Sixth Form

A-level Chemistry

Bridging Work Booklet

Name: _____

WGS Chemistry A Level Bridging Work

Welcome to WGS Chemistry!

This booklet is designed to help you bridge the gap between your GCSE Science studies and the A Level Chemistry course. It includes a list of topics from GCSE that will be helpful for you to review, as well as questions to encourage you to consider your GCSE knowledge and some of the basic skills required of an A-Level Chemist.

Why do the work?

Because we want you to be successful and what it takes to be successful at GCSE is **very** different from being successful at A-level. Although you have fewer subjects there are different skills at post 16 and the volume of work is greater because the detail and depth is more demanding.

Bridging work should help you gauge whether the subject is for you, so you can change your mind at enrolment – as long as there is space and you meet the entry criteria. We would rather you study courses that interest you and you are sufficiently qualified to study.

Some of the work is subject based and will build on your chemistry knowledge, and some is skills-based and should support you in other subjects.

Chemistry A-level

Studying Chemistry at A-level will require you to be highly organised and effective with your own **independent** work. Not only will you have to balance the workload of this subject and the other subjects you have chosen, but we require you to commit and do the very best that you can.

Anyone not completing the work or producing poor quality will be spoken to and asked to consider whether this is the correct course for you. Please use resources such as the internet, library and your Chemistry GCSE notes to help you complete this booklet.

As part of your A-Level studies you will have six 55 minute lessons each week in your timetable. In these lessons you will cover all the theory and practical work required for the course. You are also expected to spend at least five and a half hours a week on your Chemistry work outside of lessons. This will include homework tasks, pre-reading, independent study tasks, making additional notes, reviewing lesson materials and reading around the subject.

To support your learning you will be provided with a textbook for the current Year 1 A-Level course. Your teachers are, of course, an excellent source of support both in and out of lessons. Other support includes drop-in support classes outside of school hours, and significant resources on firefly:

https://woodhousegrove.fireflycloud.net/chemistry/pupil-area/a-level-chemistry

Key areas from your GCSE Science work that you will need for A Level Chemistry

Atomic structure – protons, neutrons, electrons, mass number, isotopes etc.

Electron arrangement – how many electrons each shell can hold etc.

Ionic compounds – dot and cross diagrams, properties, examples.

Covalent compounds – dot and cross diagrams, properties, examples, diamond vs graphite.

Metallic bonding – diagram, properties of metals.

Calculations – relative atomic mass, relative molecular mass, moles.

Organic compounds – alkanes and alkenes.

Rates of reaction – collision theory, how to speed up reactions, catalysts etc.

Endothermic and exothermic reactions.

Once you have familiarised yourself with the notes, you should complete the questions that follow.

Year 11 to Year 12 Chemistry A-Level

1.

(a) Define the term *atomic number* of an element.

.....

(1)

(b) Give the symbol, including mass number and atomic number, for an atom of an element which contains 12 neutrons and 11 electrons.

.....

(2)

(c) How many neutrons are there in one ^{27}Al atom?

.....

(1)

(d) Define the term *relative atomic mass* of an element.

.....

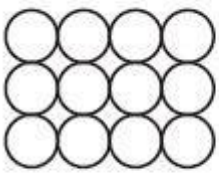
.....

(2)

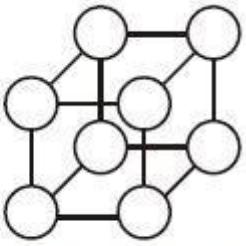
(Total 6 marks)

2. 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.

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

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.....

(1)

(d) Sodium chlorate, $NaClO_3$, is involved in many chemical reactions.

(i) Use a Periodic Table to work out the relative formula mass of $NaClO_3$

.....

.....

(2)

(ii) Sodium chlorate may be prepared by passing chlorine into hot aqueous sodium hydroxide. Balance the equation for this reaction below.

…… Cl_2 + …… NaOH → …… NaCl + $NaClO_3$ + $3H_2O$

(1)

(iii) Use the relative formula mass from part di to work out how many moles would be present in 213g of $NaClO_3$

.....

..... **(2)**

(iv) Use your answer from dii and diii to calculate the mass of chlorine gas that would be needed to make 213g of $NaClO_3$

.....

..... **(2)**

(Total 13 marks)

3. (a) Give the relative mass and relative charge of a neutron.

Relative mass .....

Relative charge.....

(2)

(b) In terms of the number of their fundamental particles, what do two isotopes of an element have in common and how do they differ?

In common .....

Difference .....

(2)

(c) Give the complete atomic symbol, including mass number and atomic number, for an atom of the isotope with 22 neutrons and 19 electrons.

..... **(2)**

(Total 6 marks)

Complete the following table about some atoms and ions. The first row has been done for you.

Particle	Atom or ion	Atomic number	Mass number	Number of protons	Number of neutrons	Number of electrons	Electron structure
$^{23}_{11}Na^{+}$	ion	11	23	11	12	10	2,8
$^{31}_{15}P$							
		13	27			10	
	atom	2	4				
				12	12		2,8

4. (a) Describe the bonding in metals

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(2)

(b) Explain why the melting point of magnesium is higher than that of sodium.

.....

.....

.....

.....

(3)

(c) Explain how metals conduct electricity.

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.....

.....

(2)

Changing between units of mass

1. Convert the mass measurements below into the bracketed units.

   a. 1000 g ➡ [kilograms] _____

   b. 3 mg ➡ [grams] _____

   c. 2.5 kg ➡ [grams] _____

   d. 150 kg ➡ [tonnes] _____

   e. 0.3 g ➡ [milligrams] _____

   f. 70 t ➡ [kilograms] _____

2. Convert the mass measurements below into units given in square brackets.

   a. 0.1 g ➡ [kilograms] _____

   b. 3000 mg ➡ [kilograms] _____

   c. 6 t ➡ [grams] _____

   d. 87 500 g ➡ [tonnes] _____

   e. 0.004 kg ➡ [milligrams] _____

   f. 0.00004 t ➡ [grams] _____

Significant figures and standard form task

Significant Figures

You need to be able to quote answers to the correct number of significant figures.

1) Write the following numbers to the quoted number of significant figures.

a) 345789 4 sig figs …… d) 6 3 sig figs ……

b) 297300 3 sig figs …… e) 0.001563 3 sig figs ……

c) 0.07896 3 sig figs …… f) 0.01 4 sig figs ……

2) Complete the following sums and give the answers to 3 significant figures.

a) 6125 x 384…… d) 750 ÷ 25 ……

b) 25.00 x 0.01…… e) 0.000152 x 13 ……

c) 13.5 + 0.18…… f) 0.0125 x 0.025 ……

Standard Form

You need to be able to work with numbers in standard form.

3) Write the following numbers in non standard form.

a) 1.5×10^{-3} …… d) 0.0534×10^{4}……

b) 0.046×10^{-2} …… e) 10.3×10^{5} ……

c) 3.575×10^{5}…… f) 8.35×10^{-3} ……

4) Write the following numbers in standard form.

a) 0.000167 …… d) 34500……

b) 0.0524…… e) 0.62……

c) 0.000000015…… f) 87000000 ……

5) Complete the following calculations and give the answers to 3 significant figures.

a) $6.125 \times 10^{-3} \times 3.5$ ……

b) $4.3 \times 10^{-4} + 7.0$……

c) $4.0 \times 10^{8} + 35000$……

d) $0.00156 + 2.4 \times 10^{3}$……

e) $6.10 \times 10^{-2} - 3.4 \times 10^{-5}$ ……

Balancing equations task

Look at the following equations – some need balancing, others do not. Balance the equations that need it.

1) $Zn + HNO_3 \rightarrow Zn(NO_3)_2 + H_2$

2) $SO_2 + O_2 \rightarrow SO_3$

3) $C + CO_2 \rightarrow CO$

4) $Al(OH)_3 + HNO_3 \rightarrow Al(NO_3)_3 + H_2O$

5) $C_6H_{12} + O_2 \rightarrow CO_2 + H_2O$

6) $Br_2 + NaOH \rightarrow NaBr + NaOBr + H_2O$

7) $F_2 + KBr \rightarrow KF + Br_2$

Rearranging Equations Task

1. Make p the subject of the formula m = 3n + 2p;
   p = ...

2. Make c the subject of the formula a = 3c – 4; c =……

3. Make b the subject of the formula P = 2a + 2b; b =.....

4. Rearrange y = ½ x + 1 to make x the subject; x = ...

5. Make a the subject of the formula s = a/4 + 8u; a = …….

6. Make u the subject of the formula $D = ut + kt^2$; u = …….

7. When you are h feet above sea level, you can see d miles to the horizon:

$$d = \sqrt{\frac{3h}{2}}$$

   Make h the subject of the formula; d = …….

Organic Chemistry Tasks

1) Draw the displayed structure of the molecule stated in each box. (4)

methanol	propane
butene	ethanoic acid

2) Give the meaning of the following terms.

a) hydrocarbon .....

..... (1)

b) unsaturated .....

..... (1)

c) functional group .....

..... (1)

d) polymer .....

..... (1)

Crude oil is a mixture of hydrocarbons which are mainly alkanes. These alkanes are separated at an oil refinery by fractional distillation. Describe how this is done and explain how it works.

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..... (5)

The actual masses of protons, neutrons and electrons are:
Proton: 1.6727×10^{-24} g
Neutron: 1.6750×10^{-24} g
Electron: 9.110×10^{-28} g

Use the information in the box to the left to demonstrate the **relative masses** of the proton, neutron and electron.
You must demonstrate **how** you calculated them.
Use the large box to show your working, and the smaller box for your answer.

Proton:

Electron:

Neutron

Two isotopes of **Barium** (proton number = 56) are barium-132 and barium-127, work out the numbers of protons, neutrons and electrons in both isotopes.

Barium-127
Protons = neutrons = electrons =
Barium-132
Protons = neutrons = electrons =

Use the actual masses of the three particles given above to calculate the actual mass (in grams) of both barium-132 and barium-127.

Barium-127
Barium-132

Different isotopes can be differentiated from each other using a **mass spectrometer**. In this, ions (an atom that has **lost one electron**) are given the same amount of kinetic energy and accelerated through a tube of fixed length. As the mass is the only variable that changes they reach the end of the tube at different time points. We use two equations:

$$KE = {}^{1}/_{2}\, mv^2$$

$$v = {}^{d}/_{t}$$

Where KE = kinetic energy (J), m = mass (kg), v = velocity (ms^{-1}), d = length of tube (m), t = time of flight (s)

Use the expressions for *KE* and *v* to give time (*t*) as the subject.

Both ions are given 5 x 10^{10}J of kinetic energy, the length of the flight tube is 1000m.

$^{127}Ba^{+}$ = 2.13 x 10^{-25} kg

$^{132}Ba^{+}$ = 2.21 x 10^{-25} kg

Use these values, with your rearranged expression, to determine the time taken for the isotopes to travel through the tube.

t =

t (^{127}Ba) =

t (^{132}Ba) =

A common chemical expression used in calculations is the **ideal gas equation**:

$$PV = nRT$$

You will learn about this in the second of Mr Davis's (TJD) topics, however you should be able to rearrange the expression, so that each of the terms (P, V, n, R, T) are made the subject:

P = n = T =

V = R =

You are also expected to be able to convert units of mass and volume:

Mass: 1x10^{3}mg (miligrams) = 1g (gram) = 1x10^{-3}kg (kilograms) = 1x10^{-6}t (metric tonnes)

Volume: 1cm^3 = 1x10^{-3}dm^3 = 1x10^{-6}m^3

Give the mass of 500g of a solid in mg, kg, metric tonnes

A gas occupies a volume of 320 dm^3 give this volume in cm^3 and m^3

All of the maths in this workbook is of GCSE standard, and this is the standard expected of A-Level Chemists. The only chemical knowledge required here is working out numbers of protons, neutrons and electrons.

In your first lesson with JHS, he will run through the answers to the problems here, you will be expected to bring this worksheet with you.

If you have struggled with the questions here then you must:

i. Revisit GCSE maths. It is **vital** that A-Level chemists are able to rearrange expressions and reliably substitute values into them. Chemistry is an extremely mathematical subject, basic maths skills are expected and required.

ii. Ask for help. A-Level Chemistry is, in places, difficult. You must get used to asking for help as soon as possible. Your teacher are here to support you, but you have to ask us for that support. The sooner you ask, the easier it will be.