Macmillan Academy

A Level Chemistry

Bridging Project

Welcome to A level chemistry at Macmillan Academy Post 16. We are pleased that this a subject you have an interest in and hope that through completing this bridging project your enthusiasm for chemistry will be further enhanced. The project is split into three sections and we would like you to complete as much of it as you can. Please bring along this booklet when you start your new course with us.

During your A level chemistry course, you will study two key areas; physical chemistry and organic chemistry, along with many underlying key principles. Through the completion of this project you will have a great head-start in understanding and applying some of the core aspects of the course.

As you work through this booklet, we hope you will enjoy exploring the key aspects. You will be working at your own pace and completing what you can. If you have any questions, please email one of us:

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Part 1 GCSE to A-level transition

A substantial part of the work you will cover at the start of your A level studies is an extension of GCSE.

Using your knowledge from GCSE please complete the retrieval questions below, you will then use your cross curricular knowledge to complete the basic mathematical skills tasks afterwards.

What does an atom consist of?	
What are the relative masses of a proton, neutron, and electron?	
What are the relative charges of a proton, neutron, and electron?	
How do you work out the number of protons and electrons in an atom?	
What name is given to atoms of the same element?	
What is the mass number of an element?	
What is an ion?	
Define the term cation	
Define the term anion	
What information can be obtained from an elements group number?	
What information can be obtained from an elements period number?	
Describe what happens during ionic bonding to the electrons.	
Describe what happens during covalent bonding to the electrons.	
DESCRIBE and EXPLAIN the reactivity down group 7.	
What is meant by a REDOX reaction and what happens in terms of electrons?	

Core mathematical skills

Being able to write numbers in standard form and convert them to the correct number of decimal places or significant figures is an essential skill required for A level chemistry.

Standard form is a way of writing a very large or very small number in a more manageable format. For example, $A \times 10^x$ where A is a number from 1 to 10 and x is the number of places you move the decimal place.

For example, to express a large number such as 50 000 mol dm^{-3} in standard form, A = 5 and x = 4 as there are four numbers after the initial 5.

Therefore, it would be written as 5×10^4 mol dm^{-3}.

Practice questions

1 Change the following values to standard form:

a boiling point of sodium chloride: 1413 °C

b largest nanoparticles: $0.0\ 001\times10^{-3}$ m

c number of atoms in 1 mol of water: 1806×10^{21}

2 Change the following values to ordinary numbers.

a 5.5×10^{-6} **b** 2.9×10^{2} **c** 1.115×10^{4} **d** 1.412×10^{-3}

e 7.2×10^{1}

When a number is expressed in significant figures it will only have digits that are important to the number's precision. It is important to record your data and your answers to calculations to a reasonable number of significant figures – usually three. Too many and your answer is claiming an accuracy that it does not have, too few and you are not showing the precision and care required in scientific analysis.

For example, 6.9301 becomes 6.93 if written to three significant figures.

Likewise, 0.000 434 56 is 0.000 435 to three significant figures.

Notice that the zeros before the figure are *not* significant.

Sometimes numbers can be expressed to a few decimal places – usually two. The decimal point is a place holder and the number of digits afterwards is the number of decimal places.

For example, the mathematical number pi is 3 to zero decimal places, 3.1 to one decimal place, 3.14 to two decimal places, and 3.142 to three decimal places.

Practice questions

3 Give the following values in the stated number of significant figures (s.f.).

a 36.937 (3 s.f.) **b** 258 (2 s.f.) **c** 0.043 19 (2 s.f.) **d** 7 999 032 (1 s.f.)

4 Use the equation:

number of molecules = number of moles × 6.02 × 10^{23} molecules per mole to calculate the number of molecules in 0.5 moles of oxygen. Write your answer in standard form to 3 s.f.

5 Give the following values in the stated number of decimal places (d.p.).

a 4.763 (1 d.p.) **b** 0.543 (2 d.p.) **c** 1.005 (2 d.p.) **d** 1.9996 (3 d.p.)

Within chemistry units are widely used and are defined so that, for example, every scientist who measures a mass in kilograms uses the same size for the kilogram and gets the same value for the mass. If you convert between units and round numbers properly it allows quoted measurements to be understood within the scale of the observations.

Multiplication factor	Prefix	Symbol
10^{9}	giga	G
10^{6}	mega	M
10^{3}	kilo	k
10^{-2}	centi	c
10^{-3}	milli	m
10^{-6}	micro	μ
10^{-9}	nano	n

Having to convert units is an essential skill that is required. For instance, you could be converting an enthalpy change of 488 889 J mol^{-1} into kJ mol^{-1}. A kilo is 10^{3} so you need to divide by this number or move the decimal point three places to the left.

488 889 ÷ 10^{3} kJ mol^{-1} = 488.889 kJ mol^{-1}

Practice question

6 Calculate the following unit conversions.

a 300 μm to m

b 5 MJ to mJ

c 10 GW to kW

As part of the physical aspect within chemistry, you will often be required to rearrange an equation to find the desired values.

For example, you may know the amount of a substance (*n*) and the mass of it you have (*m*), and need to find its molar mass (*M*).

The amount of substance (n) is equal to the mass you have (m) divided by the molar mass (M):

$$n = \frac{m}{M}$$

You need to rearrange the equation to make the molar mass (M) the subject.

Multiply both sides by the molar mass (M):

$$M \times n = m$$

Then divide both sides by the amount of substance (n):

$$m = \frac{m}{N}$$

Practice questions

1 Rearrange the equation $c = \frac{n}{V}$ to make:

a n the subject of the equation

b V the subject of the equation.

2 Rearrange the equation $PV = nRT$ to make:

a n the subject of the equation

b T the subject of the equation.

Part 2 organic functional groups

As previously mentioned, one of the two key areas you will study throughout A level chemistry is the organic side of the subject. This covers a vast array of compounds and groups of compounds. You are to select one homologous series from the list below and carry out some research surrounding your chosen series:

- Alkanes
- Alkenes
- Alcohols
- Haloalkanes
- Ketone
- Aldehyde
- Carboxylic acid
- Ester

Success criteria:

- General formula for the homologous series and examples of molecular formulas
- Examples of compounds that are found in that homologous series and their names
- Chemical and physical properties – can you explain why they have these properties?
- What reactions do they take part in? Are there any specific conditions for the reaction?
- What are the compounds used for in industry?

The format in which this is takes can be in a form of your choice e.g. an essay; a book chapter; an audio book chapter; a podcast; a newspaper article; a PowerPoint, a YouTube video; a review article etc. The aim is to demonstrate your ability to study independently.

Part 3 development of practical skills

Chemistry is a practical subject and the experimental work you will carry out provides you with important practical skills, as well as enhancing your understanding of chemical theory. You will develop your practical skills across the two years in line with learning the theory. Your knowledge and understanding will then be assessed at the end of the course.

These hands -on skills are divided into 12 categories. Your task is to select one of the practical tasks listed below and create a practical skills sheet.

Practical tasks

- Determining the concentration of hydrochloric acid
- Determining the enthalpy change of neutralisation
- Synthesis of aspirin

Success criteria:

- Introduction to the practical and some background to the science
- A list of chemicals – with hazards
- Equipment list
- Health and safety
- Procedure

Thank you for completing this bridging project. Please bring it with you when you join us starting your A level chemistry studies. If you would like to do further preparation and reading ahead of the starting the course, please use the two links below to suitable YouTube videos.

https://www.youtube.com/playlist?list=PLi6oabjl6coxUlfu8syK3K0iFXQIjwDUM

https://www.youtube.com/playlist?list=PL7O6CcKg0HaEXpTtPXEiOfcZFsmhdle6e