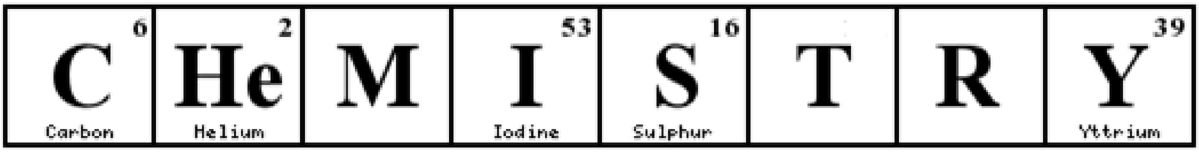


Bridging Work 2025

The aims of this Bridging work are:

Objective 1: *To review key terminology that will support you accessing A-level Chemistry vocabulary in the first half-term.*

Objective 2: *To practise calculations that you will have covered in GCSE, that will give you a solid foundation for the deeper application in A-level Chemistry.*

Objective 3: *To introduce wider reading and associated skills*

This work has three parts:

1. **Literacy activity** – identifying key terminology from the first A-level module that is taught – Module 2: Foundations in chemistry
2. **Practise calculations** from GCSE Chemistry
3. A Chemistry **wider reading task**

There will be assistance in our Chemistry Drop-In sessions on the first two weeks of the new term. These will be held in S9 on Tuesday and Thursday lunchtimes – all are welcome.

Further reading and advice can be found in our 6th Form Chemistry Handbook.

We look forward to meeting you in September.

1. Literacy activity

Part 1: Fill in the Blanks

1. The **atomic number** of an element is the number of _________ in the nucleus.
2. The **mass number** is the total number of _________ and _________ in an atom.
3. Atoms of the same element that have different numbers of neutrons are called __________.
4. The **relative atomic mass** compares the average mass of an atom to __________ of the mass of a carbon-12 atom.
5. The **m/z** value in mass spectrometry stands for __________.

Part 2: Multiple Choice

6. Which of the following releases H^+ ions in solution?

   a) Alkali
   b) Acid
   c) Neutral substance
   d) Salt

7. A strong acid is one that:

   a) Partially dissociates in solution
   b) Fully dissociates in solution
   c) Does not dissociate at all
   d) Releases OH^- ions

8. What is the role of a reducing agent?

   a) Electron pair acceptor
   b) Electron pair donor
   c) Proton donor
   d) Proton acceptor

Part 3: Matching

Match the term in Column A to the correct definition in Column B.

Column A
9. Orbital
10. Neutralisation
11. Standard solution
12. Ionic bond
13. Covalent bond

Column B
a) Reaction of H^+ and OH^- ions to form water
b) A solution with an exact known concentration
c) Region in an atom that can hold 2 electrons with opposite spins
d) Electrostatic attraction between positive and negative ions
e) Electrostatic attraction between a shared pair of electrons and the bonded atoms

Part 4: Short Answer

14. Explain what is meant by **electronegativity**.

____

____

15. Describe the difference between a **strong acid** and a **weak acid** in terms of dissociation.

____

____

16. What does **Avogadro's number** represent?

____

____

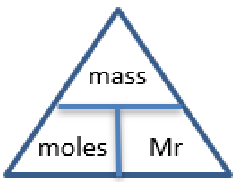
2. Practise calculations

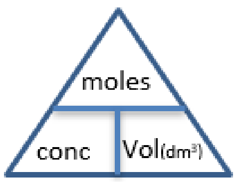
The answers are provided so that you can identify areas to review. You must show your workings, to gain marks. You may need to use some lined paper and a calculator.

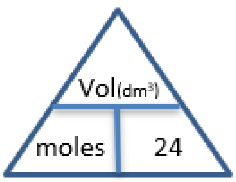
Write the formulae for the following ionic compounds.

1 Sodium bromide
2 Magnesium sulphate
3 Potassium carbonate
4 Ammonium sulphide
5 Calcium nitrate
6 Iron(III) hydroxide
7 Iron(II) sulphate
8 Copper(II) carbonate
9 Aluminium sulphate
10 Calcium hydroxide

The following calculations can be completed using the knowledge you have from GCSE. You may find the equations below helpful:







$1dm^3 = 1000cm^3$

Basic calculations involving formulae and equations

11 What is the mass of 4 moles of sodium chloride?
12 How many moles is 37g of calcium hydroxide?
13 What is the mass of 0.125 moles of copper(II) oxide?
14 0.1 moles of a substance weighs 4g. What is the mass of 1 mole?

Using the Avogadro Constant 6×10^{23}

15 How many water molecules, H_2O, are there in 1 drop of water? Assume 1 drop of water is $0.05cm^3$, and that the density of water is $1gcm^{-3}$

16 Which of the following contains the greatest number of stated particles?
   a. molecules of hydrogen in 1g of hydrogen gas, H_2
   b. atoms of helium in 1g of helium gas, He
   c. atoms of beryllium in 1g of beryllium, Be

Using moles to find formula

17 1.24g of phosphorus was burnt completely in oxygen to give 2.874g of phosphorus oxide. Find a) the empirical formula of the oxide and b) the molecular formula given that 1 mole of the oxide weighs 284g.

18 An organic compound contained 66.7% C, 11.1% H, 22.2% O by mass. Its relative formula mass was 72. Find a) the empirical formula of the compound, and b) the molecular formula of the compound.

Calculations from equations

19 Titanium is manufactured by heating titanium(IV) chloride with sodium

$TiCl_4 + 4Na \rightarrow Ti + 4NaCl$

What mass of sodium is required to produce 1 tonne of titanium?

20 2.67g of aluminium chloride was dissolved in water and an excess of silver nitrate solution was added to give a precipitate of silver chloride.

$AlCl_{3(aq)} + 3AgNO_{3(aq)} \rightarrow Al(NO_3)_{3(aq)} + 3AgCl_{(s)}$

What mass of silver chloride precipitate would be formed?

Calculations involving gases

21 Hydrogen and oxygen react according to the equation:

$2H_{2(g)} + O_{2(g)} \rightarrow 2H_2O_{(l)}$

What volume of air is needed for the complete combustion of 500cm^3 of hydrogen? (take care – air is only about 20% oxygen, so you'll need 5 times more air than you will oxygen).

22 What volume of carbon dioxide is produced by the complete combustion of 1dm^3 of butane, C_4H_{10}?

$2C_4H_{10(g)} + 13O_{2(g)} \rightarrow 8CO_{2(g)} + 10H_20_{(l)}$

23 1 mole of any gas occupies 24.0dm^3 at rtp.

a Calculate the mass of 200cm^3 of chlorine gas, Cl_2, at rtp.

b Calculate the volume occupied by 0.16g of oxygen, O_2, at rtp

c If a gas has a density of 1.42gdm^{-3} at rtp, calculate the mass of 1 mole of the gas

Calculations involving solutions

24 Some dilute sulphuric acid, H_2SO_4, had a concentration of 4.90gdm^{-3}. What is its concentration in moldm^{-3}?

25 What is the concentration in gdm^{-3} of some potassium hydroxide, KOH, solution with a concentration of 0.200moldm^{-3}?

ANSWERS

Basic calculations involving formulae and equations

11 234g
12 0.5 moles
13 10g
14 40g

Using the Avogadro Constant 6 x 10^{23}

15 1.67 x 10^{21}
16 Which of the following contains the greatest number of stated particles?

a. 0.5 moles
b. 0.25 moles
c. 0.11moles

Using moles to find formula

17 P_2O_5, molecular formula is P_4O_{10}
18 C_4H_8O, molecular formula is the same

Calculations from equations

19 1.92 tonnes
20 8.60g

Calculations involving gases

21 1250cm^3
22 4dm^3
23 1 mole of any gas occupies 24.0dm^3 at rtp.

a. 0.592g
b. 0.12dm^3
c. 34.1g

Calculations involving solutions

24 0.05moldm$^-$3
25 11.2gdm^{-3}

Now highlight areas to review – then complete your review over the summer.

Area of syllabus	**Review**	**Completed**
Formula of ionic compounds		
Basic calculations involving formulae and equations		
Using the Avogadro Constant 6 x 10^{23}		
Using moles to find formula		
Calculations from equations		
Calculations involving gases		
Calculations involving solutions		

3. Wider Reading Task

Read the **Chemistry World** article and complete the review sheet.

Why highly unsaturated molecules are so abundant in the interstellar medium

Study explores cascade of fragmentation events

Computer simulations of saturated organic molecules being bombarded by high-energy photons and particles have led an international team of researchers to propose fresh ideas surrounding how complex unsaturated molecules form in dense interstellar clouds.

As technologies that allow us to observe interstellar media develop, scientists are discovering that more complex organic molecules are surprisingly abundant in space. 'These organic molecules are ubiquitous in the universe, so anywhere you point your telescope you can see organic molecules, some of which are precursors to amino acids or nuclear bases,' says Felipe Fantuzzi of the University of Kent in the UK, who co-led the work. 'To understand how these molecules that are essential to life are formed, and how they are delivered to planets, I think, is the most important question in astrochemistry,' he adds.

Specifically, understanding how unsaturated molecules form in interstellar media is essential to explain the chemical diversity of molecular clouds such as Sagittarius B2, a molecular cloud complex found close to the centre of the Milky Way. 'The carbon–carbon double bond is rife for oxidation mechanisms, so that's where you start to see some really interesting chemistry and the formation of unique functional groups,' says Julia Lehman, an expert in interstellar spectroscopy at the University of Birmingham, UK, who wasn't involved in the research.

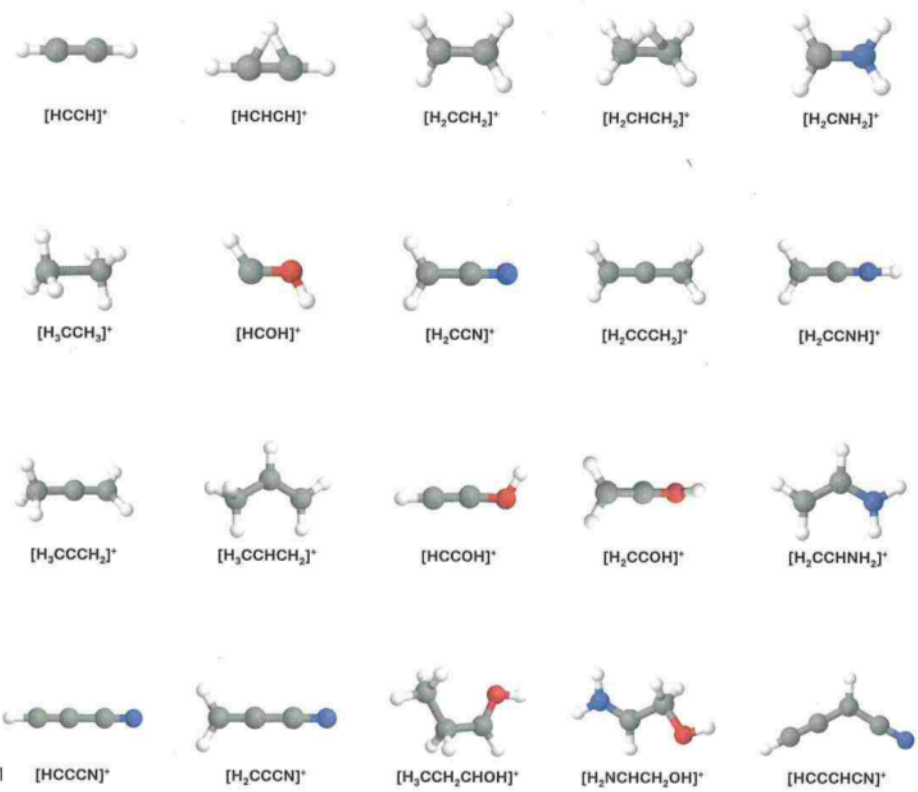
Fantuzzi and their co-workers used Born–Oppenheimer molecular dynamics simulations to investigate how cosmic rays and x-rays that penetrate dense molecular clouds ionise and fragment saturated molecules into unsaturated products. They focused on four key molecules with a high degree of saturation – ethanolamine, propanol, butanenitrile and glycolamide – which are found in molecular clouds and seen as potential precursors to more complex biomolecules. While Born–Oppenheimer molecular dynamics has been used to study molecular fragmentation in the past, this is the first time it was applied to the field of astrochemistry. 'Essentially you are running a classical molecular dynamics simulation, but for every step of the dynamics, you are also solving the Schrödinger equation,' explains Fantuzzi. This technique allowed the researchers to study the electronic structure of the radicals formed under high energy processes, and from that they proposed a series of fragmentation routes that favour structures with the highest possible number of π bonds.

They identified 56 cationic fragments that could be formed from the four saturated molecules under the high energy conditions of Sagittarius B2. Most of these fragments contain at least one π bond. Of these unsaturated fragments, 21 have already been observed in interstellar media so the high energy events described in this study could explain their formation. However, a considerable proportion have not yet been detected experimentally and are proposed by the team as potential targets for future investigation by spectroscopists.

'The researchers have done a really good job of looking into one possible route towards the formation of unsaturated molecules, but it opens up a lot of other questions,' says Lehman. For example, she'd like to know what reactions take place following the fragmentation and what fragmentation happens under lower energy conditions. 'If these molecules are theorised to be there, then we need to turn around and start characterising these in the lab so that the observationalists can then detect them.'

Charley James

Reference
J Londoño-Restrepo *et al*, *Chem. Sci.*, 2025, **16**, 3051 (DOI: 10.1039/d4sc07986h)

1 

Chemistry Topic: Alkenes	
Title of Article: Why highly unsaturated molecules are so abundant in the interstellar medium	
Source:	**Date of Publication:**
Chemistry strand: Organic/inorganic/physical?	
Summary of Article: 1. *Read the text* 2. *Break it down into sections* 3. *Identify the key points in each section* 4. *Write the summary* 5. *Check the summary against the article*	

In your opinion, what are the 3 most important pieces of information you gathered from the article?	
1	
2	

3	

The article refers to propanol. Draw three different structures of propan-1-ol.		
Molecular structure	Structural formula	Displayed formula

Specification Links	
How does this article link to what you studied at GCSE? *(Be clear and specific)*	
What key words have been used in this article? Select 5 key words and complete their definitions below.	
Keyword:	**Definition:**
1	
2	
3	
4	
5	

Date Completed:

Feedback from your teachers:

Teacher Checked	Purple	Blue	Green	Yellow	Orange

Purple:

- Your literacy activity is complete and correct
- Your calculations have been completed showing your working out
- Your marking includes topics to review and these have been completed
- The review of the scientific article is fully completed with an exceptional level of detail
- The summary is clear and specific summarising the main points of the article
- The 3 facts and figures are clearly categorised (perhaps into more than one category)
- There is a clear and very detailed link back to the specification and what you are studying.
- All 5 definitions are of complex key terms and concepts from the article

Blue:

- Your literacy activity is complete and correct
- Your calculations have been completed showing your working out
- Your marking identifies topics to review
- The review of the scientific article is fully completed with a high level of detail.
- The summary is clear, summarising the main points of the article
- The facts and figures are categorised and are useful
- There is a clear link back to the specification and what you are studying.
- 1 or 2 of the definitions are of complex key terms and concepts from the article

Green:

- Your literacy activity is complete
- Your calculations have been completed
- Your calculation have been marked
- The review of the scientific article is fully completed and all areas filled in.
- But there is potential for more detail to be added such as the specification links.
- Key words are completed but could be more complex words/concepts from the article.

Yellow:

- Your literacy activity is incomplete
- Your calculations are incomplete
- Your calculations require marking
- The review of the scientific article but sections lack detail, such as definitions, or the written areas (Summary and links to study). Key words are likely to be more basic words/concepts from the article.
- OR Your Review is partially completed, eg 2 out 3 facts or 3 out of 5 definitions.

Orange:

- Your literacy activity is incomplete
- Your calculations are incomplete
- The review of the scientific article is incomplete. Whole sections are not completed, eg definitions