

# A-Level Chemistry Bridging Unit

In this booklet you will find everything you need to successfully transition between GCSE and A-Level Chemistry!

You should complete the sessions assigned during the summer holidays. This will make sure you start back in Year 12 in the best possible position. You should be completing around 1.5 hours per session. You should then bring this booklet and all associated work to your first Chemistry lesson in September.

If you attended ALL of our bridging sessions in school, you can skip session 1 if you like as we covered this information during our sessions. Feel free to complete if you would like some more practice, however!

We can't wait to see you in September to continue your Chemistry journey!

Any questions at all, contact Miss Vaughan at:

Email: [evaughan@st-wilfrids.org](mailto:evaughan@st-wilfrids.org)





## Did you know.....

- If you pour a handful of salt into a full glass of water, the water level will actually go down rather than overflowing the glass.
- The only letter that doesn't appear on the periodic table is J.
- Although oxygen gas is colourless, the liquid and solid forms of oxygen are blue.
- The human body contains enough carbon to provide graphite for 9,000 pencils.
- Hydrofluoric acid is so corrosive that it will dissolve glass, but it is considered to be a weak acid.
- One bucket full of water contains more atoms than there are buckets of water in the Atlantic ocean.
- Bee stings are acidic, while wasp stings are alkaline.
- Water freezes faster when it is warm, not cold.
- Mars looks red due to the high levels of rust (iron oxide) on its surface.
- 20% of the world's oxygen is produced in the Amazon Rainforest.
- DNA is flame retardant. Scientists are using DNA to try and produce flame-retardant clothing.
- Vanadium Oxide is the only known substance which is in a conductor of electricity but not heat.
- Olympic gold medals are made of at least 95% silver.
- Uranus is a planet that is extremely rich in flammable gases like methane and hydrogen. None of these gases burn, however, as Uranus does not contain enough oxygen.
- The sun doesn't have any oxygen – so how does it burn? Well it doesn't! The heat and light come from nuclear fusion reactions, not combustion reactions.
- The smell we recognise after a thunderstorm is the smell of ozone ( $O_3$ ). Lightening heats up the air to 50,000 degrees Celsius, which can cause some oxygen in the air to combine into ozone which we can smell.
- The hydrogen atoms that make up your body are 13.7 billion years old
- We can't reach absolute zero. It is a theoretical temperature. The closest we have come is the range of a billionth of 1K.
- Helium changes your voice as it is a less dense gas, so sound travels around 2-3 times faster through it.
- If you peed in space it would vaporise into a gas immediately due to the lack of air pressure.
- Lobsters have blue blood, as their version of haemoglobin, hemocyanin, has a copper atom at its centre, responsible for the blue colour.
- Metals don't have a smell. The smell we associate with them is due to a reaction where the metals decompose the oils present in our skin, making 1-octen-3-one, which is responsible for the smell.



# Preparing Yourself

Before we start looking at how to prepare ourselves for the content of A-Level Chemistry, it would be useful for us to use this extra time we have to prepare ourselves to be the best possible A-Level Chemistry students we can be!

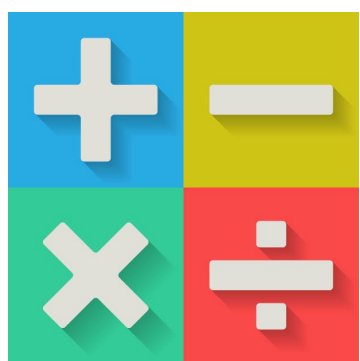
To do this I have put some self-reflection questions on this page that I would like you to complete. If you attended our bridging sessions in school then you will have already done these and don't need to do them again!

We will discuss our ideas when we're back together in September. 😊

## Self-reflection Questions

1. Which parts of GCSE Chemistry did you enjoy the most?
2. What did you find difficult in GCSE Chemistry?
3. Give three ways that you think you ensured you made maximum progress at GCSE Chemistry
4. Give five attributes that you think an A-Level Chemistry student must have
5. What do you envisage being your biggest challenge at A-Level?
6. What are you most excited for during the A-Level Chemistry course?





# Session One

I know how much you all loved the calculations part of GCSE Chemistry! We're going to spend some time this week recapping the calculations that come up again at A-Level.

These include:

- Relative Atomic Mass and Relative Formula Mass
- Concentration
- Calculations using Moles
- Empirical and Molecular Formulae

Some of the A-Level calculations include those from the Separate Chemistry course. This is an ideal time for those of you that did Combined Science to get up to speed.

These calculations are:

- Atom Economy
- Percentage Yields
- Molar Volumes

1. Use the following resources to revise and brush up on the above calculations:
  - Your GCSE revision guide
  - <https://www.bbc.co.uk/bitesize/guides/z2ty97h/revision/1>
  - <https://www.bbc.co.uk/bitesize/guides/zpk2srd/revision/1>
  - <https://www.bbc.co.uk/bitesize/guides/zg9rxfr/revision/1>
  - <https://www.bbc.co.uk/bitesize/guides/zwbyjty/revision/1>
  - Pages 37-40 in your 'Head Start to A-Level Chemistry' book
  - <https://www.youtube.com/watch?v=UQV9tLkQI3k>
2. Write a 'calculations summary sheet' that includes key formulae that you need to learn off by heart. This will come in very useful in Year 12!
3. Complete and self-assess the exam questions on the next couple of pages.



## Calculations Exam Questions

**Q1.**

How many protons are there in 6.0 g of nitrogen gas?

Avogadro constant,  $L = 6.022 \times 10^{23} \text{ mol}^{-1}$

**A**  $1.3 \times 10^{23}$

**B**  $9.0 \times 10^{23}$

**C**  $1.8 \times 10^{24}$

**D**  $3.6 \times 10^{24}$

(Total 1 mark)

**Q2.**

A solution of volume 500 cm<sup>3</sup> contains 150 g of ammonia.

What is the concentration, in mol dm<sup>-3</sup>, of ammonia in this solution?

**A** 0.51

**B** 8.82

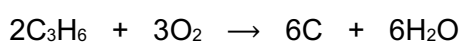
**C** 16.7

**D** 17.6

(Total 1 mark)

**Q3.**

What is the mass, in mg, of carbon formed when  $3.0 \times 10^{-3}$  mol of propene undergoes incomplete combustion?



**A**  $9.0 \times 10^{-3}$

**B**  $3.6 \times 10^{-2}$

**C**  $1.08 \times 10^2$

**D**  $2.16 \times 10^2$

(Total 1 mark)



**Q4.**

What is the empirical formula of an oxide of nitrogen that contains 26% nitrogen by mass?

- A NO<sub>2</sub>
- B N<sub>2</sub>O<sub>3</sub>
- C N<sub>2</sub>O<sub>5</sub>
- D N<sub>4</sub>O<sub>5</sub>

(Total 1 mark)

**Q5.**

Ethanol can be made from glucose by fermentation.



In an experiment, 268 g of ethanol ( $M_r = 46.0$ ) were made from 1.44 kg of glucose ( $M_r = 180.0$ ).

What is the percentage yield?

- A 18.6%
- B 36.4%
- C 51.1%
- D 72.8%

(Total 1 mark)

**Q6.**

Which sample of liquid has the greatest volume?

- A 500 mg of pentane (density = 0.63 g cm<sup>-3</sup>)
- B 650 mg of propan-1-ol (density = 0.80 g cm<sup>-3</sup>)
- C 1.20 g of dichloromethane (density = 1.33 g cm<sup>-3</sup>)
- D 1.30 g of trichloromethane (density = 1.48 g cm<sup>-3</sup>)

(Total 1 mark)

**Q7.**

A gas cylinder contains 5.0 kg of propane.

How many propane molecules are in the cylinder?

The Avogadro constant,  $L = 6.022 \times 10^{23} \text{ mol}^{-1}$

- A  $6.8 \times 10^{22}$
- B  $7.2 \times 10^{22}$
- C  $6.8 \times 10^{25}$
- D  $7.2 \times 10^{25}$

(Total 1 mark)



## Mark schemes

**Q1.**  
C

[1]

**Q2.**  
D

[1]

**Q3.**  
C

[1]

**Q4.**  
C

[1]

**Q5.**  
B

[1]

**Q6.**  
C

[1]

**Q7.**  
C  
[1]





## Session Two

Similarly to your GCSE course, you're A-Level Chemistry course contains required practicals that you must carry out.

The first one you will carry out will be a Titration to find the concentration of an unknown substance. Separate Chemists will be familiar with titrations from Year 10. Combined scientists this is again a great opportunity to get caught up!

Your task this week is to produce an 'Idiot's Guide to Titrations.'

The format you produce this in is entirely up to you, but it should include:

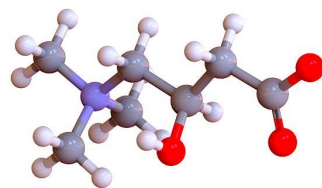
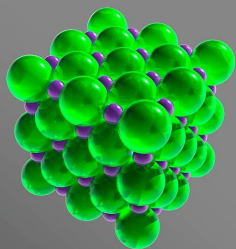
- The names of pieces of key equipment and what they are used for
- A general method to use during the practical
- Common mistakes or issues that people come up against, and how to make sure this doesn't happen to you
- Calculations that must be carried out on your results

### **Potential sources of information**

- <https://www.bbc.co.uk/bitesize/guides/zg9rxfr/revision/3>
- <https://www.youtube.com/watch?v=jnG9Ut--yUA>
- <https://www.youtube.com/watch?v=UAKibS8DOqY>
- <https://www.youtube.com/watch?v=UAKibS8DOqY>
- [https://www.youtube.com/watch?v=LsYXOa38OgE&list=PLxkbSWe\\_nXKXp3i8gRXvpM3FMC36yTe1U1](https://www.youtube.com/watch?v=LsYXOa38OgE&list=PLxkbSWe_nXKXp3i8gRXvpM3FMC36yTe1U1)
- <https://chemrevise.files.wordpress.com/2016/08/1-25-titrations.pdf>



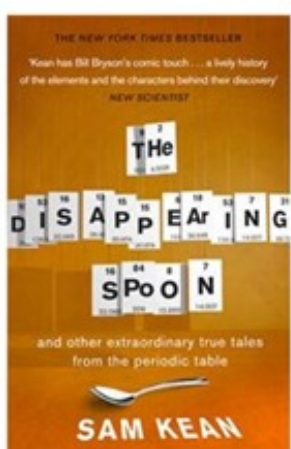




## Session Three

At GCSE we looked in-depth at Ionic, Metallic and Covalent bonding. We look at this in even more detail at A-Level. To prepare for this you should complete the task below. You could read ahead using your bridging book from Kindle, and any other online resources you can find and add some A-Level detail in! Particularly I would love it if you included some information on dative covalent bonds!

**Your task is to produce a chapter for the disappearing spoon, an acclaimed book about the Periodic table.**



*Why did Gandhi hate iodine (I, 53)? Why did the Japanese kill Godzilla with missiles made of cadmium (Cd, 48)? How did radium (Ra, 88) nearly ruin Marie Curie's reputation? And why did tellurium (Te, 52) lead to the most bizarre gold rush in history? The periodic table is one of our crowning scientific achievements, but it's also a treasure trove of passion, adventure, betrayal and obsession. The fascinating tales in "The Disappearing Spoon" follow carbon, neon, silicon, gold and every single element on the table as they play out their parts in human history, finance, mythology, conflict, the arts, medicine and the lives of the (frequently) mad scientists who discovered them. Why did a little lithium (Li, 3) help cure poet Robert Lowell of his madness? And how did gallium (Ga, 31) become the go-to element for laboratory pranksters? "The Disappearing Spoon" has the answers, fusing science with the classic lore of invention, investigation, discovery and alchemy, from the big bang through to the end of time*

Your chapter should answer the following questions:

**Why do atoms/elements from the Periodic table bond?**

(Remember atomic structure, electron arrangement, ions)

**How do atoms/elements from the Periodic table bond?**

(Remember ionic, covalent and metallic bonding)

Make your chapter a fun and interesting read, diagrams may be necessary.

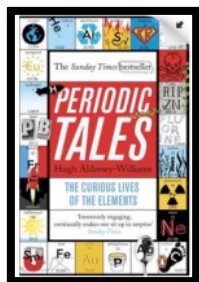
A minimum of 500 words is required in **your own words please!**



# Further Reading

**Book Recommendations (note: these are just suggestions, we do not expect you to have read them all!)**

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

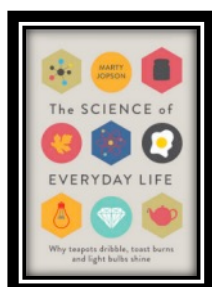


ISBN-10: 0141041455

<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.

**The Science of Everyday Life: Why Teapots Dribble, Toast Burns and Light Bulbs Shine** (Hardback) Marty Jopson



ISBN-10: 1782434186

<http://bit.ly/pixlchembook2>

The title says it all really, lots of interesting stuff about the things around you home!

**Bad Science** (Paperback) Ben Goldacre

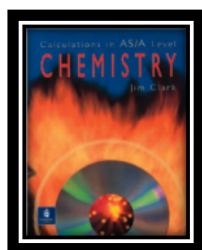


ISBN-10: 000728487X

<http://bit.ly/pixlchembook3>

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'.

**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.



# Something to Watch

**Videos to watch online (again, these are just suggestions, we do not expect you to have watched them all!)**

## **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/x2igjq\\_Rough-Science\\_rough-science-full-series/1#video=xxw6pr](http://www.dailymotion.com/playlist/x2igjq_Rough-Science_rough-science-full-series/1#video=xxw6pr)

or

<http://bit.ly/pixlchemvid1b>

<https://www.youtube.com/watch?v=IUoDWAt259I>

## **A thread of quicksilver – The Open University**

A brilliant history of the most mysterious of elements – mercury. This program shows you how a single substance led to empires and war, as well as showing you some of the cooler properties of mercury.

<http://bit.ly/pixlchemvid2>

<https://www.youtube.com/watch?v=t46lvTxHHTA>

## **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>

## **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-real-science-behind-fantastic-four/>

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



# Who to follow on Twitter

Below is a list of people you might find it useful and interesting to follow on Twitter:

@ASFC\_CHEMISTRY – Ashton Sixth Form College Chemistry who do great YouTube videos

@UKScienceguy – The famous face behind the revision YouTube videos

@IFLScience – Funny science content

@TEDx – watch TED events and streams from around the world

@NCL\_medresearch – The Faculty of Medical Sciences at Newcastle University

@NewcastleMedSch – Newcastle University Medical School

@TakeThatChem – Science Fun

@ScienceMagazine – cutting-edge research

@BillNye – The Science Guy

@neiltyson – Astrophysicist

@ProfBrianCox – Particle Physics Professor

@newscientist – Twitter account for the magazine

@BBCScienceNews

@royalsociety

@NASA

@NatGeo

@RoySocChem – Royal Society of Chemistry

@ChemistryWorld – Chemistry Magazine published by the Royal Society of Chemistry.

@MaChemGuy – Makes great A-Level Chemistry YouTube videos

@ChemistryALevel

@compoundchem – Great chemistry infographics

