

## Chemistry Course Introduction and Taster Tasks

**Dear Chemists**

**In this booklet I have explained the content of the course and what you will be expected to do during your A level. Read through to make sure you are still happy to take on this course. Keep this information for using when you start the course.**

**Read through the tasks. Those to be completed for the start of term are** if you cannot do this, you may complete the tasks on paper drawing out the tables and carefully copying out the diagrams. **summarised in this table.**

Title of Tasks	Purpose of Task:	Time to be taken	Outcome Expected
Task 1: Research project	<i>To learn about the theories and ideas involved in the development of an atom's structure</i>	4 hours	Choose 1 of the 2 topics to research and produce three A4 pages with images and bibliography
Task 2: Foundations in Chemistry	<p><i>This covers the basic elements you will require going forward, this will be the first topic covered in September. It covers the following topics:</i></p> <ul style="list-style-type: none"> <li>• <i>Atoms, ions and compounds</i></li> <li>• <i>Amount of substance</i></li> <li>• <i>Acid and redox</i></li> <li>• <i>Electrons and bonding</i></li> <li>• <i>Shapes of molecules and intermolecular forces.</i></li> </ul>	1.5 hours	<p>Completion of questions which will require you to recall information from GCSE or use notes/internet.</p> <p>Complete Module 1 and 2 from the Amount of Substance workbook. The answers are at the back of the book so you can check you answers. (We will be checking your working out).</p> <p>If you wish to refer back to you GCSE text book, you can find it on Moodle (enrolment key – chem)</p>
Task 3: Maths skills checklist	<i>20% of Chemistry assessments will be mathematical skills. However Chemistry does have a lot of Mathematical application.</i>	2-3 hours	Read through the skills check list and complete the relevant modules from the Amount of Substance workbook. Each skill that has a relevant task has

			been set out next to each one.
Task 4: Organic Chemistry	<i>Checking you have the basic Organic skills. This was a topic covered at GCSE, however, at A-level this topic is 40% of the course. (Paper 2).</i>	1.5 hours	Complete questions.  Extension task – this will require you to research reactions in Organic Chemistry  If you wish to refer back to you GCSE text book, you can find it on Moodle (enrolment key – chem)
Useful websites	<a href="https://www.bbc.co.uk/bitesize/subjects/zs6hvcw">https://www.bbc.co.uk/bitesize/subjects/zs6hvcw</a>  <a href="https://www.chemguide.co.uk/">https://www.chemguide.co.uk/</a>		

A-level Chemistry is set into 6 modules some of which you will have partially covered at GCSE. Especially Foundations in Chemistry, Periodic Table and energy, and Core Organic Chemistry. I would like you to complete 3 pieces of work which will be collected in during your first week of year 12.

### 1. PAG 12 Research Project

#### Introduction

During your 2 year course you will complete your Practical Endorsement, this is a set of scientific skills that you are required to pass. The skills assessed are independent thinking, use and application of scientific methods and practices, Research and referencing and Instruments and equipment. You will have numerous opportunities to pass these skills throughout the course. This piece of work is intended to use the skills of researching and referencing information from books, journals and the internet. The topic chosen should link to one of the areas being studied in chemistry at A level.

Choose one topic to research, you have a range of topics to choose from. Please read below.

#### Aim

To write a suitable report on a chosen area of A Level Chemistry, demonstrating appropriate level research skills, using information from books, journals and the internet along with **correct referencing** of any sources of information used.

### 1. Looking for patterns in Chemistry:

*The theories and ideas involved in the development of an atom's structure gives a fascinating insight into how science works. This scientific method is often represented as the sequence of experiments, observation, analysis and conclusion. The model of the nuclear atom – consisting of protons, neutrons and electrons- is extremely useful and allows us to explain chemical bonding, as well as to understand the pattern of the periodic table. The nuclear atom is well accepted by the chemists and is firmly based on sound experimental evidence. It is amazing to think that these experiments all began with the investigating particle that cannot every been seen.*

*However, science doesn't always advance. The nuclear model of the atom has now been replaced, and further models will also be replaced as science advances further. We have come a long way from the four elements of the ancient Greeks.*

1. Describe how the model of the atom has changed over the years and how it continues to do so?
2. How is scientific knowledge evolving?
3. Describe how new theories are accepted by the scientists?

**Include the work of the following:**

- a. Greek Philosophers and the first idea of atoms and elements
- b. John Dalton
- c. Joseph John Thomson
- d. Ernest Rutherford
- e. Neils Bohr
- f. And many more

**2. The Periodic Table**

*The Periodic Table is the single most important reference document for the chemist. Scientists have attempted to organise the elements in some sort of logical order for centuries. It was only in the nineteenth century that the first recognised Periodic Table was pieced together by comparing the properties of different elements. Since then, the Periodic Table has helped generations of chemists – and chemistry students – to understand the complex relationships between the elements.*

1. Describe early attempts to order the elements.
2. How are advances in scientific knowledge accepted?
3. Explain the importance of the work of Mendeleev and other scientists in developing the modern Periodic Table.

**Include the work of the following**

- a. Dimitri Mendeleev
- b. Antoine-Laurent Lavoisier
- c. Jöns Jakob Berzelius
- d. Johann Wolfgang Döbereiner
- e. Alexandre-Emile Béguyer de Chancourtois
- f. John Newlands

**Other suggested titles are:**

- **Chemistry in Climate**
- **The Future of Plastic**
- **Equilibrium and Industry**
- **Development of drugs e.g. coronavirus vaccine.**

**Procedure**

- **Identify a topic.**
- **Research your chosen topic identifying new knowledge and understanding going beyond what is taught in the physics classroom.**
- **Produce a written report of approximately three A4 pages.**

- You should include information taken from suitable resources, and you must properly cite the sources of information that you have used.
- Present the information in class in an appropriate professional manner.

**To submit**

- For this piece of work to count towards a Practical Activity of the GCE Chemistry Practical Endorsement you should have a written report to discuss with your teacher.
- You should have also have maintained contemporaneous notes of your research and the sources used.

## 2. Foundations in Chemistry

### Introduction

This topic covers the basic elements you will require going forward, this will be the first topic covered in September. It covers the following topics:

- Atoms, ions and compounds
- Amount of substance
- Acid and redox
- Electrons and bonding
- Shapes of molecules and intermolecular forces.

From GCSE you should be able to answer the following questions. Work through each point, using your key stage 4 notes and the internet, then complete Module 1 and 2 from the Amount of substance booklet.

1. Draw a table to show, the relative charge and approximate relative masses of protons, neutrons and electrons.
2. Use your periodic table to calculate numbers of protons, neutrons and electrons in atoms for 10 elements of your choice.
3. Write formulae and balance chemical equations for 3 reactions you enjoyed completing during your GCSE.
4. Calculate relative formula masses of species separately and in one of your balanced chemical equations.
5. Use a balanced equation to calculate masses of reactants or products.
6. Write the general equations to show that acids react with some metals and with carbonates, predicting products from given reactants.
7. Describe neutralisation as an acid reacting with an alkali to form a salt and water. State the ionic equation including state symbols.
8. Explain the terms reduction and oxidation?
9. Construct a dot and cross diagram for simple ionic and covalent substances. (your choice)

I have attached a workbook in which you should complete the following Module 1, and 2.

### Maths skills checklist:

Use the Amount of substance workbook to help you assess the following skills. Please do not feel you have to print the booklet out as all work will need to be completed on paper and show all working out.

- *Working with standard form and significant figures, and using appropriate units. **Complete Module 3, task 7.***
- *Changing the subject of an equation, for carrying out structure and unstructured mole calculations. **Complete Module 4 - task 8, Module 5 – task 9 & task 10.***
- *Using ratios, fractions and percentage, for working with moles and equations using ratios, calculating atom economies. **Complete Module 5 – Task 12 and 13.***
- *Finding arithmetic means, for calculating weighted means when determining an atomic mass and when calculating mean titres. **Complete Module 7- task 16***
- *Using angles and shapes in regular 2D and 3D structures, for predicting the shapes of and bond angles in molecule and ions.*

## 3. Core Organic chemistry

This elements covers the basics of Organic Chemistry this contains:

- Alkanes
- Alkenes
- Alcohols

- Haloalkanes
- Organic synthesis
- Spectroscopy.

From GCSE you should be able to answer the following questions. Work through each point, using your knowledge, notes and the internet.

1. Describe how crude oil is a main source of hydrocarbons and is a feedstock for the petrochemical industry.
2. Explain how modern life is crucially dependent upon hydrocarbons and recognise that crude oil is a finite resource.
3. Describe and explain the separation of crude oil by fractional distillation.
4. Describe the fractions as largely a mixture of compounds of formula  $C_nH_{2n+2}$  which are members of the alkane homologous series.
5. Describe the production of materials that are more useful by cracking.

**Extension:**

I have attached a blank copy of the synthesis routes. You will need to draw a general structure for each compound. Research the reagents and conditions needed to convert between the arrows.

## Synthetic routes (A Level) - reaction pathways Aliphatic compounds

