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**Year 12 Chemistry Bridging Booklet**

**2024/25**

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**How the use this Bridging Booklet**

Welcome to A Level Chemistry! It is a great course covering lots of fundamental knowledge and skills that are essential for University study in a number of areas. For example, A Level Chemistry provides essential knowledge if you are considering a career in Medicine and lots of other scientific areas. The skills developed in A Level Chemistry are highly prized in other career areas such as accountancy and law. A Level Chemistry fits nicely alongside lots of other subjects such as Biology, Physics, Maths, Computer Science, Geography, Economics and Psychology.

There are a variety of tasks throughout the booklet, which cover some fundamentals of Chemistry that you need to feel confident with before starting the A Level Chemistry course.

**Please complete the 16 activities set on some pieces of paper ready to hand in to your teacher in September. Don’t do them all at once – break it up into chunks working for no longer than 1 hour at a time.**

**As well as your answers please also complete the final sheet of this booklet -assessing how confident you are in your skills in each area – to hand in with your answers.**

At the end of the booklet there are some links to some videos and other websites with information about the A Level Chemistry course. It would be a really good idea for you to start to explore the course and even start pre-learning some material so that you can make a really positive start to A Level Chemistry.

Enjoy!

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| **Activity 1 Scientific vocabulary: Designing an investigation** |
| Link each term on the left to the correct definition on the right. |

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| **Activity 2 Scientific vocabulary: Making measurements** |
| Link each term on the left to the correct definition on the right. |

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| **Activity 3 Scientific vocabulary: Errors** |
| Link each term on the left to the correct definition on the right. |

Understanding and using SI units

Every measurement has a size (eg 2.7) and a unit (eg metres or kilograms). Sometimes, there are different units available for the same type of measurement. For example, milligram, gram, kilogram and tonne are all units used for mass.

There is a standard system of units, called the SI units, which are used for most scientific purposes.

These units have all been defined by experiment so that the size of, say, a metre in the UK is the same as a metre in China.

There are seven SI base units, which are given in the table.

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| **Physical quantity** | **Unit** | **Abbreviation** |
| Mass | kilogram | kg |
| Length | metre | m |
| Time | second | s |
| Electric current | ampere | A |
| Temperature | kelvin | K |
| Amount of substance | mole | mol |
| luminous intensity | candela | cd |

All other units can be derived from the SI base units. For example, area is measured in metres square (written as m2) and speed is measured in metres per second (written as m s–1: not that this is a change from GCSE, where it would be written as m/s).

Using prefixes and powers of ten

Very large and very small numbers can be complicated to work with if written out in full with their SI unit. For example, measuring the width of a hair or the distance from Manchester to London in metres (the SI unit for length) would give numbers with a lot of zeros before or after the decimal point, which would be difficult to work with.

So, we use prefixes that multiply or divide the numbers by different powers of ten to give numbers that are easier to work with. You will be familiar with the prefixes milli (meaning 1/1000), centi (1/100), and kilo (1 × 1000) from millimetres, centimetres and kilometres.

There is a wide range of prefixes. Most of the quantities in scientific contexts will be quoted using the prefixes that are multiples of 1000. For example, we would quote a distance of 33 000 m as   
33 km.

The most common prefixes you will encounter are given in the table.

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| **Prefix** | **Symbol** | **Power of 10** | **Multiplication factor** | |
| Tera | T | 1012 | 1 000 000 000 000 | |
| Giga | G | 109 | 1 000 000 000 | |
| Mega | M | 106 | 1 000 000 | |
| kilo | k | 103 | 1000 | |
| deci | d | 10-1 | 0.1 | 1/10 |
| centi | c | 10-2 | 0.01 | 1/100 |
| milli | m | 10-3 | 0.001 | 1/1000 |
| micro | μ | 10-6 | 0.000 001 | 1/1 000 000 |
| nano | n | 10-9 | 0.000 000 001 | 1/1 000 000 000 |
| pico | p | 10-12 | 0.000 000 000 001 | 1/1 000 000 000 000 |
| femto | f | 10–15 | 0.000 000 000 000 001 | 1/1 000 000 000 000 000 |

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| **Activity 4 SI units and prefixes** |
| 1. What would be the most appropriate unit to use for the following measurements? 2. The mass of water in a test tube. 3. The volume of water in a burette. 4. The time taken for a solution to change colour. 5. The radius of a gold atom. 6. The number of particles eg atoms in a chemical. 7. The temperature of a liquid. 8. Re-write the following quantities using the correct SI units. 9. 0.5 litres 10. 5 minutes 11. 20 °C 12. 70 °F 13. 10 ml (millilitres) 14. 5.5 tonnes 15. 96.4 microlitres (µl) 16. Scientists have been developing the production of a new material through the reaction of two constituents.   Before going to commercial production, the scientists must give their data in the correct SI units.   1. The flow rate of the critical chemical was reported as 240 grams per minute at a temperature of 20 °C.   Re-write this flow rate using the correct SI units. Show your working. |

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| **Activity 5 Converting data** |
| Re-write the following.   1. 0.1 metres in millimetres 2. 1 centimetre in millimetres 3. 104 micrograms in grams 4. 1.1202 kilometres in metres 5. 70 decilitres in millilitres 6. 70 decilitres in litres 7. 10 cm3 in litres 8. 2140 pascals in kilopascals |

The delta symbol (Δ)

The delta symbol (Δ) is used to mean ‘change in’. You might not have seen this symbol before in your GCSE Chemistry course, although it is used in some equations in GCSE Physics.

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| **Activity 6 Using the delta symbol** |
| In exothermic and endothermic reactions there are energy changes.  The diagram below shows the reaction profile for the reaction between zinc and copper sulfate solution.     1. Which letter represents the products of the reaction? 2. Which letter represents the activation energy? 3. Complete the sentence using the words below.  |  |  |  |  | | --- | --- | --- | --- | | The reaction is |  | and therefore ΔH is |  |  |  |  |  |  | | --- | --- | --- | --- | | endothermic | exothermic | negative | positive | |

Practical skills

The practical skills you learnt at GCSE will be further developed through the practicals you undertake at A-level. Your teacher will explain in more detail the requirements for practical work in Chemistry.

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| **Activity 7 Electrolysis** |
| Students were investigating if the time the current flows through an electrolyte affects the amount of copper deposited on the negative electrode.     1. Write a hypothesis for this investigation. 2. What do you predict will be the result of this investigation? 3. For this investigation, give 4. the independent variable 5. the dependent variable 6. a control variable. 7. What is the difference between repeatable and reproducible results? 8. What would be the most likely resolution of the balance you use in a school lab? 9. How could you make the reading more precise? 10. Random errors cause readings to be spread about the true value.   How could you reduce the effect of random errors and make the results more accurate?   1. The results the student recorded are given in the table.  |  |  |  |  |  | | --- | --- | --- | --- | --- | | **Time / minutes** | **Increase in mass / g** | | | **Mean** | | 2 | 0.62 | 0.64 | 0.45 |  | | 4 | 0.87 | 0.83 | 0.86 |  | | 6 | 0.99 | 1.02 | 0.97 |  | | 8 | 1.06 | 1.05 | 1.08 |  | | 10 | 1.10 | 1.12 | 1.10 |  |     Calculate the mean increase in mass for each time measurement. |

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| 1. Plot a graph of your results. |

Using maths skills

Throughout your A-level Chemistry course you will need to be able to use maths skills you have developed in your GCSE Chemistry and GCSE maths courses, such as using standard form, rounding correctly and quoting your answer to an appropriate number of significant figures.

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| **Activity 8 Using maths skills** |
| 1. Write the following numbers in standard form: 2. 4000 3. 1 000 000 4. Zinc oxide can be produced as nanoparticles.   A nanoparticle of zinc oxide is a cube of side 82nm.    Calculate the surface area of a nanoparticle of zinc oxide. Give your answer in standard form   1. Express the following numbers to 3 significant figures: 2. 57 658 3. 0.045346 4. Toothpaste may contain sodium fluoride (NaF).   The concentration of sodium fluoride can be expressed in parts per million (ppm). 1 ppm represents a concentration of 1 mg in every 1 kg of toothpaste.  A 1.00 g sample of toothpaste was found to contain 2.88 × 10–5 mol of sodium fluoride.  Calculate the concentration of sodium fluoride, in ppm, for the sample of toothpaste.    Give your answer to 3 significant figures.  **Use the following information to help you**  To convert moles to grams use g = moles × relative formula mass  Relative formula mass of NaF = 42 |

**Using the periodic table**

During your course you will need to become familiar with the periodic table of the elements, and be able to use information from the table to answer questions.

There is a copy of the periodic table that you will be given to use in your exams on the next page.

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| **Activity 9 Atoms** |
| 1. Give the atomic number of: 2. Osmium 3. Lead 4. Sodium 5. Chlorine 6. Give the relative atomic mass (Ar) of: 7. Helium 8. Francium 9. Barium 10. Oxygen 11. What is the number of neutrons in each of the following elements? 12. Fluorine 13. Beryllium 14. Gold |

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| **Activity 10 Formulae of common compounds** |
| State the formulae of the following compounds:   1. Methane 2. Sulfuric acid 3. Potassium manganate (VII) 4. Water |

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| **Activity 11 Ions and ionic compounds** |
| The table below lists the formulae of some common ions.   |  |  |  |  | | --- | --- | --- | --- | | **Positive ions** | | **Negative ions** | | | **Name** | **Formula** | **Name** | **Formula** | | Aluminium | Al3+ | Bromide | Br– | | Ammonium | NH4+ | Carbonate | CO32– | | Barium | Ba2+ | Chloride | Cl– | | Calcium | Ca2+ | Fluoride | F– | | Copper(II) | Cu2+ | Iodide | I– | | Hydrogen | H+ | Hydroxide | OH– | | Iron(II) | Fe2+ | Nitrate | NO3– | | Iron(III) | Fe3+ | Oxide | O2– | | Lead | Pb2+ | Sulfate | SO42– | | Lithium | Li+ | Sulfide | S2– | | Magnesium | Mg2+ |  |  | | Potassium | K+ |  |  | | Silver | Ag+ |  |  | | Sodium | Na+ |  |  | | Zinc | Zn2+ |  |  |   Use the table to state the formulae for the following ionic compounds.   1. Magnesium bromide 2. Barium oxide 3. Zinc chloride 4. Ammonium chloride 5. Ammonium carbonate 6. Aluminium bromide 7. Calcium nitrate 8. Iron (II) sulfate 9. Iron (III) sulfate |

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| **Activity 12 Empirical formula** |
| Use the periodic table on page 21 to help you answer these questions.   1. The smell of a pineapple is caused by ethyl butanoate.   A sample is known to contain:  0.360 g of carbon  0.060 g of hydrogen  0.160 g of oxygen.  What is the empirical formula of ethyl butyrate?   1. What is the empirical formula of a compound containing:   0.479 g of titanium  0.180 g of carbon  0.730 g of oxygen   1. A 300g sample of a substance is analysed and found to contain only carbon, hydrogen and oxygen.   The sample contains 145.9 g of carbon and 24.32 g of hydrogen.  What is the empirical formula of the compound?   1. Another 300 g sample is known to contain only carbon, hydrogen and oxygen.   The percentage of carbon is found to be exactly the same as the percentage of oxygen.  The percentage of hydrogen is known to be 5.99%.  What is the empirical formula of the compound? |

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| **Activity 13 Balancing equations** |
| 1. Write balanced symbol equations for the following reactions.   You’ll need to use the information on the previous pages to work out the formulae of the compounds.  Remember some of the elements may be diatomic molecules.   1. Aluminium + oxygen 🡪 aluminium oxide 2. Methane + oxygen 🡪 carbon dioxide + water 3. Calcium carbonate + hydrochloric acid 🡪 calcium chloride + water + carbon dioxide 4. Chalcopyrite is a sulfide mineral with formula CuFeS2.   Chalcopyrite is the most important copper ore. It is a sulfide mineral, a member of iron (2+) sulfides and a copper sulfide.  Copper can be produced from rock that contains CuFeS2 in two stages.  Balance the equations for the two stages in this process.  **Hint: remember that sometimes fractions have to be used to balance equations.**  Stage 1:           CuFeS2 + O2 + SiO2  Cu2S + Cu2O + SO2 + FeSiO   Stage 2:           Cu2S + CuO  Cu + SO2 |

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| **Activity 14 Moles** |
| The amount of a substance is measured in moles (the SI unit). The mass of one mole of a substance in grams is numerically equal to the relative formula mass of the substance. One mole of a substance contains the same number of the stated particles, atoms or ions as one mole of any other substance. The number of atoms, molecules or ions in a mole of a given substance is the Avogadro constant. The value of the Avogadro constant is  6.02 × 1023 per mole.  Complete the table. Use the periodic table on page 21 to help you.   |  |  |  |  | | --- | --- | --- | --- | | **Substance** | **Mass of substance in grams** | **Amount in moles** | **Number of particles** | | Helium |  |  | 18.12 × 1023 | | Chlorine (Cl) | 14.2 |  |  | | Methane |  | 4 |  | | Sulfuric acid | 4.905 |  |  | |

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| **Activity 15 Isotopes and calculating relative atomic mass** |
| 1. What is the relative atomic mass of bromine if the two isotopes 79Br and 81Br exist in equal amounts? 2. A sample of neon is made up of three isotopes:   20Ne accounts for 90.9%  21Ne accounts for 0.3%  22Ne accounts for 8.8%.  What is the relative atomic mass of neon?  Give your answer to 4 significant figures.   1. Copper’s isotopes are 63Cu and 65Cu.   If the relative atomic mass of copper is 63.5, what are the relative abundances of these isotopes? |

**Extended writing**

The ability to write coherently in a logical, well-structured way is an essential skill to develop. At GCSE the 6-mark extended response questions are used so students can demonstrate this skill. At A-level you will still need to write precise answers using the correct scientific language.

The command word in a question, like at GCSE, is important as it gives you an indication of what to include in your answers. For example, ‘explain’ means you must give reasons why things are happening, not just give a description. A comparison needs advantages and disadvantages or points for and against.

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| **Activity 16 Types of bonding** |
| Compare the similarities and differences between ionic, covalent and metallic bonding. |

**Exploring the A Level Chemistry Course**

**At Whickham we study the OCR (A) A Level Chemistry course. You can find information about the course here:**

[**https://www.ocr.org.uk/qualifications/as-and-a-level/chemistry-a-h032-h432-from-2015/specification-at-a-glance/**](https://www.ocr.org.uk/qualifications/as-and-a-level/chemistry-a-h032-h432-from-2015/specification-at-a-glance/)

[**https://www.ocr.org.uk/Images/171720-specification-accredited-a-level-gce-chemistry-a-h432.pdf**](https://www.ocr.org.uk/Images/171720-specification-accredited-a-level-gce-chemistry-a-h432.pdf)

There are some excellent online resources for the course. It would be a really good idea for you to start to explore the course and even start pre-learning some material so that you can make a really positive start to A Level Chemistry.

**Take a look at these:**

- Allery Chemistry YouTube (Videos covering A Level Chemistry course content): <https://www.youtube.com/channel/UCPtWS4fCi25YHw5SPGdPz0g/playlists?view=50&sort=dd&shelf_id=3>

- SnapRevise YouTube (Videos covering A Level Chemistry course content):

<https://www.youtube.com/watch?v=qZ3INba16v0&list=PLkocNW0BSuEEc4SOEXeDXrwUiKZjhAJ2q>

- Physics and Maths tutor (Website includes notes, flashcards and questions by topic for A Level Chemistry)

<https://www.physicsandmathstutor.com/chemistry-revision/a-level-ocr-a/>

- Maths Made Easy (Website with lots of resources and questions/answers for A Level Chemistry)

<https://mathsmadeeasy.co.uk/a-level-chemistry-revision/>

Machemguy YouTube (Videos covering A Level Chemistry course content)

<https://www.youtube.com/channel/UCyl4QJXN9zNapzmKAn-fJgQ>

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Chemistry Bridging self reflection

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|  | **Confident - green** | **Ok - amber** | **Unsure - red** |
| Activity 1 – scientific vocabulary |  |  |  |
| Activity 2 – scientific vocabulary |  |  |  |
| Activity 3 – scientific vocabulary |  |  |  |
| Activity 4 – SI units and prefix |  |  |  |
| Activity 5 – Converting data |  |  |  |
| Activity 6 – Using the delta symbol |  |  |  |
| Activity 7 – Practical skills: Electrolysis |  |  |  |
| Activity 8 – Using maths skills |  |  |  |
| Activity 9 – Atoms |  |  |  |
| Activity 10 – Formula of common compounds |  |  |  |
| Activity 11 – Ions and ionic compounds |  |  |  |
| Activity 12 – Empirical formula |  |  |  |
| Activity 13 – Balancing equations |  |  |  |
| Activity 14 – Moles |  |  |  |
| Activity 15 – Isotopes and calculating relative atomic mass |  |  |  |
| Activity 16 – Extended writing: Types of bonding |  |  |  |