



GET READY TO STUDY A LEVEL CHEMISTRY

If you are planning to study A Level chemistry with us in September, please review this document and complete the required activities. Please bring the completed activities with you at induction.

FAQ

What specification will I study?

You'll be covering the OCR A specification – you can find it [here](#).

How many lessons will I have a week?

You'll have 4 lessons a week, each lesson is 1 hours and 5 minutes

Who can I contact if I have a question about this subject?

Alex Melhuish, Curriculum Leader for Science, a.melhuish@barnsley.ac.uk

Katie Scott, Teacher of Chemistry, katie.scott@barnsley.ac.uk

What subjects go well with Chemistry?

It's a challenging science subject so we recommend you choose other STEM subjects such as biology, maths and physics to complete your study programme.

What grades should I have?

In addition to the general sixth form entry requirements, learners must have a 6 in chemistry and another science or 66 in combined science and 5 in maths

WHAT WILL I STUDY?

In Year 1, you will study the following topics:

Foundation skills in chemistry

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

Periodic table and energy

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

Core organic chemistry

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

In Year 2, you will study the following topics:

Physical chemistry and transition elements

- Reaction rates and equilibrium (quantitative) • pH and buffers
- Enthalpy, entropy and free energy • Redox and electrode potentials
- Transition elements

Organic chemistry and analysis

- Aromatic compounds • Carbonyl compounds • Carboxylic acids and esters
- Nitrogen compounds • Polymers • Organic synthesis
- Chromatography and spectroscopy (NMR)

Practical skills are developed throughout the course

WHAT WILL I NEED?

To study the course, you will need the following equipment:

- A scientific calculator
- A folder with dividers
- Lined paper
- Pens and pencils
- Highlighters
- A ruler

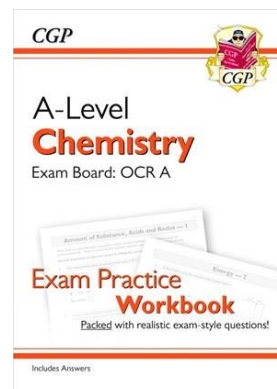
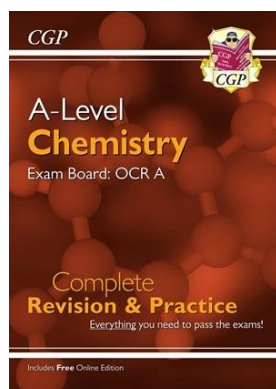
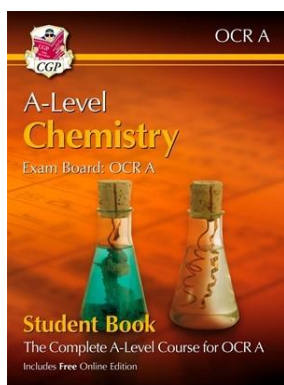
Students also find it useful to have:

- Blank flashcards
- A whiteboard and whiteboard pens

We recommend all students buy a textbook, lab coat and safety glasses

These can be purchased from the college at the start of term.

Financial support is available for these.



FIND OUT MORE

These activities are to help broaden your understanding of the subject in preparation for studying this subject at an advanced level.

Careers	Here are some useful links looking at careers in chemistry Science and research careers Career options in chemistry Prospects
Social Media	MaChemGuy on Twitter
YouTube	There are some really useful videos for the course so we recommend subscribing to the following channels MaChemGuy Allery Chemistry Royal Society of Chemistry
Further Reading / Useful websites	Keep up to date with the latest news and events in chemistry Chemistry world Royal Society of Chemistry

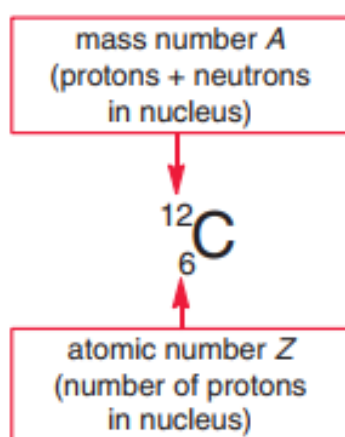
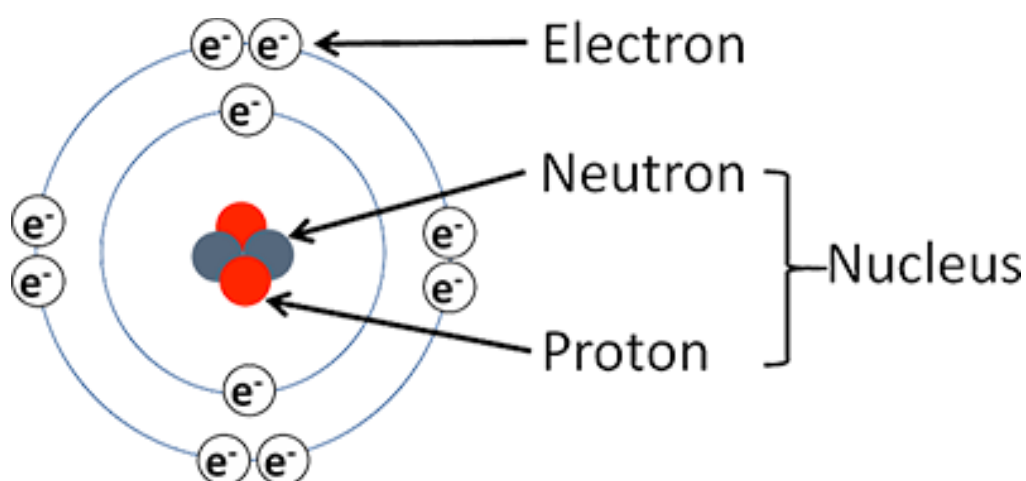
REQUIRED ACTIVITIES

It is important that all the required activities are completed in preparation for starting your course. Please bring the last section "Questions to submit" with you at induction.

Choosing your A Levels can be a challenge for some learners therefore if you are undecided around which subjects you are planning to study completing these activities will give yourself greater insight into the course to help ensure you have made the right choice.

Atomic structure

Revise atomic structure – make sure you can describe the structure of an atom and link the sub-atomic particles to the numbers on a periodic table. This [video](#) will help you recap.



Have a go at completing questions 1 and 2 in the questions to submit section.

Revise relative atomic mass calculations – this [video](#) will help you recap.

Finding A_r

- Find the relative atomic mass of Chlorine.

Isotope	Relative Mass	Abundance
^{35}Cl	34.969	75.80%
^{37}Cl	36.966	24.20%

$$A_r(\text{Cl}) = \frac{34.969 \times 75.8 + 36.966 \times 24.2}{100}$$

$$A_r(\text{Cl}) = 35.45$$

Have a go at completing questions 3 in the questions to submit section.

Formulae

You need to know the formula and charge of common ions and compounds. This list includes some of the common ions you should know:

List of Common Ions and Their Charges

Polyatomic ions		Other ions	
ammonium	NH_4^+	silver	Ag^+
carbonate	CO_3^{2-}	zinc	Zn^{2+}
sulfate	SO_4^{2-}	iron(II)	Fe^{2+}
phosphate	PO_4^{3-}	iron(III)	Fe^{3+}
nitrate	NO_3^-	copper(II)	Cu^{2+}
hydroxide	OH^-		

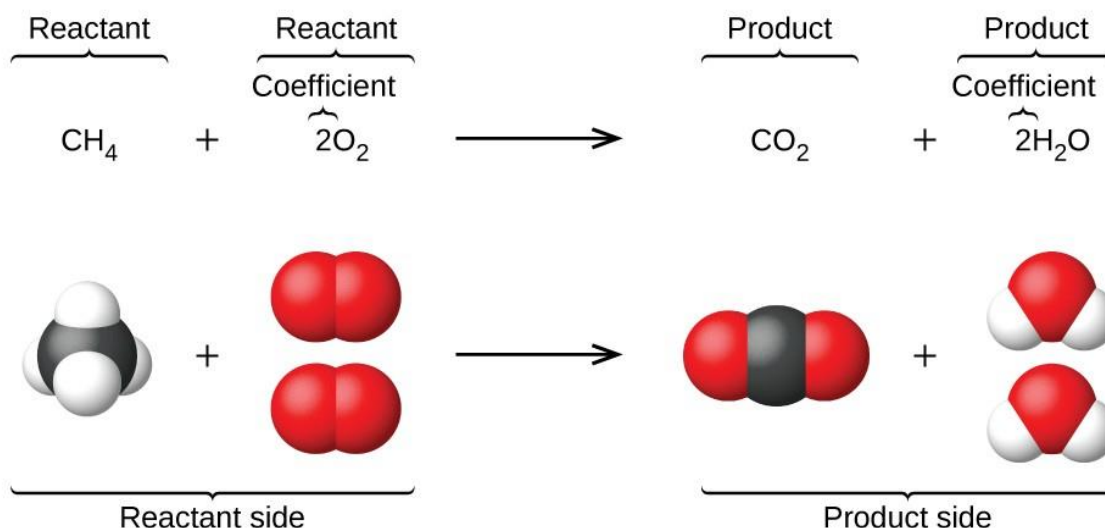
Watch the [video](#) and complete the activities on the video.

Once you are confident at writing formula complete Q4 in the questions to submit section.

Balancing equations

First write out the correct formula for all reactants and products.

Then use coefficients to get all atoms to balance

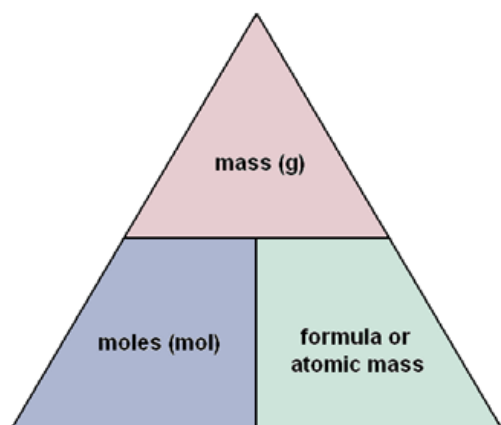


Watch this [video](#) if you need help with balancing equations.

Have a go at completing Q5 & Q6 in the questions to submit section.

Moles Calculations and calculating reacting masses

Calculating moles is an important skill in A level chemistry and it is vital that you are confident using this equation. Watch this [video](#) and complete the activity.

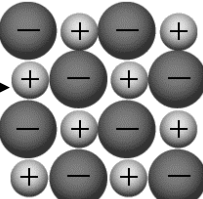
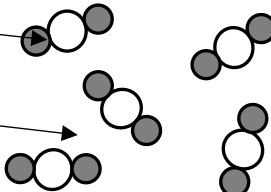
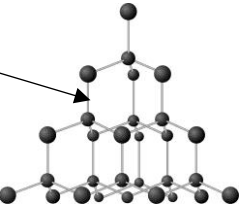
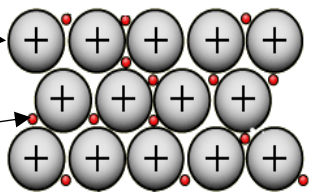


Have a go at completing Q7 – Q9 in the questions to submit section

Watch the [video](#) on calculating reacting mass completing the activities within the video.

Have a go at completing Q10 in the questions to submit section

Structure and Bonding. Research the properties of the different structures and given an explanation for these properties.

Structure	Properties	Explanation
<p>Giant ionic structure</p> <p><i>Lattice of positive and negative ions strongly attracted together</i></p> 	Melting point	
	Electrical conductivity	
<p>Simple molecular structure</p> <p><i>Strong covalent bonds</i></p> <p><i>Weak intermolecular forces</i></p> 	Melting point	
	Electrical conductivity	
<p>Giant covalent structure</p> <p><i>Strong covalent bonds</i></p> 	Melting point	
	Electrical conductivity	
<p>Metallic structure</p> <p><i>Positive ions</i></p> <p><i>Delocalised electrons from the outer shells of the metal atoms</i></p> 	Melting point	
	Electrical conductivity	

General math skills

Often questions ask for answers to be given to a certain number of significant figures

Notice: The zeros are not significant when they are at the beginning of the number.

Or standard form

Standard Form

Positive Power = Large Number

$$4.3 \times 10^6 = 4\,300\,000$$

Negative Power = Small Number

$$2.1 \times 10^{-3} = 0.021$$

Converting units

Mass units		How to convert
1000 mg	1g	Divide by 1000
1000 g	1kg	Divide by 1000
1000 kg	1 tonne	Divide by 1000
Volume units		
1000 cm ³	1 dm ³	Divide by 1000
1000 dm ³	1 m ³	Divide by 1000
Temperature units		
0 °C	273 Kelvin	Add 273
Pressure units		
1000 Pa	1 kPa	Divide by 1000

Have a go at Q11 in the questions to submit section.

Basic Organic chemistry

Half of the course is dedicated to organic chemistry. Can you name the first 10 alkanes?

Molecular formula	Condensed Structural Formula	Name
CH ₄	CH ₄	
C ₂ H ₆	CH ₃ CH ₃	
C ₃ H ₈	CH ₃ CH ₂ CH ₃	
C ₄ H ₁₀	CH ₃ CH ₂ CH ₂ CH ₃	
C ₅ H ₁₂	CH ₃ CH ₂ CH ₂ CH ₂ CH ₃	
C ₆ H ₁₄	CH ₃ CH ₂ CH ₂ CH ₂ CH ₂ CH ₃	
C ₇ H ₁₆	CH ₃ CH ₂ CH ₂ CH ₂ CH ₂ CH ₂ CH ₃	
C ₈ H ₁₈	CH ₃ CH ₂ CH ₂ CH ₂ CH ₂ CH ₂ CH ₂ CH ₃	
C ₉ H ₂₀	CH ₃ CH ₂ CH ₂ CH ₂ CH ₂ CH ₂ CH ₂ CH ₂ CH ₃	
C ₁₀ H ₂₂	CH ₃ CH ₂ CH ₂ CH ₂ CH ₂ CH ₂ CH ₂ CH ₂ CH ₂ CH ₃	

Understanding functional groups are an important of organic chemistry. Can you name these common functional groups? If not do some research to find out.

Structure	Functional group	Structure	Functional group
$\begin{array}{c} \text{R} \quad \text{H} \\ \diagdown \quad / \\ \text{C} = \text{C} \\ / \quad \diagdown \\ \text{H} \quad \text{H} \end{array}$		$\text{R}-\text{X}$ <p>X = F, Cl, Br, I</p>	
$\begin{array}{c} \text{H} \\ \\ \text{R}-\text{C}-\text{OH} \\ \\ \text{H} \end{array}$		$\begin{array}{c} \text{O} \\ \\ \text{R}-\text{C}-\text{OH} \end{array}$	
$\begin{array}{c} \text{O} \\ \\ \text{R}-\text{C}-\text{H} \end{array}$		$\begin{array}{c} \text{O} \\ \\ \text{R}-\text{C}-\text{R} \end{array}$	
$\begin{array}{c} \text{O} \\ \\ \text{R}-\text{C}-\text{O}-\text{R} \end{array}$		$\begin{array}{c} \text{O} \\ \\ \text{R}-\text{C}-\text{NH}_2 \end{array}$	
$\text{R}-\text{NH}_2$		$\text{R}-\text{C}\equiv\text{N}$	

INDUCTION TASK

Atomic Structure

Q1. Complete the table to show the location, relative charge and relative mass of each sub-atomic particle found within an atom

Sub-atomic particle	Location	Relative charge	Relative mass
Neutron			
Proton			
Electron			

Q2. Complete the missing data in the table below :

Atom	Atomic Number	Mass Number	No. of protons	No. of electrons	No. of neutrons
N					
K					
	5	11			
			18		22

Q3. Calculate the relative atomic mass of the following elements

Remember for each isotope you have to take into account its mass and its relative abundance, e.g. %

a) Boron contains: 19.77% ^{10}B & 80.23% ^{11}B Ar: _____

b) Silicon contains: 92.18% ^{28}Si , 4.70% ^{29}Si & 3.12% ^{30}Si Ar: _____

c) X contains: 4.31% ^{50}X , 83.76% ^{52}X , 9.55% ^{53}X & 2.38% ^{54}X Ar: _____

Use the periodic table to work out the identity of this unknown element: _____

Formula and equations

Q4. Complete the grid to give the correct formula

cation	chloride	sulfate	hydroxide	nitrate
sodium	NaCl	Na ₂ SO ₄		NaNO ₃
calcium		CaSO ₄	Ca(OH) ₂	
aluminium				Al(NO ₃) ₃
hydrogen		H ₂ SO ₄		
magnesium	MgCl ₂			
silver(I)			AgOH	
potassium		K ₂ SO ₄		

Q5. Balance the following equations:

1. $\dots\text{C} + \dots\text{O}_2 \longrightarrow \dots\text{CO}$
2. $\dots\text{Ba} + \dots\text{H}_2\text{O} \longrightarrow \dots\text{Ba(OH)}_2 + \dots\text{H}_2$
3. $\dots\text{C}_2\text{H}_6 + \dots\text{O}_2 \longrightarrow \dots\text{CO}_2 + \dots\text{H}_2\text{O}$
4. $\dots\text{HCl} + \dots\text{Mg(OH)}_2 \longrightarrow \dots\text{MgCl}_2 + \text{H}_2\text{O}$
5. $\dots\text{N}_2 + \dots\text{O}_2 \longrightarrow \dots\text{NO}$
6. $\dots\text{Fe}_2\text{O}_3 + \dots\text{C} \longrightarrow \dots\text{Fe} + \dots\text{CO}_2$

Q6. Write balanced equations for each of these reactions from their description. You need to work out the formulae of the reactants and products first then balance the equations.

Hint: Common gases like nitrogen and oxygen are all diatomic molecules (they go around in pairs like O_2).

1. The reaction between silicon and nitrogen to form silicon nitride Si_3N_4 .
.....
2. The extraction of iron from iron(III) oxide (Fe_2O_3) using carbon monoxide.
.....
3. The preparation of boron trichloride from its elements.
.....
4. The reaction of nitrogen and oxygen to form nitrogen monoxide.
.....
5. The formation of silicon tetrachloride (SiCl_4) from SiO_2 using chlorine gas and carbon.
.....

Mole calculations

Q7. Calculate the Mr of each compound listed below, showing full working:

- a) CaCO_3
- b) Cu(OH)_2
- c) $(\text{NH}_4)_2\text{SO}_4$

Q8. Calculate the number of moles in the following:

- a) 90.0 g of H₂O
- b) 20.0 g of C₄H₁₀
- c) 685 g of NH₃

Q9. Calculate the mass of the following:

- a) 2.50 moles of PH₃
- b) 0.400 moles of C₂H₅OH
- c) 10.0 moles of Ca(OH)₂

Q10. Carry out these reacting mass calculations:

What mass of iron is formed when 240 g of iron(III) oxide reacts with carbon monoxide?



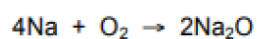
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What mass of oxygen reacts with 9.2 g of sodium?



.....

.....

.....

Q11.

a) Round the following number 304659

2 significant figures	3 significant figures	3 significant figures and standard form

b) Round the following number 0.0005433894

2 significant figures	3 significant figures	3 significant figures and standard form

c) Convert the following values

200 cm ³ into dm ³	
250 mg into g	
2 kg into g	
3000 kg into tonnes	
0.00680 g into mg	
500 cm ³ into m ³	
25 °C into Kelvin	
300 Kelvin into °C	
3.5 m ³ into dm ³	
5.5 kPa into Pa	