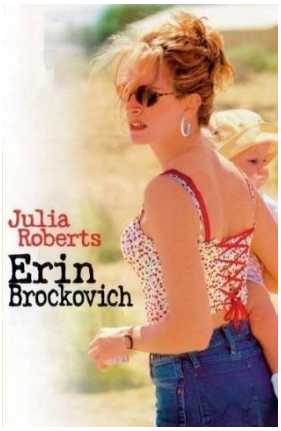

**The Human Experiment (2013)**
A documentary that explores chemicals found in everyday household products.

**An Inconvenient Truth (2006)**
Al Gore, former presidential candidate campaigns to raise public awareness of the dangers of global warming and calls for immediate action to curb its destructive effects on the environment.
(See also: An Inconvenient Sequel, 2017)

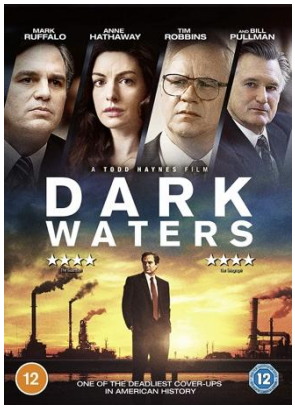



**A Civil Action (1998)**
A tenacious lawyer takes on a case involving a major company responsible for causing several people to be diagnosed with leukemia due to the town's water supply being contaminated, at the risk of bankrupting his firm and career.




**Erin Brokovich (2000)**
Based on a true story. An unemployed single mother becomes a legal assistant and almost single-handedly brings down a California power company accused of polluting a city's water supply.




**Dark Waters (2019)**
A corporate defense attorney takes on an environmental lawsuit against Dupont (makers of Teflon) that exposes a lengthy history of pollution.

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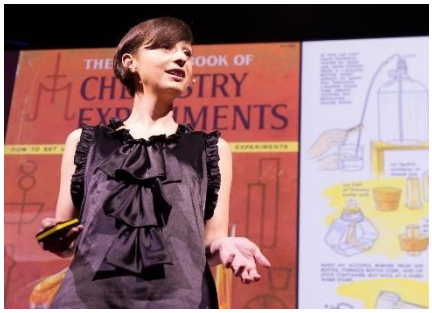
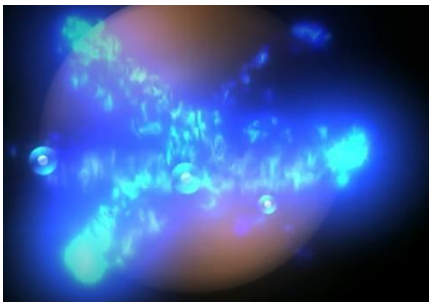
# TED Talks

If you have 30 minutes to spare, here are some great presentations (and free!) from world leading scientists and researchers on a variety of topics. They provide some interesting answers and ask some thought-provoking questions. Use the link or scan the QR code to view:

**Play with Smart Materials**
Available at :
https://www.ted.com/talks/catarina_mota_play_with_smart_materials Ink that conducts electricity; a window that turns from clear to opaque at the flip of a switch; a jelly that makes music. All this stuff exists, it's time to play with it. A tour of surprising and cool new materials.



**Just how small is an atom?**
Available at :
https://www.ted.com/talks/just_how_small_is_an_atom
Just how small are atoms? Really, really, really small. This fast-paced animation from TED-Ed uses metaphors (imagine a blueberry the size of a football stadium!) to give a visceral sense of just how small atoms are.



**Battling Bad Science**
Available at :
https://www.ted.com/talks/ben_goldacre_battling_bad_science#t-44279
Every day there are news reports of new health advice, but how can you know if they're right? Doctor and epidemiologist Ben Goldacre shows us, at high speed, the ways evidence can be distorted, from the blindingly obvious nutrition claims to the very subtle tricks of the pharmaceutical industry.



**How Spectroscopy Could Reveal Alien Life**
Available at :
https://www.ted.com/talks/garik_israelian_what_s_inside_a_star
Garik Israelian is a spectroscopist, studying the spectrum emitted by a star to figure out what it's made of and how it might behave. It's a rare and accessible look at this discipline, which may be coming close to finding a planet friendly to life.



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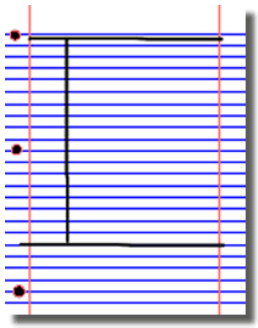
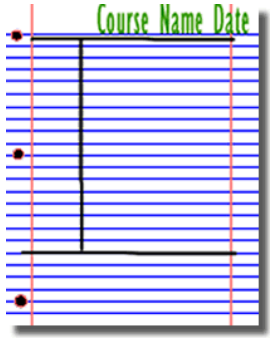
# Research Activities

Research, reading and note making are essential skills for A level chemistry study. For the following task you are going to produce 'Cornell Notes' to summarise your reading.

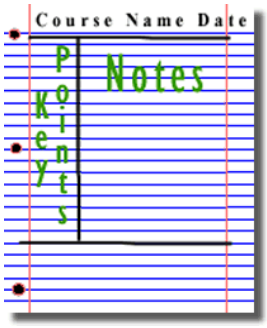
1. Divide your page into three sections like this



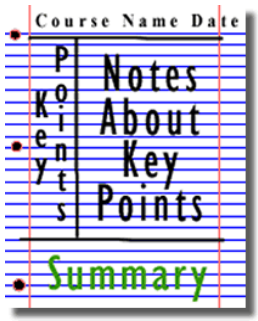
2. Write the name, date and topic at the top of the page



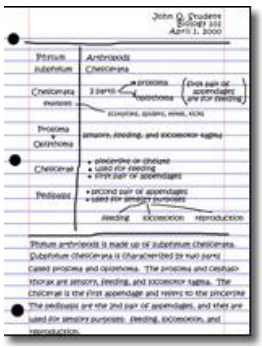

3. Use the large box to make notes. Leave a space between separate idea. Abbreviate where possible.




4. Review and identify the key points in the left hand box




5. Write a summary of the main ideas in the bottom space



Images taken from http://coe.jmu.edu/learningtoolbox/cornellnotes.html

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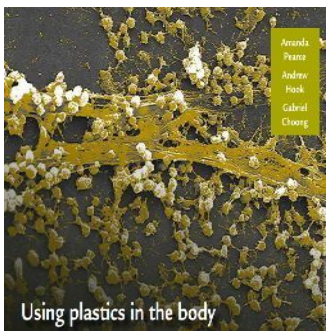
# Research Activities

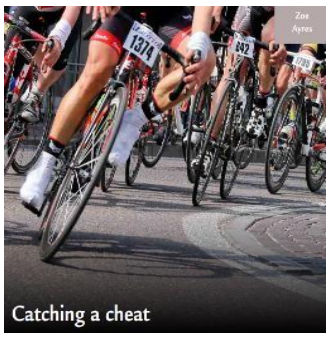
Aimed at students aged 14-19, Catalyst magazine is packed with interesting articles on cutting-edge science, interviews and new research written by leading academics. It also includes a booklet of teacher's notes, full of ideas and lesson plans to bring the articles to life in the classroom.
For each of the following topics you are going to use the resources to produce one page of Cornell style notes.
Use the links of scan the QR code to take you to the resources.

CATALYST

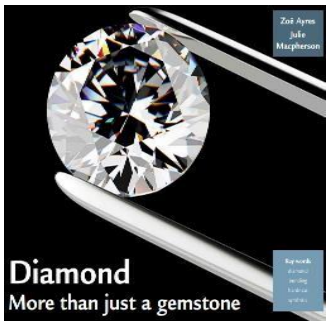
Topic 1: Using Plastics in the Body
Available at:
https://www.stem.org.uk/resources/elibrary/resource/382317/using-plastics-body
This Catalyst article looks at how scientists are learning to use polymers for many medical applications, including implants, bone repairs and reduction in infections.




Topic 2: Catching a Cheat
Available at:
https://www.stem.org.uk/system/files/elibrary-resources/2017/03/Catching%20a%20cheat.pdf This Catalyst article looks at analytical chemists who are involved in many kinds of testing, including drug testing to catch cheats in sport.




Topic 3: Diamond: More than just a gemstone
Available at:
https://www.stem.org.uk/system/files/elibrary-resources/2017/02/Diamond%20more%20than%20just%20a%20gemstone.pdf
This Catalyst article looks at diamond and graphite which are allotropes of carbon. Their properties, which depend on the bonding between the carbon atoms, are also examined.

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Topic 4: The Bizarre World of High Pressure Chemistry
Available at:
https://www.stem.org.uk/system/files/elibrary-resources/2016/11/Catalyst27_1_the_bizarre_world_of_high_pressure_chemistry.pdf
This Catalyst article investigates high pressure chemistry and discovers that, when put under extreme pressure, the properties of a material may change dramatically.




Topic 5: Microplastics and the Oceans
Available at:
https://www.stem.org.uk/system/files/elibrary-resources/2016/11/Catalyst27_1_microplastics_%20and_the_oceans.pdf
This Catalyst article looks at microplastics. Microplastics are tiny particles of polymer used in many products. They have been found to be an environmental pollutant especially in oceans.




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# Science on Social Media

Science communication is essential in the modern world and all the big scientific companies, researchers and institutions have their own social media accounts. Here are some of our top tips to keep up to date with developing news or interesting stories:

Follow on Twitter:
Satlers' Institute - Our activities include Festivals of Chemistry; Chemistry Camps; Curricula; Awards for Technicians, Graduates, A Level Students; and Seminars
@salters_inst

Daily A Level Chemistry Facts – Daily Chemistry Facts (Based on the A-Level AQA spec but most facts work with all)
@chemAlevels

Chemistry News –The latest chemistry news from only the best sources
@chemistrynews

Compound Interest– Graphics exploring everyday #chemistry. Winner of @absw 2018 science blog award
@compoundchem

Chemistry World – Chemistry magazine bringing you the latest chemistry news and research every day. Published by the Royal Society of Chemistry.
@ChemistryWorld

Royal Society of Chemistry - Promote, support and celebrate chemistry. Follow for updates on latest activities
@RoySocChem

Periodic Videos– Chemistry video series by @BradyHaran & profs at the Uni of Nottingham - also see @sixtysymbols & @numberphile
@periodicvideos

Find on Facebook:
Science Now - Science Now is a dedicated community that helps spread science news in all fields, from physics to biology, medicine to nanotechnology, space and beyond!

National Science Foundation – As an independent federal agency, NSF fund a significant proportion of basic research. For official source information about NSF, visit www.nsf.gov

Science News Magazine - Science covers important and emerging research in all fields of science

BBC Science News - The latest BBC Science and Environment News: breaking news, analysis and debate on science and nature around the world

Scientific American - Scientific American is the authority on science and technology for a general audience, with coverage that explains how research changes our understanding of the world and shapes our lives.

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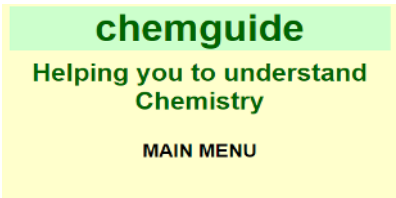
# Useful Websites

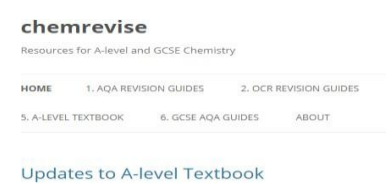
These websites all offer an amazing collection of resources that you should use again and again throughout your course.




This website is very detailed and identifies other resources which are sharing incorrect or outdated information and suggests the correct materials to use. The site also contains links to the syllabuses of many exam boards which means it is accessible and useful to all students.
https://www.chemguide.co.uk/




Doc Brown is a website dedicated to all three science subjects; physics, chemistry and biology. It provides the user with summarised notes (useful for making flash cards) and practice questions to further their knowledge and understanding.
The site provides resources from a wide range of exam boards including AQA, Edexcel, Chemistry, CCEA, OCR, WJEC, CIE and Salters from GCSE level to A2.
http://www.docbrown.info/




Revision guides for OCR Chemistry, we use them in our work booklets.
https://chemrevise.org/




The free revision website for students studying GCSE and A-levels. S-cool provides revision guides, question banks, revision timetable and more
https://www.s-cool.co.uk/a-level/chemistry




Machemguy videos on you-tube are based on the OCR specification and cover pretty much every topic.
https://www.youtube.com/playlist?list=PLi6oabjl6coxUlfu8syK3K0iFXQIjwDUM




Tons of awesome courses in one awesome channel! Check out the playlists for past courses in physics, philosophy, games, economics, U.S. government and politics, astronomy, anatomy & physiology, world history, biology, literature, ecology, psychology, and of course, chemistry!
https://www.youtube.com/user/crashcourse/featured

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# Science: Things to do!

Day 4 of the holidays and boredom has set in?
There are loads of citizen science projects you can take part in either from the comfort of your bedroom, out and about, or when on holiday. Wikipedia does a comprehensive list of all the current projects taking place. Google 'citizen science project'

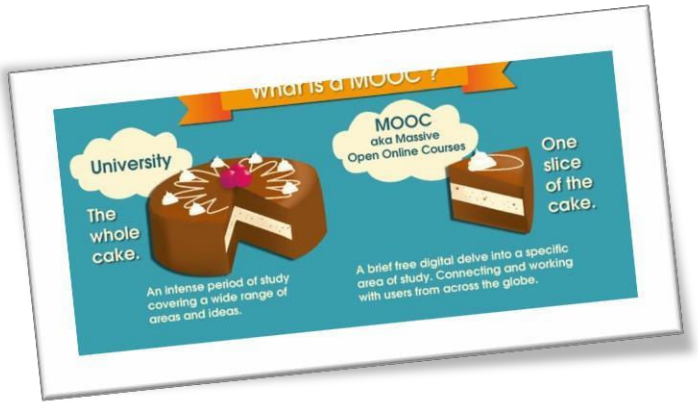
MOOC

**Want to stand above the rest when it comes to UCAS? Now is the time to act.**
**MOOCs are online courses run by nearly all universities. They are short FREE courses that you take part in. They are usually quite specialist, but aimed at the public, not the genius!**
**There are lots of websites that help you find a course, such as edX and Future learn.**
**You can take part in any course, but there are usually start and finish dates. They mostly involve taking part in web chats, watching videos and interactives.**

canvas networks
edX
coursera
OPEN 2 STUDY
UDACITY udacity.com
FUTURELEARN
KHAN ACADEMY
ed2go

Completing a MOOC will look great on your Personal statement and they are dead easy to take part in!

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# Pre-Knowledge Topics Answers to problems

## Topic 2 oxidation numbers:

a) +4 b) +6 c) +5 d) +4 e) +3 f) +5 g) +7 h) +6 j) +4

==========

## Topic 3: Chemical Equations

Q1

a. $2H_2 + 0_2 \rightarrow 2\ H_20$

b. $S_8 + 1202 \rightarrow 8SO_3$

c. $2HgO \rightarrow 2Hg + 0_2$

d. $Zn + 2HCl \rightarrow ZnCl_2 + H_2$

e. $2Na + 2H_20 \rightarrow 2NaOH + H_2$

f. $C_{10}H_{16} + 8Cl_2 \rightarrow 10C + 16HCl$

g. $2Fe + 30_2 \rightarrow 2Fe_2O_3$

h. $C_6H_{12}O_6 + 60_2 \rightarrow 6\ CO_2 + 6\ H_20$

i. $Fe_2O_3 + 3H_2 \rightarrow 2Fe + 3H_20$

j. $2Al + 3\ FeO \rightarrow Al_2O_3 + 3Fe$

## Topic 4 Measuring chemicals – the mole

a) 85.2/284 = 0.3 moles b) 73.56/122.6 = 0.6 moles c) 249.5/249.5 = 1.0 moles

d) 0.125 x 212.8 = 26.6g

e) 2Mg : 2O or 1:1 ratio 2.4g of Mg = 0.1moles so we need 0.1 moles of oxygen ($O_2$): 0.1 x 32 = 3.2g

==========

## Topic 5: Solutions and concentrations/ Topic 6: Titration

a) 9.53g/95.3 = 0.1 moles, in $100cm^3$ or $0.1dm^3$ in $1dm^3$ 0.1moles/$0.1dm^3$ = 1.0 mol $dm^{-3}$

b) 13.284g/331.2 = 0.04 moles, in $2dm^3$ in $1dm^3$ 0.04moles /$2dm^3$ = 0.02 mol $dm^{-3}$

c) $100cm^3$ of 0.1 mol $dm^{-3}$ = 0.01 moles added to a total volume of 2 $dm^3$ = 0.01moles/$2dm^3$ = 0.005 mol $dm^{-3}$

d) in $1dm^3$ of 1 mol $dm^{-3}$ silver nitrate, 1 mole of Ag = 107.9g in $0.1dm^3$ = 107.9 x 0.1 = 10.79g

e) 0.0526 x 79.7 = 42.0274g

==========

Q1

$Ba(NO_3)_2 : Na_2SO_4$

1 : 1 ratio

$12.5cm^3$ of $Ba(NO_3)_2$ = $0.0125dm^3$

0.15 $moldm^{-3}$ x $0.0125dm^3$ = 0.001875 moles

same number of moles of sodium sulfate needed, which has a concentration of 0.25 mol $dm^{-3}$

0.001875 moles / 0.25 mol $dm^{-3}$ = 0.0075 $dm^3$ or $7.5cm^3$

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