



A-level chemistry – pre-course task

The purpose of the first part of this task is to revisit the topics from GCSE chemistry that are vital to success at A-level chemistry. There should be nothing new in this part of the task – it should simply remind you about what you learnt at GCSE. In the second part of the task you will complete two activities that are linked to the A-level specification. At the end of this task is some information to ensure that you are ready to go in September.

Complete the entire task on lined paper. It is vital that you arrive in September with this task completed and with this knowledge fully embedded. If you are struggling, please email me before you return so we can have issues addressed for the beginning of the course:

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Part 1

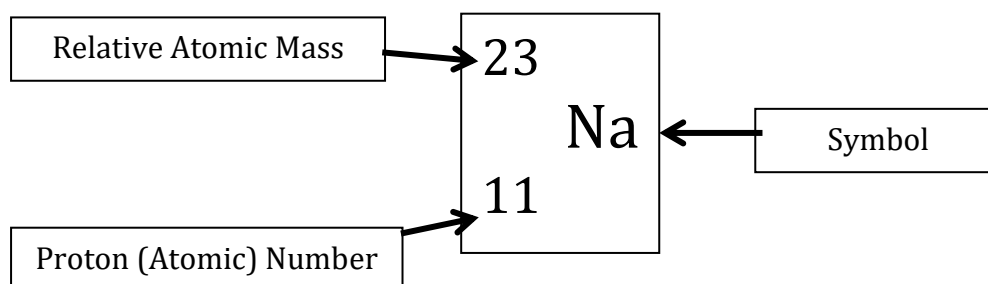
Atomic Structure

An atom is the smallest particle of an element. It is made up of smaller subatomic particles.

1. Draw a labelled diagram of an atom. For each subatomic particle, give its relative mass and relative charge.
2. Why is the overall charge an atom zero?
3. What is the link between the group number and the number of electrons in the outer shell? Use an example diagram showing the electron arrangement and an electron configuration in your answer.
4. What happens to an atom to form an ion of +2?
5. What happens to an atom to form an ion of -1?

Using the Periodic Table

You can use the Periodic Table to look up the relative mass and the proton number for each element.



1. How do you use the Periodic Table to work out:
 - a. The number of protons in each atom of that element
 - b. The number of electrons in each atom of that element
 - c. The number of neutrons in each atom of that element?
2. Using your answer to question 1, work out the number of protons, electrons and neutrons in an atom of:
 - a. Sodium
 - b. Carbon
 - c. Krypton



Bonding

Bonding is a key concept involved in chemistry. There are three different types of bonding, depending upon the starting reactants.

1. What is an ionic bond?
2. Explain what happens when a group one alkali metal and a group seven halogen react together in terms of electron transfer.
3. What is a covalent bond?
4. Is a covalent bond formed between atoms of metals, non-metals or a mixture of metals with non-metals?
5. Using your knowledge of electron arrangement, how many bonds will an atom of the following elements form:
 - a. Carbon
 - b. Oxygen
 - c. Hydrogen
 - d. Nitrogen
 - e. Chlorine?
6. Describe the structure and bonding in silicon dioxide, SiO₂.
7. How does this vary from carbon dioxide? In your answer, you should also compare the properties of silicon dioxide and carbon dioxide. Why would you expect them to have similar properties?
8. What is a metallic bond?
9. Use your understanding of metallic bonding to explain the different properties of metals.

Balancing Equations

When a chemical reaction occurs, there is always a conservation of mass. The atoms in the reactants must be the same as the atoms in the products. To make sure this is the case, the chemical equation needs to be balanced so that the number of each atoms of each element is the same on both sides of the equation. When balancing equations, you use big numbers in front of each formula.

1. Balance the following equations:
 - a. $__ \text{N}_2 + __ \text{H}_2 \rightarrow __ \text{NH}_3$
 - b. $__ \text{C}_8\text{H}_{18} + __ \text{O}_2 \rightarrow __ \text{CO}_2 + __ \text{H}_2\text{O}$
 - c. $__ \text{Na} + __ \text{H}_2\text{O} \rightarrow __ \text{NaOH} + __ \text{H}_2$
 - d. $__ \text{P} + __ \text{O}_2 \rightarrow __ \text{P}_2\text{O}_5$

Energy Changes

When a chemical reaction happens, there is almost always a change in energy.

1. What happens (in terms of energy transfer and temperature change) during:
 - a. An exothermic reaction
 - b. An endothermic reaction?
2. Draw an energy level diagram to describe the energy changes during:
 - a. An exothermic reaction
 - b. An endothermic reaction.



Rate of reaction

Monitoring the rate of reaction is particularly important in industry, as it allows them to maximise the amount of substance that they can produce.

1. State and explain how the following factors affect the rate of reaction:
 - a. Increasing temperature
 - b. Decreasing concentration
 - c. Increasing pressure
 - d. Using a powder rather than larger pieces of a solid
 - e. Adding a catalyst
2. Describe two practical methods for monitoring rate of reaction.

Acids and alkalis

The reactions of acids and alkalis are important in the manufacture of many organic compounds.

1. Give the overall general reaction equation for the reaction of an acid with:
 - a. Metal
 - b. Metal hydroxide
 - c. Metal oxide
 - d. Metal carbonate
2. What does the pH scale measure? How can the pH be measured (give two methods)?

Moles

The amount of substance measures the number of particles involved or needed for a reaction to take place. Calculating this accurately minimises any waste through unreacted reactants.

1. Give the equation used to calculate the number of moles of:
 - a. Solids and liquids
 - b. Solutions
 - c. Gases
2. What is the value of Avogadro's number? What is its significance?

Organic chemistry

Organic chemistry is the study of the structure, properties, composition, reactions and preparation of carbon-containing compounds. *(Some of this content is not covered in combined science, so you may need to do research).*

1. Draw and name the first four members of the following homologous series:
 - a. Alkanes
 - b. Alkenes
 - c. Alcohols
 - d. Carboxylic acids
2. Using an example, describe and explain the difference in reactivity between alkanes and alkenes.
3. Discuss the similarities and differences between addition and condensation polymerisation.



Part 2

These tasks come from the A-level specification. The entire specification can be found using the following link:

<https://www.ocr.org.uk/Images/171720-specification-accredited-a-level-gce-chemistry-a-h432.pdf>

Task one

This task is linked to the specification point (a) from section 2.1.2 Compounds, formulae and equations. It looks at the charges on ions and writing ionic formulae.

- (a) *The writing of formulae of ionic compounds from ionic charges, including:*
- Prediction of ionic charge from the position of an element in the periodic table*
 - Recall of the names and formulae for the following ions: $(NO_3)^-$, $(CO_3)^{2-}$, $(SO_4)^{2-}$, $(OH)^-$, $(NH_4)^+$, Zn^{2+} and Ag^+ .*

Based on this specification point, answer the following questions:

- State and explain the charges on ions made from elements from groups 1, 2, 3, 5, 6 and 7.
- Write the ionic formulae for the following ionic compounds:
 - Lithium oxide
 - Calcium nitride
 - Ammonium nitrate
 - Silver carbonate
 - Zinc hydroxide
 - Aluminium bromide

You need to learn the names and formulae for the ions listed in the specification point (a ii). You will be tested on these in the first lesson of the term. The test will include recalling ions, as well as writing ionic formulae based on ions formed from elements and the ions from (a ii).

Task two

This task is linked to the specification point (b) from section 2.1.1 Atomic structure and isotopes. This discusses atomic structure and includes concepts from 'How science works'.

HSW1 Different models for atomic structure can be used to explain different phenomena, e.g. the Bohr model explains periodic properties.

HSW7 The changing accepted models of atomic structure over time. The use of evidence to accept or reject particular models.

Make a PowerPoint that includes:

- Images representing the different models of the atom.
- Description of how each model differs from the last and detail about how the experiment they conducted led to their conclusion.
- Scientists to cover are Dalton, Thomson, Rutherford, Bohr and Chadwick.

You need to be ready to present this to the rest of the class in the second lesson of the term. Make sure you can present fluently without reading off the slides. You can either bring the presentation saved on a pen drive or email it directly to Miss Nutter.



Part 3

This part is just about making sure that you are organised for the start of term. For the first lesson, please come with a file and file dividers. We'll look at how you need to organise your work in the first lesson, as it's easier to start this from the beginning of term. File dividers are vital – please have quite a few!

The textbook that we use is the Oxford University Press book, A Level Chemistry for OCR A:

<https://global.oup.com/education/product/9780198351979/?region=international>



This book is vital for your success, so it is recommended that you buy it as soon as possible (although you don't need to buy directly from them – it's available on lots of online sites, with good quality second-hand copies available too). There is a sixth form bursary to support with the costs of buying books, so please do speak to the head of sixth form to see if you would qualify for this support.

That's all for now, but if you have any questions, please do just email and ask. Enjoy the rest of your summer holiday and I look forward to seeing you in September.

Miss Nutter ☺