A Level Chemistry Bridging Pack

A Level Chemistry Bridging Work
For students moving from Year 11 into Year 12
OCR Chemistry A (H432)
Submission Date: First Chemistry Lesson in September

Contents

Welcome to A Level Chemistry

Congratulations on choosing A Level Chemistry! This subject builds upon the foundations you studied at GCSE and pushes your scientific thinking to new levels. This pack will help you bridge the gap between GCSE and the A Level course starting in September.

You get out of the course what you put into it. If you're aiming for top grades, the extra time you invest now will set you up for success later. Use this pack to guide your preparation. Complete the tasks that align with the grade you want to achieve at the end of the course.

Structure of the Pack:

Tasks are divided into three categories:

- **Aiming for: Grade C & Above** – Core knowledge and skills needed for success
- **Aiming for: Grade B & Above** – Tasks that consolidate and enrich your understanding
- **Aiming for: A/A*** – Stretch and explore for those who want to go further and are pushing for top grades

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✅ Section 1 – Chemistry Skills Check & Audit

Task: Chemistry Self-Audit

Fill in the Chemistry Skills Confidence Grid (1 – Low, 5 – High)

Topic	Confidence (1–5)	Comments
Atomic structure		
The periodic table		
Bonding		
Moles & chemical equations		
Acids, bases & neutralisation		

Reflect on your scores: Which topics do you feel strongest in? Which need more revision?

🧮 Section 2 – Mole Calculations & Chemistry Maths *(Aiming for: Grade C & Above)*

Linked to OCR Spec: Module 2.1.3 Amount of Substance

Includes:

- Recap notes: What is a mole? Equations to remember
- Practice questions with scaffolded support:
  - Mass, moles, molar mass (n = m/Mr)
  - Solutions (n = c × V)
  - Gases (n = V / 24 dm^3)
  - Reacting mass calculations using equations

Task: Complete all questions, self-mark, and reflect on common errors

PART 1: MEASURING AMOUNT OF SUBSTANCE

1) Mass

Convert the following into grams:

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

2) 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

$n = V \times c$

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

PART 2: USING CHEMICAL EQUATIONS

How many moles?

1) Jahin weighs a sample of $CaCO_3$ and records a mass of 5.0 g. How many moles of calcium carbonate are present?

2) Fatima measures out 50 cm^3 of 0.1 $moldm^{-3}$ hydrochloric acid. How many moles of hydrochloric acid are present?

3) Hussain collects 48 cm^3 of carbon dioxide in a gas syringe. How many moles of carbon dioxide are present?

Using Chemical Equations

Chemical Equations show the ratio in which different species react in a chemical reaction.

This equation shows that 6 moles carbon dioxide of react with 6 moles of water to make 1 mole of glucose and 6 moles of oxygen.

6: 6: 1: 6

How many moles of water are needed to react with 0.03 moles of carbon dioxide?

How many moles of glucose can you make from 0.03 moles of carbon dioxide?

How many moles of oxygen can you make from 0.03 moles of carbon dioxide?

Equation 1: $Mg + 2HCl \rightarrow MgCl_2 + H_2$

a) How many moles of magnesium would be needed to react with 0.01 moles of hydrochloric acid?

b) How many moles of hydrogen could be produced from 0.01 moles of hydrochloric acid?

Equation 2: $2H_2S + 3O_2 \rightarrow 2SO_2 + 2H_2O$

a) How many moles of oxygen is needed to react with 0.5 moles of hydrogen sulphide?

b) How many moles of sulphur dioxide can be made from 0.5 moles of hydrogen sulphide?

Equation 3: $4K + O_2 \rightarrow 2K_2O$

a) How many moles of oxygen are needed to react with 0.05 moles of potassium?

b) How many moles of potassium oxide can be made from 0.05 moles of potassium?

Calculating Reacting Quantities from Chemical Equations

You perform these calculations in three steps:

- calculate the number of moles of one of the substances (you will either be given the mass, or the aqueous volume and the concentration, or the gaseous volume)

- use the equation to work out the number of moles of the other substance (mole ratio)

- use one of the mole relationships to work out the quantity you need

1) What mass of hydrogen is produced when 192 g of magnesium is reacted with hydrochloric acid? (3)

$$Mg + 2HCl \rightarrow MgCl_2 + H_2$$

2) What mass of oxygen is needed to react with 8.5 g of hydrogen sulphide (H_2S)? (3)

$$2\ H_2S + 3\ O_2 \rightarrow 2\ SO_2 + 2\ H_2O$$

3) What mass of potassium oxide is formed when 7.8 g of potassium is burned in oxygen? (3)

$$4\ K + O_2 \rightarrow 2\ K_2O$$

4) What mass of oxygen is required to oxidise 10 g of ammonia to NO? (3)

$$4\ NH_3 + 5\ O_2 \rightarrow 4\ NO + 6\ H_2O$$

5) What mass of aluminium oxide is produced when 135 g of aluminium is burned in oxygen?

$2\ Al + 3\ O_2 \rightarrow Al_2O_3$

6) What mass of iodine is produced when 7.1 g of chlorine reacts with excess potassium iodide?

$Cl_2 + 2\ KI \rightarrow 2\ KCl + I_2$

7) What volume of hydrogen is needed to react with 32 g of copper oxide? (3)

$CuO + H_2 \rightarrow Cu + H_2O$

8) What volume of oxygen is formed when 735 g of potassium chlorate decomposes? (3)

$2\ KClO_3 \rightarrow 2\ KCl + 3\ O_2$

9) What volume of hydrogen is produced when 195 g of potassium is added to water? (3)

$2\ K + 2\ H_2O \rightarrow 2\ KOH + H_2$

10) What mass of calcium carbonate is required to produce 1.2 dm^3 of carbon dioxide? (3)

$CaCO_3 \rightarrow CaO + CO_2$

11) What mass of magnesium oxide is formed when magnesium reacts with 6 dm^3 of oxygen? (3)

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

12) What volume of carbon dioxide is produced when 5.6 g of butene (C_4H_8) is burnt? (3)

$C_4H_8 + 6\ O_2 \rightarrow 4\ CO_2 + 4\ H_2O$

13) The pollutant sulphur dioxide can be removed from the air by reaction with calcium carbonate in the presence of oxygen. What mass of calcium carbonate is needed to remove 480 dm^3 of sulphur dioxide? (3)

$2\ CaCO_3 + 2\ SO_2 + O_2 \rightarrow 2\ CaSO_4 + 2\ CO_2$

14) 25 cm^3 of a solution of sodium hydroxide reacts with 15 cm^3 of 0.1 mol/dm^3 HCl. What is the molar concentration of the sodium hydroxide solution? (3)

$HCl + NaOH \rightarrow NaCl + H_2O$

Answers to Questions

MEASUREMENTS IN CHEMISTRY

Mass

a) 0.25 x 1000 = 250 g
b) 15 x 1000 = 15000 g
c) 100 x 10^6 = 1 x 10^8 g
d) 2 x 10^6 g

Volume

a) 100/100 = 0.1 dm^3
b) 25/1000 = 0.025 dm^3
c) 50 x 1000 = 50000 dm^3
d) 50000/1000 = 50 dm^3

What is a mole?

a) (2.5 x 10^{21})/(6.02 x 10^{23}) = 4.15 x 10^{-3}
b) 0.25 x 6.02 x 10^{23} = 1.51 x 10^{23}

How can you work out how many moles you have?

a) From a measurement of **MASS**:

1.	a) 0.10	b) 0.078	c) 5500	d) 0.16	e) 0.022
2.	a) 3.6 g	b) 14.9 g	c) 5.6 g	d) 39.9 kg	e) 6.8 g
3.	a) 28	b) 40	c) 160	d) 28	e) 249.6

b) From a measurement of AQUEOUS VOLUME:

1. a) 2.5 x 10^{-3} b) 8 x 10^{-3} c) 0.015 d) 2.5 x 10^{-3} e) 5 x 10^{-3}
2. a) 2.5 $moldm^{-3}$, 91.3 gdm^{-3} b) 0.4 $moldm^{-3}$, 16 gdm^{-3}
   c) 0.121 $moldm^{-3}$, 11.9 gdm^{-3} d) 0.1 $moldm^{-3}$, 16.0 gdm^{-3}
   e) 2 $moldm^{-3}$, 34 gdm^{-3}
3. a) 350 gdm^{-3}, 5.98 $moldm^{-3}$ b) 100 gdm^{-3}, 0.627 $moldm^{-3}$
   c) 100 gdm^{-3}, 2.74 $moldm^{-3}$ d) 32 gdm^{-3}, 0.8 $moldm^{-3}$
   e) 50 gdm^{-3}, 1.47 $moldm^{-3}$

c) From a measurement of GASEOUS VOLUME:

1. a) 2 b) 0.05 c) 0.022 d) 4.0 e) 2.5×10^{-3}
2. a) 1.2 dm^3 b) 6 dm^3 c) 24 dm^3 d) 2.4 dm^3 e) 10.4 dm^3
3. a) 64 g b) 2.2 g c) 0.23 g d) 296 g e) 0.115 g

How many moles?

1) 0.05
2) 5×10^{-3}
3) 2×10^{-3}

Using Chemical Equations

Equation 0: a) 0.03 b) 0.005 c) 0.03

Equation 1: a) 0.005 b) 0.005

Equation 2: a) 0.75 b) 0.5

Equation 3: a) 0.0125 b) 0.025

Calculating Reacting Quantities from Chemical Equations

1) Moles Mg = 192/24.3 = 7.90mol

   Moles H_2 = 7.90mol (1:1 ratio with Mg)

   Mass H_2 = moles x Mr = 7.90 x 2 = 15.80g

2) Moles H_2S = 8.5/34.1 = 0.249mol

   Moles O_2 = 0.249 x 3/2 = 0.3735mol

   Mass O_2 = 0.03735 x 32 = 12.0g (to 3 sig fig)

3) Moles K = 7.8/39.1 = 0.199 mol

   Moles K2O = 0.199/2 = 0.0995mol

   Mass K2O = 0.0995 x 94.2 = 9.37g

4) Moles NH3 = 10/17 = 0.588mol

   Moles O2 = 0.588 x 5/4 = 0.735mol

   Mass O2 = 0.735 x 32 = 23.5g

5) Moles Al = 135/27.0 = 5mol

   Moles Al_2O_3 = 5/2 = 2.5mol

   Mass Al_2O_3 = 2.5 x 102 = 255g

6) Moles Cl_2 = 7.1/71 = 0.1 mol

   Moles I_2 = 0.1mol (1:1 ratio)

   Mass I_2 = 0.1 x 253.8 = 25.4g

7) Moles CuO = 32/79.5 = 0.402…mol

   Moles H_2 = 0.402… (1:1 ratio)

   Vol H_2 = n x 24 = 0.402… x 24 = 9.65dm^3

8) Moles $KClO_3$ = 735/122.6 = 5.995…mol

   Moles O_2 = 5.995… x 3/2 = 8.992…mol

   Vol O_2 = 8.992… x 24 = 216dm^3 (3 sigfig)

9) Moles K = 195/39.1 = 4.987…mol

   Moles H_2 = 4.987… /2 = 2.49 mol

   Vol H_2 = 2.49 x 24 = 59.8dm^3

10) Moles CO_2 = V/24 = 1.2/24 = 0.05mol

    Moles $CaCO_3$ = 0.05mol (1:1 ratio)

    Mass $CaCO_3$ = 0.05 x 100.1 = 5.01g (3 sig fig)

11) Moles O_2 = V/24 = 6/24 = 0.25mol

    Moles MgO = 0.25 x 2 = 0.5mol

    Mass MgO = 0.5 x 40.3 = 20.2g (3 sig fig)

12) Moles butene = 5.6/56 = 0.1mol

    Moles CO_2 = 0.1 x 4 = 0.4mol

    Vol CO_2 = n x 24 = 0.4 x 24 = 9.6dm^3

13) Moles SO_2 = V/24 = 480/24 = 20mol

    Moles of $CaCO_3$ = 20mol (1:1 ratio)

    Mass of $CaCO_3$ = 20 x 100.1 = 2002g = 2.002kg

14) Moles HCl = c x V (in dm^3) = 0.1 x 0.015dm^3 = 0.0015mol

    Moles NaOH = 0.0015 (1:1 ratio)

    Conc NaOH = n/V(in dm^3) = 0.0015/0.025 = 0.06$moldm^{-3}$

🧠 Section 3 – Atomic Structure, Bonding & the Periodic Table *(Aiming for: Grade B & Above)*

Linked to OCR Spec: Module 2.1.1, 2.2, 3.1

Task: Create a Learning Resource (Poster, Slide, or Infographic)

Use A4 paper or digital tools. Your resource should include:

- Atomic structure (protons, neutrons, electrons, isotopes)
- How electron structure links to group/period
- Group 2 and Group 7 properties & reactivity trends
- Explanation of different bonding types:
  - Giant ionic
  - Giant covalent (diamond, graphite, graphene)
  - Metallic
  - Simple molecular
- Diagrams and comparisons

Checklist for Success:

- ❑ Diagrams are included
- ❑ Explanations link to periodicity and properties
- ❑ At least one example for each bonding type

To help you with finding A level knowledge about these (hopefully) familiar concepts, here are some useful links:

Atomic structure:

- https://www.youtube.com/watch?v=Pxfa41et2WU
- http://docbrown.info/page04/4_71atom.htm

Periodic table:

- https://www.youtube.com/watch?v=_6uPkjLJGhM

Group 2:

- https://www.youtube.com/watch?v=o4ZirhYykGA
- http://docbrown.info/page07/sblock.htm

Group 7 properties:

- https://www.youtube.com/watch?v=JiI1P7Wpx_Y
- http://docbrown.info/page07/ASA2group7.htm
- https://www.youtube.com/watch?v=aPVu2maopyU

Structure and Bonding:

- http://docbrown.info/page04/4_72bond2.htm
- http://docbrown.info/page04/4_72bond3.htm

- http://docbrown.info/page04/4_72bond5.htm

🌍 Section 4 – Chemistry in the Real World *(Aiming for: Grade B & Above)*

Choose one of the following projects:

- Chemistry and climate change
- Medicinal chemistry
- Smart materials

Instructions:

1. Choose your topic
2. Use at least two of the websites below (and any others you can find)
3. Create a 1-page article, blog post, or infographic (handwritten or digital)

Websites to start with:

- https://www.bbc.co.uk/bitesize/subjects/zs6hvcw
- https://edu.rsc.org/secondary-teachers
- https://www.compoundchem.com/
- https://www.khanacademy.org/science/chemistry

Success Criteria:

- ❑ Includes 3–5 key ideas
- ❑ Clear link to chemistry concepts
- ❑ Answers the question: Why does this matter?

✨ Section 5 – Challenge & Explore *(Aiming for: A/A*)*

Complete the three following enrichment tasks:

Push your learning further with any of these enrichment options. These tasks are ideal if you're aiming for the top grades or considering university courses in science.

1. Top of the Bench Chemistry Challenge

Visit the RSC's official Top of the Bench page and complete one full set of the **older practice questions** (aimed at Year 10–11). These are designed for students like you moving from GCSE to A Level.

🔗 Top of the Bench Practice Papers

Mark your answers using the provided mark scheme and reflect on which areas you found most challenging. This is a great way to assess your readiness for A Level problem-solving.

Then move on to:

2. Watch, Read & Review

Choose a podcast or Article and write a 100–150 word review.

Podcasts:

- **Chemistry in its Element** (RSC) – Bite-sized episodes about the elements and chemical compounds
  🔗 https://www.rsc.org/periodic-table/podcast
- **Chemistry for Your Life** – Fun, easy-to-follow discussions about real-world chemistry questions
  🔗 https://chemforyourlife.com

Free-to-Read Chemistry Articles

- Compound Interest: https://www.compoundchem.com
- Chemistry in its Element: https://www.rsc.org/periodic-table/podcast
- RSC Education News: https://edu.rsc.org

Your review should:

- ✅ Summarise the **main topic or theme**
- ✅ Highlight one or two **interesting facts or ideas** you learned
- ✅ Explain why you found it **useful, surprising, or inspiring**
- ✅ Reflect on how it links to **chemistry you've learned before** or might learn in A Level

Some potential sentence starters:

- "I chose this podcast/article because…"
- "One surprising thing I learned was…"
- "This links to what I already know about…"
- "This has made me want to find out more about…"

3. A Level Chemistry Reflection

Write a short blog or reflection titled *Why I Chose Chemistry A Level*.

Suggested prompts:

What excites you about chemistry?

What are your future plans?

Why is chemistry important?

📅 Final Section – Submission Checklist

Task	Completed (Yes/No)
Section 1 Audit & Quiz	
Section 2 Mole Questions	
Section 3 Learning Resource	
Section 4 Mini Project	
Section 5 Challenge & Explore	

Bring your completed work to your first Chemistry lesson in September. We're looking forward to seeing your thinking and creativity in action!