Year 12 Chemistry Summer Work 2026

The concepts in A Level Chemistry build on from the topics you learnt at GCSE. The purpose of the following tasks is to review knowledge from GCSE and to introduce you to some general maths skills that are required at A Level. Use the links to help you complete the tasks on this sheet (printed) or on lined paper. Bring the completed tasks with you to your first lesson.

It is vital that you attempt to complete all the tasks before the start of the course in September. If you are struggling with a section that is ok, think of a question that you could ask when you start the course that would help you to complete the section – write it down and bring it with you.

Good luck, we are looking forward to seeing you in September 😊

Section 1 Atomic Structure, Formulae and Equations

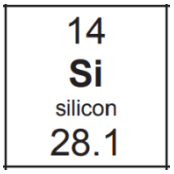
Atomic Structure GCSE Bitesize Atomic Structure OCR A

Task: Draw and label a lithium atom (include as much detail as possible)

Task: Complete the following table with information about the sub-atomic particles

Particle	Relative mass	Relative charge	Location in atom
Proton			
Neutron			
Electron			

Task: Label the following chemical symbol (include as much detail as possible)



Define: What does the term ISOTOPE mean?

Task: Complete the following table for the isotopes of Carbon

Isotope	$^{12}C_6$	$^{13}C_6$	$^{14}C_6$
Mass Number, Z			
Atomic Number, A			
Number of neutrons			
Number of protons			
Number of electrons			

Ions GCSE Bitesize Forming Ions OCR A

Define: What does the term ion mean?

Task: Complete the following table for two different ions

Ion	$^{23}Na_{11}^{+}$	$^{35}Cl_{17}^{-}$
Atomic Number, *Z*		
Mass Number, *A*		
Protons		
Neutrons		
Electrons		
Overall charge		

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Formulae of Simple Covalent Molecules

At A-Level you are expected to know the formula of several simple covalent molecules.

Task: The table below shows some of the formulae you will need for the A Level course. Complete the table by adding the formulae

Name	Formula	Name	Formula
Water		Chlorine	
Carbon dioxide		Hydrochloric acid	
Ammonia		Sulfuric acid	
Methane		Nitric acid	
Hydrogen		Ethanoic acid	

Suggestion: Make flashcards of any formulae above that you are not confident with and use them to learn the formulae and gain confidence 😊

Formulae of Ions

At A-Level you are expected to know the formula of several ions.

Task: The formula of simple ions can be worked out using the Periodic table. Complete the table below to state the charge formed on an ion from each Group of the Periodic table (excluding groups 4 and 0)

Group	1	2	3	5	6	7
Charge	1+					

Task: The elements in the transition block on the Periodic table can have multiple charges. The charge on the ion is shown as a Roman numeral in a name e.g. iron (III) = Fe^{3+}

Complete the table to state the formula and charge on each transition element shown.

Name	Formula	Name	Formula
Iron (III)	Fe^{3+}	Copper (II)	
Iron (II)			Mn^{7+}
Copper (I)		Manganese (IV)	

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Task: The table below shows some of the formulae you will need to learn for the A Level course. Complete the table by adding the formulae – make sure you include charges

Name	Formula	Name	Formula
Hydrogen ion		Hydrogen carbonate	
Hydroxide		Phosphate	
Sulfate		Ammonium	
Carbonate		Zinc ion	
Nitrate		Silver ion	

Suggestion: Make flashcards of any formulae above that you are not confident with and use them to learn the formulae and gain confidence 😊

Formulae of Ionic Compounds VIDEO LINK

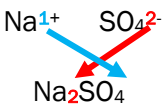
Ionic compounds have no overall charge (they are neutral). Look at the following example of how to make sure the charges cancel out:

Sodium sulfate contains Na^+ and SO_4^{2-} ions

Na^+	SO_4^{2-}	
Na^+		
2+	2-	charges now balance

Formula: Na_2SO_4

Cross-over method:



Task: Write the formulae for the following ionic compounds:

1) Calcium carbonate .....
2) Calcium nitrate .....
3) Aluminium oxide .....
4) Iron (III) hydroxide .....
5) Ammonium sulfate .....

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Balancing Equations VIDEO LINK

A key concept for any chemistry is balancing equations. We balance equations to make sure that we have the same number of each element on each side (nothing is lost or gained). This allows us to see the ratio of the reactants and products in the reaction e.g.

$$2\ Na + Cl_2 \rightarrow 2\ NaCl$$

Ratio 2 : 1 : 2

This enables us to work out reacting amounts in moles:

4 moles of Na will react with 2 moles of Cl_2 and form 2 moles of NaCl

Task: Watch the video link above on balancing equations and then attempt the questions below.

1) .....Na + ...H_2O → .....NaOH + ...H_2
2) .....KOH + ...H_2SO_4 → .....K_2SO_4 + H_2O
3) .....Br_2 + ...NaI → .....NaBr + ...I_2
4) .....$NaHCO_3$ → .....Na_2CO_3 + ...H_2O + ...CO_2
5) .....$ZnCO_3$ → .....ZnO + ...CO_2

During the A Level you will also need to write balanced ionic and half-equations. Take a look at these videos ahead of the course:

VIDEO: Ionic Equations

VIDEO: Half-equations

Section 2 General Maths Skills

Standard Form VIDEO LINK – part of a series on standard form

$A \times 10^n$

Where A is the first significant figure and n describes the direction and number of decimal places the decimal point has moved.

Task: Write the following in standard form:

a) 0.0000000003 .....

b) 560000000000 .....

Task: Change the following to ordinary numbers

a) 5.5×10^{-6} .....

b) 1.115×10^{4} .....

Significant figures VIDEO LINK

- Zeros after the first non-zero digit are significant
- Zeros before the first non-zero are not significant.
- To round: consider the number after the last desired significant figure, round the last significant figure accordingly.

Task: Complete the following calculations, giving your answers to three significant figures.

a) 32420 + 762891 .....

b) 12000 ÷ 1000 .....

c) 0.06438 + 0.0004378 .....

d) 180 ÷ 90 .....

Unit Conversions

During A Level calculations you may have to convert from one unit of measurement to another. Below are a few common unit conversions to practice. Make sure you learn these!

Volumes VIDEO LINK 1000 cm^3 = 1 dm^3

1000000 cm^3 = 1 m^3

Task: Annotate the following to show the conversion factors for volumes

Temperatures VIDEO LINK 0 K = -273 °C (absolute zero)

Task: Annotate the following to show the conversion factors for temperatures

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Pressures 1000 Pa = 1 kPa

Task: Annotate the following to show the conversion factors for pressures

Pa ⟶ kPa

Task: Convert the following values

1) 25 °C → Kelvin .....
2) 200 cm^3 → dm^3 .....
3) 2.53 kPa → Pa .....
4) 75 cm^3 → m^3 .....
5) 98 °C → Kelvin .....

Avogadro's Number: THE MOLE! VIDEO LINK

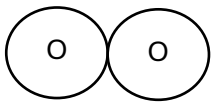
A mole is a measure of 'amount of substance'. One mole of any substance contains a specific number of particles: 6.02×10^{23} (The Avogadro's Constant).

For example:

1 mole of O_2 will contain 6.02×10^{23} molecules of oxygen

2 moles of O_2 will contain $2 \times (6.02 \times 10^{23}) = 1.204 \times 10^{24}$ molecules of oxygen

But.....how many moles of oxygen atoms are in 1 mole of oxygen?



1 molecule of oxygen contains 2 atoms, so.....

6.02×10^{23} molecules of oxygen will contain

$2 \times (6.02 \times 10^{23}) = 1.204 \times 10^{24}$ atoms of oxygen (2 moles)

Worked question:

How many ions are there in 0.75 mol of NaOH?

1 unit of NaOH contains 2 ions Na^+ and OH^- so 0.75 mol NaOH contains 2 x 0.75 = 1.5 mol of ions

Number of particles = number of moles x $6.02 \times 10^{23} = 1.5 \times (6.02 \times 10^{23}) = 9.03 \times 10^{23}$ ions

Task: Answer the following moles questions (write your answer in standard form)

1) How many atoms are there in 0.5 moles of water (H_2O)? .....atoms

2) How many sodium ions are there in 1.5 moles of NaCl? .....Na^+ ions

3) How many chloride ions are there in 0.25 mol of $CaCl_2$? .....Cl^- ions

4) How many oxygen atoms are there in 0.70 mol of CO_2? ..... O atoms

5) How many ammonium ions are there in 1.2 mol of $(NH_4)_2SO_4$? .....NH_4 ions

Mole Concepts

The mole is an important concept in quantitative chemistry. The mole allows chemists to convert from mass or volume or concentrations. It also allows chemists to compare amount of substance.

Mass VIDEO LINK

The mass of 1 mole of any substance is called the molar mass. It is the relative atomic mass or relative formula mass of a substance in grams.

e.g. 1 mole of carbon has a mass of 12g 1 mole of CO_2 has a mass of 44g

To convert from mass to moles we use the following equation:

$$moles\ (n) = \frac{mass\ (m)}{Mr}$$

Task: Use the above equation to calculate moles, mass or Mr in each of the following questions.

1) What is the mass of 1.5 moles of H_2O (Mr = 18) .....g

2) If 1.2 moles of substance X has a mass of 19.2 g, what is its Mr? .....g mol^{-1}

3) How many moles are there in 2.5 g of ammonia (Mr = 17)? .....mol

Gas Volumes

At room temperature and pressure 1 mole of any gas has a volume of 24 dm^3.

$$volume\ (v) = moles(n)\ x\ 24$$

Task: Use the above equation to calculate the following

1) The volume occupied by 1.5 moles of NH_3 (in dm^3) ..... dm^3

2) The volume occupied by 0.73 moles of Cl_2 (in cm^3) ..... cm^3

3) The number of moles of O_2 gas in 230 cm^3 ..... mol

4) The number of moles of CH_4 gas in 0.95 dm^3 ..... mol

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Concentrations VIDEO LINK (first 2 min useful for this section)

The concentration of a substance tells us how many moles of the substance are dissolved per unit volume. For example, a solution with a concentration of 0.5 mol dm^{-3} contains 0.5 mol in each 1 dm^3. You can use this concept to calculate how many moles you have in any volume using the following equation:

$$concentration\ (c) = \frac{moles\ (n)}{volume\ (v)}$$

Task: Use the above equation to calculate the following:

1) The concentration of a solution if 250 cm^3 contains 0.32 moles

..... mol dm^{-3}

2) The concentration of a solution if 36 cm^3 contains 9.2 x 10^{-2} moles

..... mol dm^{-3}

3) The number of moles present in 45 cm^3 of a 0.2 mol dm^{-3} solution

..... mol dm^{-3}

4) The number of moles present in 57 cm^3 of a 0.5 mol dm^{-3} solution

..... mol dm^{-3}