Royal Russell

A Level Chemistry

Summer Bridging Work

AQA A-Level Chemistry

AQA: http://www.aqa.org.uk/subjects/science/as-and-a-level/chemistry-7404-7405

AS or A-level Chemistry

Studying Chemistry after your GCSEs really develops your practical and mathematical skills. If you enjoy experimenting in the lab, you'll love it.

At first, you may find the jump in demand from GCSE a little daunting, but if you follow the tips and advice in this guide, you'll soon adapt.

Why study A-level Chemistry?

Chemistry students get to investigate a huge range of ideas: the big question you'll ask yourself is 'what is the world made of?' If you choose it as career, you have the potential to help solve all sorts of problems. You could work on a cure for cancer, or you might develop a new food: the possibilities are endless.

Even if you don't decide to work in chemistry, studying it still develops useful and transferable skills for other careers. You'll develop research, problem solving and analytical skills, alongside teamwork and communication. Universities and businesses regard all of these very highly.

Should you study AS or A-level?

AS and A-level are separate qualifications.

An AS lasts one year. Your exam results don't count towards an A-level, but they're still valuable and AS UCAS points are accepted by higher education institutions.

Despite being separate to an A-level, AS course content is the same as the first year of A-level. If you want to switch from an AS to an A-level, you can. Your teacher will help you decide whether it is the right move for you.

All exams for the AS take place at the end of the one-year course. Exams for the A-level take place at the end of the two-year course.

Course prerequisite:

In order to ensure you have the required work ethos necessary to succeed on the A-level chemistry course, you must complete the six tasks below and bring your completed answers to the first chemistry lesson in September 2018.

Before starting in September, you should read an article about chemistry or a popular science book and come ready to discuss this in your first lesson.

Resources

Head start to A-Level Chemistry - This book shall help you to complete the tasks below, as well as offering a substantial bridging between GCSE and A-level. Some of the concepts will be new to you and you will cover these in Year 12, so you may enjoy reading further, but you will not be expected to know all of this new content. https://royalrussell.fireflycloud.net/chemistry/bridging-the-gap-from-year-11-to-year-12

ILPAC starter units - STEM website: https://www.stem.org.uk/resources/collection/3846/ilpac-starter-units

Summer Start to A Level Chemistry (Primrose Kitten) - https://royalrussell.fireflycloud.net/chemistry/bridging-the-gap-from-year-11-to-year-12

Task 1 – About the A-level course

Go to the exam board website and find out about the course you will be studying (I recommend the 'specification at a glance' page.)

1. What are the three main areas of Chemistry that are examined? Complete the table below with examples of topics that are in these three areas:

3.1	3.2	3.3

2. How many exams will you sit at the end of Year 13 (A-level rather than AS) and what percentage is each worth?

3. How is practical work assessed?

Task 2 – formulae

You need to be able to write formulae for ionic compounds and simple molecules without a second thought!

Complete this list of the ion formulae and charges you need to recall:

Positive ions		**Negative ions**	
Group 1 ions: lithium sodium potassium Group 2 ions: magnesium calcium barium	Group 3 ions: aluminium Other common ions silver zinc ammonium hydrogen	Group 7 ions: fluoride chloride bromide iodide Group 6 ions: oxide sulfide	Other common ions nitrate sulfate carbonate hydrogencarbonate hydroxide hydride phosphate

Write the formulae of these ionic compounds and these common molecular compounds:

1) silver bromide .....
2) sodium carbonate .....
3) potassium oxide .....
4) iron (III) oxide .....
5) chromium (III) chloride .....
6) calcium hydroxide .....
7) aluminium nitrate .....
8) sodium sulfate .....

Some common molecular compounds:

carbon dioxide
carbon monoxide
nitrogen monoxide
nitrogen dioxide
sulfur dioxide
sulfur trioxide
ammonia
methane
hydrogen sulfide

Acid	Formula of acid	Base	Formula of base
Sulfuric		Potassium hydroxide	
Hydrochloric		Potassium hydrogencarbonate	
Nitric		Ammonia	
Ethanoic		Sodium carbonate	

Task 3 – writing equations

Some general reactions you should know:

General Reaction
substance + oxygen → oxides
metal + water → metal hydroxide + hydrogen
metal + acid → salt + hydrogen
oxide + acid → salt + water
hydroxide + acid → salt + water
carbonate + acid → salt + water + carbon dioxide
hydrogencarbonate + acid → salt + water + carbon dioxide
ammonia + acid → ammonium salt
metal carbonate → metal oxide + carbon dioxide (on heating)

Write balanced equations for the following reactions:

1. Burning aluminium

2. Burning hexane (C_6H_{14})

3. Burning ethanol

4. Reaction of lithium with water

5. Reaction of calcium carbonate with nitric acid

Task 4 – Standard form and significant figures

- Standard form is very useful for writing very large or small numbers.
- They are written in the form A x 10^n where A is a number between 1 and 10.
- n represents the number of places the decimal point is moved (for +n values the decimal point has been moved to the left, for -n values the decimal point has been moved to the right).

Write the following numbers in standard form.

a) 0.000167	……	d) 34500	……
b) 0.0524	……	e) 0.62	……
c) 0.000000015	……	f) 87000000	……

In questions where various pieces of data are given, your final answer should be given to the *same number of significant figures as the least number of significant figures in the data used.*

Task 5 – Quantitative Chemistry

At GCSE, you will have already covered a lot of the mathematical requirement of the 'Amounts of Substance' topic. Therefore, you need to be able to use and apply this knowledge from day 1 of the A-level course.

Quantitative Chemistry to review from GCSE:

- The mole and the meaning of Avogadro's number
- Calculating Mr
- Calculating reacting masses/theoretical yields in a reaction
- Limiting reactants
- % yield
- Atom economy
- Concentration of solutions
- Titration calculations
- Molar gas volume calculations

New concepts that will be introduced at A-level:

- Calculating empirical formulae
- The ideal gas equation
- Application of these ideas to practical work

Questions to complete:

1) How many moles are there in each of the following?

a) 72.0 g of Mg

b) 4.00 kg of CuO

c) 39.0 g of $Al(OH)_3$

d) 1.00 tonne of NaCl

e) 20.0 mg of $Cu(NO_3)_2$

2) What mass of oxygen reacts with 192 g of magnesium?

$2\ Mg + O_2 \rightarrow 2\ MgO$

3) 5.00 g of iron and 5.00 g of sulphur are heated together to form iron (II) sulphide. Which reactant is in excess and what is the maximum mass of iron (II) sulphide that can be formed?

$Fe + S \rightarrow FeS$

4) Titanium can be extracted from titanium chloride by the following reaction. $TiCl_4 + 2\,Mg \rightarrow Ti + 2\,MgCl_2$

a) Calculate the maximum theoretical mass of titanium that can be extracted from 100 g of titanium chloride .

b) In the reaction, only 20.0 g of titanium was made. Calculate the percentage yield.

c) Give three reasons why the amount of titanium made is less than the maximum theoretical maximum.

5) Calculate the atom economy to make sulfur trioxide from sulfur dioxide. $2\,SO_2 + O_2 \rightarrow 2\,SO_3$

6) Calculate the volume of 0.05 mol dm^{-3} KOH is required to neutralise 25.0 cm^3 of 0.0150 mol dm^{-3} HNO_3.

$$HNO_3 + KOH \rightarrow KNO_3 + H_2O$$

7) What volume, in dm^3, of carbon dioxide gas is produced when 1.00 kg of iron oxide is reacted with excess carbon monoxide? (under standard conditions)

$$Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$$

Task 6 – bonding

You need to be able to represent ionic compounds and simple molecules using dot and cross diagrams, and to compare properties of these substances.

Draw dot and cross diagrams to illustrate the bonding in the following

1. Carbon dioxide, CO_2

2. Ethyne, C_2H_2

3. Magnesium chloride, $MgCl_2$

4. Sodium cyanide, NaCN

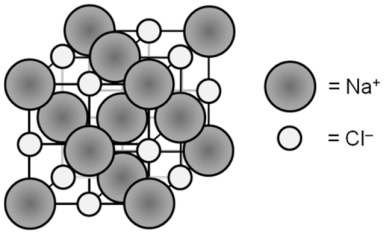
A student has written the revision cards below to help her prepare for the exam. However, she has made a number of mistakes. Correct her cards to make sure she has accurate information to revise from;

Ionic bonding

Between a metal and a non-metallic atom, e.g. NaCl

Electrons are shared between the atoms

The molecules have high melting points owing to the strong electrostatic attraction between the ions



Ionic compounds do not conduct electricity at all as the ions that carry the current are held in a fixed position in the lattice structure

Corrections:

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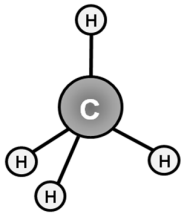
Covalent bonding

Between two non-metallic atoms, e.g. CO_2

Electrons are transferred between the atoms

Covalent molecules have high melting points because of the strong covalent bonds which must be broken



Covalent compounds do not conduct electricity at all as there are no free electrons

Corrections:

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Metallic bonding

In metallic bonding, the outer electrons from the metal atoms merge to produce a lattice of negative metal ions in a sea of delocalised electrons

The strength of the metal depends on two things;
- the charge on the metal ion
- the size of the metal ion
Therefore sodium is stronger than magnesium

Metals have low melting points because of the repulsive forces between the

Corrections:

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