Calday Grange Grammar School
FACULTY OF SCIENCE - CHEMISTRY

A LEVEL CHEMISTRY PRE-COURSE EXERCISE

The following questions cover GCSE topics that are an essential foundation for the study of A Level Chemistry.

Module 1 Chemistry will develop GCSE understanding of the following key areas:

- Atomic Structure
- Chemical Bonding
- Mole Calculations

Atomic Structure

1. (b) Copy and complete the following table.

Particle	Relative charge	Relative mass
Proton		
Neutron		
Electron		

(3)

(b) An atom of element **Z** has two more protons and two more neutrons than an atom of $^{34}_{16}S$.
Give the symbol, including mass number and atomic number, for this atom of **Z.**

.....

(2)

(c) An atom has twice as many protons as, and four more neutrons than, an atom of ^{9}Be.
Deduce the symbol, including the mass number, of this atom.

.....

(2)

(d) The table below shows some data about fundamental particles.

Particle	Proton	neutron	Electron
Mass /g	1.6725×10^{-24}	1.6748×10^{-24}	0.0009×10^{-24}

(ii) Calculate the mass of an atom of hydrogen which is made from a proton and an electron.

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(iii) Calculate the mass of one mole of such hydrogen atoms giving your answer to four decimal places.
(The Avogadro constant, $L = 6.0225 \times 10^{23}$ mol^{-1})

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(iv) An accurate value for the mass of one mole of hydrogen atoms is 1.0080 g. Give one reason why this value is different from your answer to part (c)(iii).

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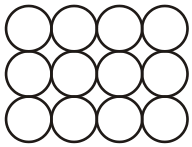
(4)

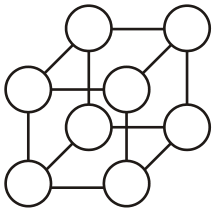
Chemical Bonding

1. At room temperature, both sodium metal and sodium chloride are crystalline solids which contain ions.

(a) On the diagrams for sodium metal and sodium chloride below, mark the charge for each ion.



Sodium metal



Sodium chloride

(2)

(b) (i) Explain how the ions are held together in solid sodium metal.

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.....

(ii) Explain how the ions are held together in solid sodium chloride.

.....

.....

(iii) The melting point of sodium chloride is much higher than that of sodium metal. What can be deduced from this information?

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(3)

(c) Compare the electrical conductivity of solid sodium metal with that of solid sodium chloride. Explain your answer.

Comparison .....

.....

Explanation .....

.....

.....

(3)

(d) Explain why sodium metal is malleable (can be hammered into shape).

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(1)
(Total 9 marks)

2. Sodium sulphide, Na_2S, is a high melting point solid which conducts electricity when molten. Carbon disulphide, CS_2, is a liquid which does not conduct electricity.

(a) Deduce the type of bonding present in Na_2S and that present in CS_2

Bonding in Na_2S .....

Bonding in CS_2.....

(b) By reference to all the atoms involved explain, in terms of electrons, how Na_2S is formed from its atoms.

.....

.....

(c) Draw a diagram, including all the outer electrons, to represent the bonding present in CS_2

(6)

3. Diamond and graphite are both forms of carbon.
Diamond is able to scratch almost all other substances, whereas graphite may be used as a lubricant. Diamond and graphite both have high melting points.

Explain each of these properties of diamond and graphite in terms of structure and bonding.
Give **one** other difference in the properties of diamond and graphite.

(Total 9 marks)

The Mole

1. A hydrocarbon, **W,** contains 92.3% carbon by mass. The relative molecular mass of **W** is 78.0

(a) Calculate the empirical formula of **W**.

(b) Calculate the molecular formula of **W**. (4)

2. The carbonate of metal **M** has the formula M_2CO_3. The equation for the reaction of this carbonate with hydrochloric acid is given below.

$$M_2CO_3 + 2HCl \rightarrow 2MCl + CO_2 + H_2O$$

A sample of M_2CO_3, of mass 0.394 g, required the addition of 21.7 cm^3 of a 0.263 mol dm^{-3} solution of hydrochloric acid for complete reaction.

(i) Calculate the number of moles of hydrochloric acid used.

(ii) Calculate the number of moles of M_2CO_3 in 0.394 g.

(iii) Calculate the relative molecular mass of M_2CO_3

(iv) Deduce the relative atomic mass of **M** and hence suggest its identity.

(6)

3. When potassium chlorate is heated strongly it decomposes to produce potassium chloride and oxygen.

$$2KClO_3(s) \rightarrow 2KCl(s) + 3O_2(g)$$

(a) Calculate the mass potassium chloride produced from 3.00g of potassium chlorate.

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(b) Heating 3.00 g of potassium chlorate produced 1.60 g of potassium chloride.

What is the percentage yield of this reaction?

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This work should be completed and brought to the first Chemistry lesson in September