Glossopdale School & Sixth Form

AS SUMMER TRANSITION

CHEMISTRY 2020

MASS **VOLUME** **MOLAR MASS** **AVOGADRO**

CONCENTRATION **ATOM** **ION** **MOLECULE**

COURSE OUTLINE - AQA Chemistry A –Level

A-level Chemistry attempts to answer the big question 'what is the world made of' and it's the search for this answer that makes this subject so fascinating. From investigating how one substance can be changed drastically into another, to researching a new wonder drug to save millions of lives, the opportunities that chemistry provides are endless.

The A-level Course is split into 3 strands; Physical, Inorganic and Organic Chemistry.

AS and first year of A-level	Second year of A-level
Physical chemistry Including atomic structure, amount of substance, bonding, energetics, kinetics, chemical equilibria and Le Chatelier's principle	**Physical chemistry** Including thermodynamics, rate equations, the equilibrium constant K_p, electrode potentials and electrochemical cells
Inorganic chemistry Including periodicity, Group 2 the alkaline earth metals, Group 7(17) the halogens	**Inorganic chemistry** Including properties of Period 3 elements and their oxides, transition metals, reactions of ions in aqueous solution
Organic chemistry Including introduction to organic chemistry, alkanes, halogenoalkanes, alkenes, alcohols, organic analysis	**Organic chemistry** Including optical isomerism, aldehydes and ketones, carboxylic acids and derivatives, aromatic chemistry, amines, polymers, amino acids, proteins and DNA, organic synthesis, NMR spectroscopy, chromatography

Practicals

Chemistry, like all sciences, is a practical subject. Throughout the course you will carry out practical activities including:

- measuring energy changes in chemical reactions
- tests for identifying different types of compound
- different methods for measuring rates of reaction
- studying electrochemical cells
- preparation of organic solids and liquids
- an advanced form of chromatography for more accurate results.

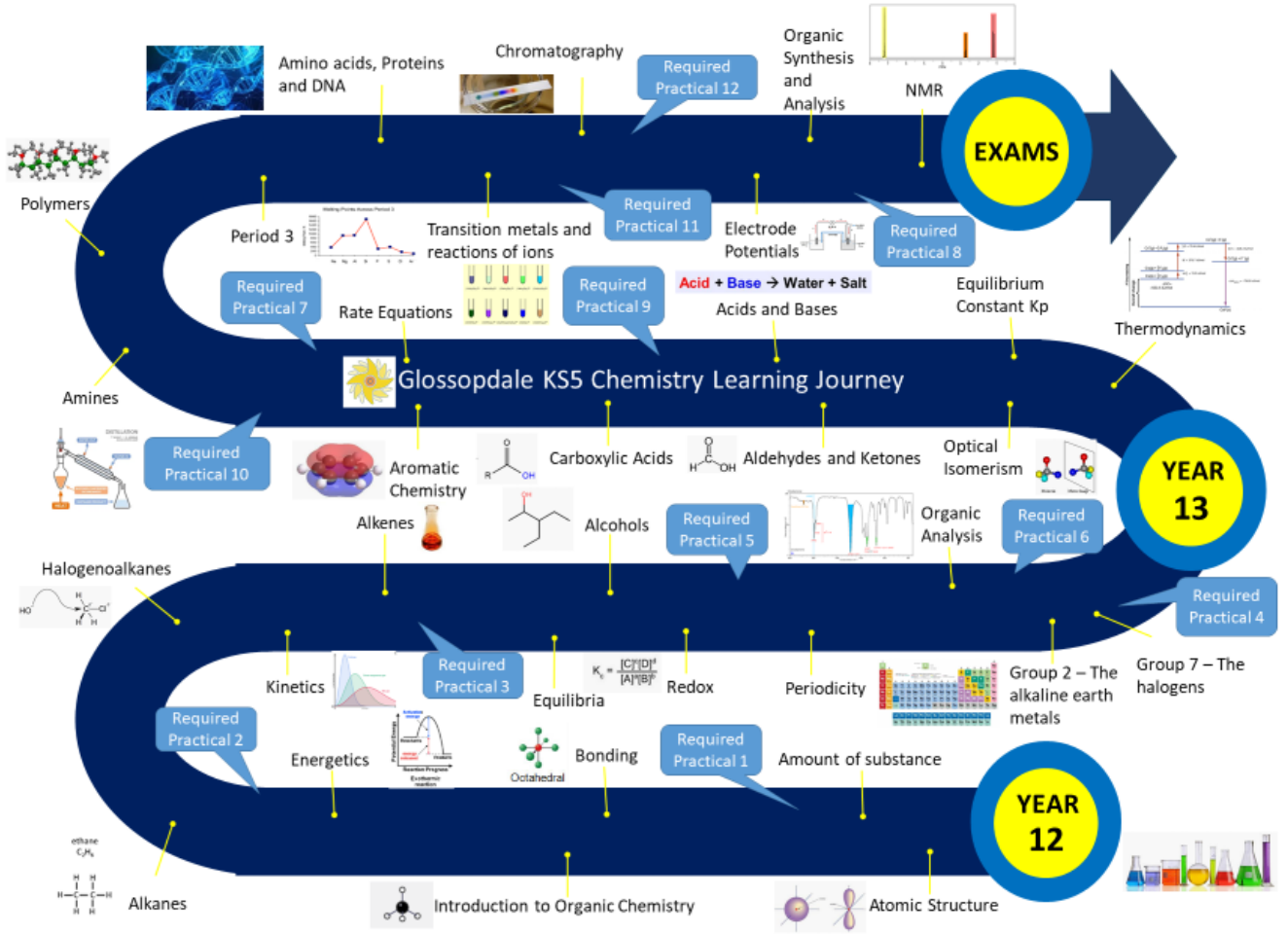
Exams

There is no coursework on this course. However, your performance during practicals will be assessed.

There are three exams at the end of the two years for A-level, all of which are two hours long. At least 15% of the marks for A-level Chemistry are based on what you learned in your practicals.

The AS has two exams at the end of the year. Both are 1 hour 30 minutes long.

Course Structure

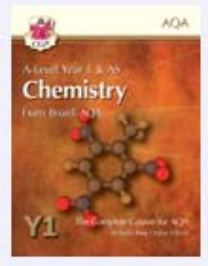


Nothing in life is to be feared, it is only to be understood. Now is the time to understand more, so that we may fear less. – Marie Curie

COURSE BOOKS

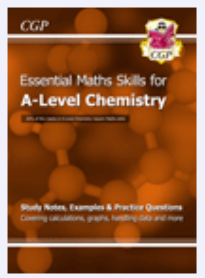
CGP: New A-Level Chemistry for AQA: Year 1 & AS Student Book with Online Edition.

Retail price is £19.99 but can be bought through the school for £10.00



In the Chemistry course the use of maths is needed for 20% of the marks so we would also recommend the CGP book -New A-Level Chemistry: Essential Maths Skills.

Retail price is £7.50 but can be bought through the school for £3.50



Useful Websites

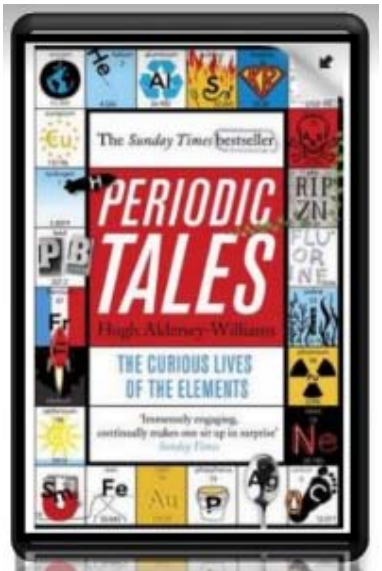
www.chemguide.co.uk

https://chemrevise.org/

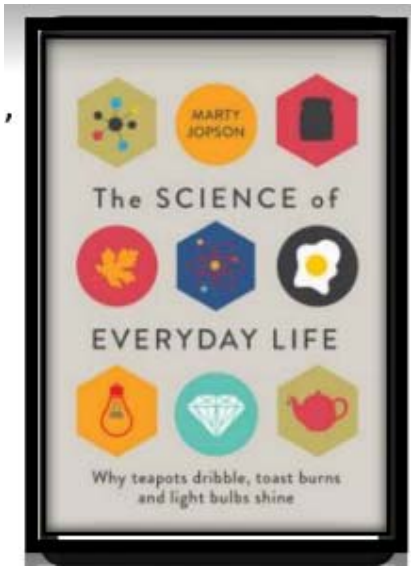
www.rsc.org/periodic-table

www.s-cool.co.uk

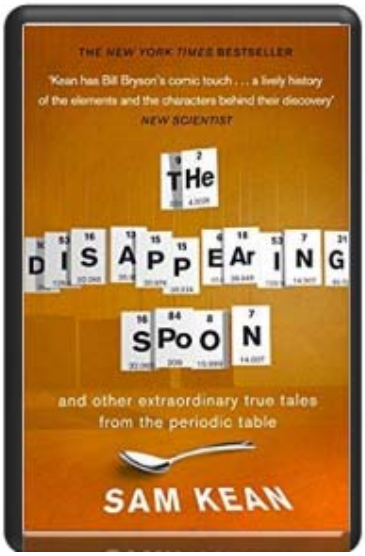
WIDER READING



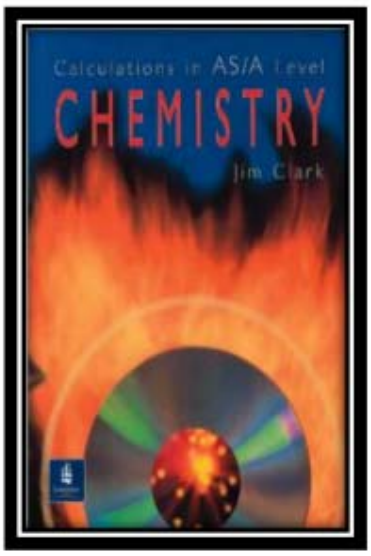
Periodic Tales: The Curious Lives of the Elements
This book covers the chemical elements, where they come from and how they are used. There are loads of fascinating insights into uses for chemicals you would have never even thought about.



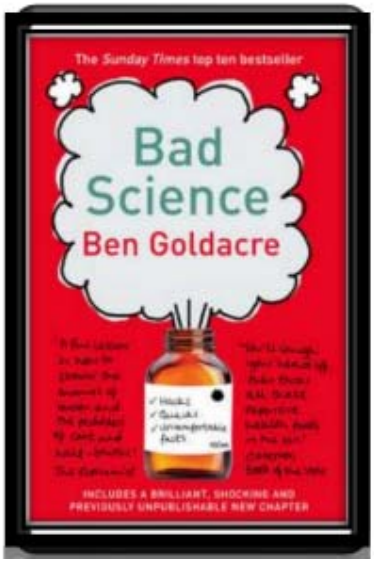
The Science of Everyday Life: Why Teapots Dribble, Toast Burns and Light Bulbs Shine
The title says it all really, lots of interesting stuff about the things around your home!



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.



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.



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'.

Task 1- Independent research

Your task is to use your current knowledge from GCSE and carry out more research to create and present a learning resource about ONE topic from the list below:

1. The history of the structure of the atom (hints: Greek atom, John Dalton, Joseph John (JJ) Thomson, Ernest Rutherford, Neils Bohr, James Chadwick, Today's Atomic structure)

2. The history of the arrangement of the periodic table (hints: Ancient Greeks, Berzelius, DÖbereiner 'triads', De Chancourtois, Meyer, Newland's octaves, Mendeleev, Ramsay, Today's periodic table and trends)

3. Analytical techniques: Paper chromatography, Gas chromatography, Mass spectrometry and Infrared spectroscopy (hints: What can these techniques do? How do they work? Can they be used together? How can Scientists interpret data given? (spectra) How are these techniques useful today? Relevant Advantages/ disadvantages of each technique?

Websites: BBC Bitesize, Chemguide and Chemwiki) You should display your work neatly and include as much relevant scientific detail as possible.

Try to be as creative as possible…you want to impress us on your first day! ☺ Ideas to help you are: Comic strip, stop motion animation, PowerPoint, song, poem, creative story, film, spoof documentary (think David Attenborough in the Amazon!), a role play, a photo story with music, words and voiceover, news report/ interviews etc

Your project MUST be ready to present to the rest of the class on the FIRST Chemistry lesson of Year 12. It should be 5-10 minutes long.

Task 2-Fundamental Chemistry skills

During the first year of A level Chemistry, we build on the knowledge that you learnt at GCSE level. Therefore it is important that you already know the basics in order to understand more advanced work.

Answer the following questions to recap GCSE work:

1. The structure of the Atom

a. Draw the structure of an atom?

b. What is the relative charge and mass of each sub-atomic particle?

c. What is the difference between Atomic Number and Mass Number?

d. What are Isotopes?

e. Why is the Relative Atomic Mass for chlorine not a whole number?

f. How do you calculate Relative Formula Mass? Give a specific example.

g. What a mole?

h. What equations links the number of moles; mass of a substance; and Relative Atomic Mass?

i. How are electrons arranged in an atom?

2. Chemical Bonds: Ionic and Covalent Structures

a. What is ionic bonding?

b. How are ionic compounds formed? Draw a diagram of a specific example.

c. What are the physical properties of ionic structures?

d. What is covalent bonding?

e. How are covalent compounds formed? Draw a diagram of a specific example.

f. What are the physical properties of simple covalent and giant covalent structures?

g. What are Groups and Periods in the Periodic Table?

3. Hydrocarbon Molecules

a. What is a hydrocarbon?

b. What is fractional distillation?

c. What happens with the combustion of hydrocarbons?

d. What are alkanes? Draw and name a specific example.

e. What are alkenes? Draw and name a specific example.

f. What is polymerisation?

g. What is cracking?

4. Rates of Reaction

a. What is meant by Rate of Reaction?

b. How can we measure the rate of a reaction?

c. What 5 factors affect the rate of a reaction?

5. Reversible Reactions

a. What is a reversible reaction?

b. What is equilibrium?

c. What is meant by yield, and what factors can change the yield in a reversible reaction?

6. Symbol Equations

a. How do you balance a chemical equation? Give a tricky example!

7. Calculating Formulae

a. What is the difference between empirical formula and molecular formula?

b. How do you calculate empirical formulae?

8. Reactivity and The Periodic Table

a. How are elements arranged in the periodic table?

b. What are the main trends in reactivity and properties in the Period Table?

9. Chemical Reactions

a. What is Addition?

b. What is Dehydration?

c. What is Displacement?

d. What is Disproportionation?

e. What is Addition?

f. What is Hydrogenation?

g. What is Neutralisation?

h. What is Oxidation?

i. What is Reduction?

j. What is REDOX?

k. What is Precipitation?

l. What is Substitution?

m. What is Thermal Decomposition?

10. Energy and Chemistry

a. What is an exothermic reaction?

b. What is an endothermic reaction?

c. How do they relate to breaking & making bonds?

Task 3-Key definitions

During A level Chemistry you will be required to recall some key definitions. These must be learnt word for word for you to gain marks in your exams.

Over the summer, learn the definitions for the following words:

1. **Relative isotopic mass** = the mass of an isotope compared with one-twelfth of the mass of an atom of carbon-12.

2. **Relative atomic mass, Ar** = The weighted mean mass of an atom of an element compared with one-twelfth of the mass of an atom of carbon-12.

3. **First ionisation energy** = the energy required to remove one electron from each atom in one mole of gaseous atoms of an element to form one mole of gaseous 1+ ions

4. **Standard enthalpy change of formation** = the enthalpy change that takes place when one mole of a compound is formed from its elements under standard conditions, with all reactants and products in their standard states.

5. **Standard enthalpy change of combustion** = the enthalpy change that takes place when one mole of a substance reacts completely with oxygen under standard conditions, with all reactants and products in their standard states.

6. **Enthalpy change of neutralisation** = the energy change that accompanies the reaction of an acid by a base to form one mole of H2O (l), under standard conditions, with all reactants and products in their standard states.

7. **Standard conditions** are 100kPa and 298K

8. **Homologous series** = a series of organic compounds with the same functional group but each successive member differing by CH2

9. **Electrophile** = an electron pair acceptor

10. **Nucleophile** = an electron pair donor

Don't worry too much about understanding these terms. You will be taught about them throughout the course but be prepared to be tested on the definitions at the start of your course (and throughout!)

This is also a good opportunity to find out what revision techniques work best for you. 🙂 Strategies to help you: Flashcards, re-writing the definition out and checking each time, asking a relative/ friend to help you, making a poster and reading it every day, mind maps etc

Task 4 - Mathematical skills

Throughout A level Chemistry you will meet several topics that require good mathematical skills. A lot of these skills you have already done at GCSE level!

Over the summer, make sure you familiarise yourself with the following skills:

Unit conversions Calculate mean average Decimal places Percentage error Significant figures Calculate enthalpy change Standard form Plot graphs Percentage yield Draw line of best fit Atom economy Calculate gradient Balance equations (ratios) Carry out mole calculations.

This is not a complete list of skills required for A level Chemistry, however we feel that most of the skills listed above have been met at GCSE level and you will have a big advantage if you revise them over the summer. See below!

Mass

Convert the following into grams:

a) 0.25 kg
b) 15 kg
c) 100 tonnes
d) 2 tonnes

Volume

Convert the following into dm^3:

a) 100 cm^3
b) 25 cm^3
c) 50 m^3
d) 50000 cm^3

Tip – always use standard form for very large and very small numbers!

What is a mole?

Atoms and molecules are very small – far too small to count individually!

It is important to know how much of something we have, but we count particles in MOLES because you get simpler numbers

1 mole = 6.02×10^{23} particles

(6.02×10^{23} is known as Avogadro's number)

a) If you have 2.5×10^{21} atoms of magnesium, how many moles do you have?

b) If you have 0.25 moles of carbon dioxide, how many molecules do you have?

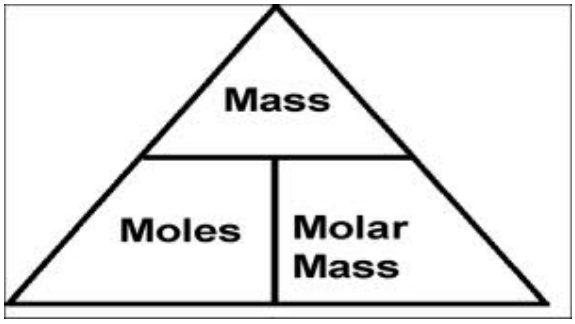
How can you work out how many moles you have?

a) From a measurement of MASS:

You can find the number of moles of a substance if you are given its **mass** and you know its **molar mass**:

number of moles = mass/molar mass

$n = m/m_r$



Mass MUST be measured in grams!

Molar mass has units of $gmol^{-1}$

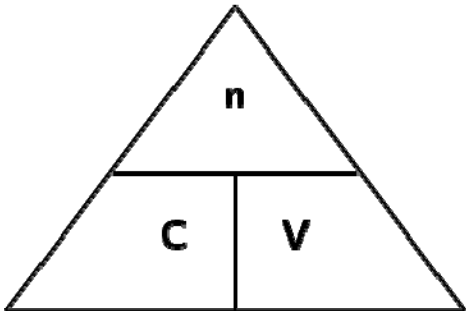
1. Calculate the number of moles present in:	2. Calculate the mass of:	3. Calculate the molar mass of the following substances:
a) 2.3 g of Na	a) 0.05 moles of Cl_2	a) 0.015 moles, 0.42 g
b) 2.5 g of O_2	b) 0.125 moles of KBr	b) 0.0125 moles, 0.50 g
c) 240 kg of CO_2	c) 0.075 moles of $Ca(OH)_2$	c) 0.55 moles, 88 g
d) 12.5 g of $Al(OH)_3$	d) 250 moles of Fe_2O_3	d) 2.25 moles, 63 g
e) 5.2 g of PbO_2	e) 0.02 moles of $Al_2(SO_4)_3$	e) 0.00125 moles, 0.312 g

b) From a measurement of AQUEOUS VOLUME:

You can find the number of moles of a substance dissolved in water (aqueous) if you are given the **volume** of solution and you know its **molar concentration**:

number of moles = aqueous volume x molar concentration

n = V x C



Aqueous volume MUST be measured in dm^3!

concentration has units of $moldm^{-3}$

If you know the molar mass of the substance, you can convert the molar concentration into a mass concentration:

Molar concentration ($moldm^{-3}$) x m_r = mass concentration (gdm^{-3})

1. Calculate the number of moles of substance present in each of the following solutions:	2. Calculate the molar concentration and the mass concentration of the following solutions:	3. Calculate the molar concentration and the mass concentration of the following solutions:
a) 25 cm^3 of 0.1 $moldm^{-3}$ HCl	a) 0.05 moles of HCl in 20 cm^3	a) 35 g of NaCl in 100 cm^3
b) 40 cm^3 of 0.2 $moldm^{-3}$ HNO_3	b) 0.01 moles of NaOH in 25 cm^3	b) 20 g of $CuSO_4$ in 200 cm^3
c) 10 cm^3 of 1.5 $moldm^{-3}$ NaCl	c) 0.002 moles of H_2SO_4 in 16.5 cm^3	c) 5 g of HCl in 50 cm^3
d) 5 cm^3 of 0.5 $moldm^{-3}$ $AgNO_3$	d) 0.02 moles of $CuSO_4$ in 200 cm^3	d) 8 g of NaOH in 250 cm^3
e) 50 cm^3 of 0.1 $moldm^{-3}$ H_2SO_4	e) 0.1 moles of NH_3 in 50 cm^3	e) 2.5 g of NH_3 in 50 cm^3

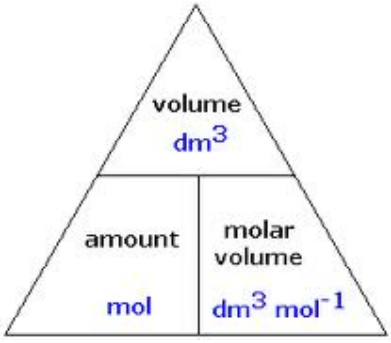
c) From a measurement of GASEOUS VOLUME:

You can find the number of moles of a gas if you are given the **volume** of the gas:

number of moles = volume / 24

n = V / 24

24 dm^3 is the volume occupied by 1 mole of any gas at room temperature and pressure



Volume MUST be measured in dm^3!

1. Calculate the number of moles present in:	2. Calculate the volume of gas occupied by:	3. Calculate the mass of the following gas samples:
a) 48 dm^3 of O_2	a) 0.05 moles of Cl_2	a) 48 dm^3 of O_2
b) 1.2 dm^3 of CO_2	b) 0.25 moles of CO_2	b) 1.2 dm^3 of CO_2
c) 200 cm^3 of N_2	c) 28 g of N_2	c) 200 cm^3 of N_2
d) 100 dm^3 of Cl_2	d) 3.2 g of O_2	d) 100 dm^3 of Cl_2
e) 60 cm^3 of NO_2	e) 20 g of NO_2	e) 60 cm^3 of NO_2

TRANSITION COURSE – END