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Multi Academy Trust



**KEEP
CALM
AND
STUDY
CHEMISTRY**

Transition Work

This transition work **MUST** be completed by the time you start your course and it will be assessed in September. The aims are for you re-familiarise yourself with work studied during GCSE but largely ignored for the past 10 weeks, but vital for progression at post 16 level.

Chemistry can be a fun subject but requires hard work to succeed with few shortcuts. Please use resources such as the internet, library and your Chemistry GCSE notes to help you complete this work.

To pass the full A-level you will complete twelve set practical activities which you will be internally assessed on and obtain your Practical Endorsement.

Exam board: AQA Chemistry

Paper 1	Paper 2	Paper 3
<p>What's assessed:</p> <p>Relevant physical chemistry topics (sections 3.1.1 to 3.1.4, 3.1.6 to 3.1.8 and 3.1.10 to 3.1.12)</p> <p>Inorganic chemistry (section 3.2) Relevant practical skills</p> <p>Assessed by written exam: 2 hours 105 marks 35% of A-level</p> <p>Questions 105 marks of short and long answer questions</p>	<p>What's assessed:</p> <p>Relevant physical chemistry topics (sections 3.1.2 to 3.1.6 and 3.1.9)</p> <p>Organic chemistry (section 3.3) Relevant practical skills</p> <p>Assessed by written exam: 2 hours 105 marks 35% of A-level</p> <p>Questions 105 marks of short and long answer questions</p>	<p>What's assessed: Any content. Any practical skills.</p> <p>Assessed by written exam: 2 hours 90 marks 30% of A-level</p> <p>Questions</p> <p>40 marks of questions on practical techniques and data analysis</p> <p>20 marks of questions testing across the specification</p> <p>30 marks of multiple choice questions</p>

Task 1 - Fundamental Particles

Atoms are the basic building blocks of matter. It is not the smallest of particles, and within Chemistry, we are interested in electrons, protons and neutrons.

Using a periodic table, draw the *electronic configuration*, as well as identifying *how many sub-atomic particles* there are for the following atoms and its corresponding ions:

<p>Hydrogen</p> <p>Number of: e⁻: p: n:</p>	<p>Oxygen</p> <p>Number of: e⁻: p: n:</p>	<p>Calcium</p> <p>Number of: e⁻: p: n:</p>
<p>Hydrogen ion, H⁺</p> <p>Charge:</p> <p>Number of: e⁻: p: n:</p>	<p>Oxygen ion</p> <p>Charge:</p> <p>Number of: e⁻: p: n:</p>	<p>Calcium ion</p> <p>Charge:</p> <p>Number of: e⁻: p: n:</p>

Task 2 – Constructing formulae from common ions

Writing chemical formulae is an essential skill for both AS and A2 Chemistry and requires a knowledge of both the common positive and negative ions.

Positive ions		Negative ions	
Name	Formula	Name	Formula
Hydrogen	H ⁺	Chloride	Cl ⁻
Sodium	Na ⁺	Bromide	Br ⁻
Silver	Ag ⁺	Fluoride	F ⁻
Potassium	K ⁺	Iodide	I ⁻
Lithium	Li ⁺	Hydroxide	OH ⁻
Ammonium	NH ₄ ⁺	Nitrate	NO ₃ ⁻
Barium	Ba ²⁺	Oxide	O ²⁻
Calcium	Ca ²⁺	Sulfide	S ²⁻
Copper(II)	Cu ²⁺	Sulfate	SO ₄ ²⁻
Magnesium	Mg ²⁺	Carbonate	CO ₃ ²⁻
Zinc	Zn ²⁺		
Lead	Pb ²⁺		
Iron(II)	Fe ²⁺		
Iron(III)	Fe ³⁺		
Aluminium	Al ³⁺		

Unlike GCSE these are not given on any data sheet and therefore important to learn and the best way of learning them is using them.

You can though use the periodic table and this can be helpful, particular with the metal ions; try to spot the connection between the metals and their position in the Periodic table.

Complete the table for the formula making sure the charges balance;-

	Na ⁺	K ⁺	Mg ²⁺	Ca ²⁺	Al ³⁺	Cu ²⁺ (III)
Cl ⁻	NaCl					
O ²⁻		K ₂ O				
OH ⁻			Mg(OH) ₂			
CO ₃ ²⁻				CaCO ₃		
SO ₄ ²⁻					Al ₂ (SO ₄) ₃	

Name the five compounds formed in the grey highlighted boxes above.

- 1.
- 2.
- 3.
- 4.
- 5.

Using the ion table and your own research give the formulae of the following ionic compounds:

1. Potassium nitrate
2. Lithium hydroxide
3. Barium fluoride
4. Ammonium nitrate
5. Sodium hydrogen carbonate
6. Iron (II) chloride
7. Iron (III) chloride
8. Zinc nitrate
9. Hydrochloric acid
10. Ammonium hydroxide
11. Sodium sulfate
12. Sodium sulphide
13. Sulphuric acid
14. Potassium phosphate
15. Potassium dichromate (VI)

Task 3 - Dot cross diagrams

You would have covered ionic and covalent bonding in your GCSE. Using your knowledge, draw the dot cross diagrams for the following compounds, showing only outer electrons.

You will need to decide what type of bonding is present within these compounds, before you start remember **ionic compounds** contain ions and must contain **both a metal and a non-metal**; **covalent molecules** share electrons and contain **non-metals**.

Chlorine gas	Sodium chloride
Magnesium oxide	Water
Carbon dioxide	Calcium chloride
Methane (CH₄)	Nitrogen gas

Task 4 - Rearranging Formulae

When solving chemistry problems you will often be required to rearrange an equation to solve for an unknown. You would have seen this in Physics when trying to solve speed.

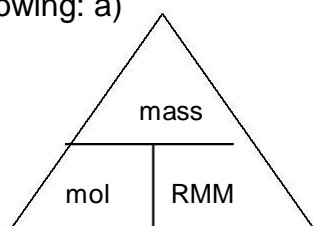
$$\text{Speed (m/s)} = \text{distance (m)} / \text{time (s)}$$

We can write this to show distance and time as follows:

$$\text{Distance (m)} = \text{speed (m/s)} \times \text{time (s)}$$

$$\text{Time (s)} = \text{distance (m)} / \text{speed (m/s)}$$

Rearrange the following: a)

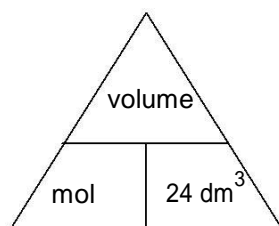


mass =

mol =

RMM =

b)



Volume =

mol =

c)

$$n = c v$$

c =

v =

The units of n is mol and the unit for v is dm^3 . Write down the units for c .

d) There are 1000cm^3 in 1dm^3 . Convert the following:

1.	250 cm^3 is	dm^3	4.	0.8 dm^3 is	cm^3
2.	30 cm^3 is	dm^3	5.	10 dm^3 is	cm^3
3.	500 cm^3 is	dm^3	6.	0.0065 dm^3 is	cm^3

Task 5 - Significant Figures and Standard Form

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) 6125×384 d) $750 \div 25$
b) 25.00×0.01 e) 0.000152×13
c) $13.5 + 0.18$ f) 0.0125×0.025

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) $4.3 \times 10^{-4} \div 7.0$
c) $4.0 \times 10^8 + 35000$
d) $0.00156 + 2.4 \times 10^3$
e) $6.10 \times 10^{-2} - 3.4 \times 10^{-5}$

Task 6 - Balancing equations

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

- 1) C + O₂ → CO
 - 2) Na + O₂ → Na₂O
 - 3) H₂ + O₂ → H₂O
 - 4) Na + I₂ → NaI
 - 5) CH₄ + O₂ → CO₂ + H₂O
 - 6) SO₂ + O₂ → SO₃
 - 7) Fe₂O₃ + C → Fe + CO
 - 8) Fe₂O₃ + CO → Fe + CO₂
 - 9) NH₃ + O₂ → NO + H₂O
 - 10) Fe₃O₄ + H₂ → Fe + H₂O
 - 11) C + CO₂ → CO

 - 12) Fe + S → FeS
 - 13) Ca + H₂O → Ca(OH)₂ + H₂
 - 14) Al + Cl₂ → AlCl₃
 - 15) Fe + HCl → FeCl₂ + H₂
-

Task 6 - Relative formula mass

Use a Periodic Table to work out the relative formula mass of the following compounds

NaOH : Na + O + H = 23 + 16 + 1 = **40**

CuSO₄

Mg(HCO₃)₂

NH₄NO₃

CuCO₃

Ca(OH)₂

H₂SO₄

C₃H₈

HgO

NH₄Fe(SO₄)₂·12H₂O

K₃Fe(CN)₆

Al₂(SO₄)₃

Task 7 – Organic Chemistry

Organic chemistry is the study of the structure, properties, reactions, and preparations of carbon containing compounds and often derived from living systems.

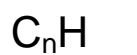
The hydrocarbons are some of the simplest organic compounds and contain only carbon and hydrogen atoms e.g. Methane.

Complete the tables for the first six alkanes and alkenes.

The Alkanes

Name	Formula	Display Formula
Methane	CH ₄	$\begin{array}{c} \text{H} \\ \\ \text{H}-\text{C}-\text{H} \\ \\ \text{H} \end{array}$
Ethane		
	C ₃ H ₈	
		$\begin{array}{cccc} \text{H} & \text{H} & \text{H} & \text{H} \\ & & & \\ \text{H}-\text{C} & -\text{C} & -\text{C} & -\text{C}-\text{H} \\ & & & \\ \text{H} & \text{H} & \text{H} & \text{H} \end{array}$
Pentane		

The Alkanes all share a general formula – using *n* to represent the number of carbon atoms, complete the general formula below:-

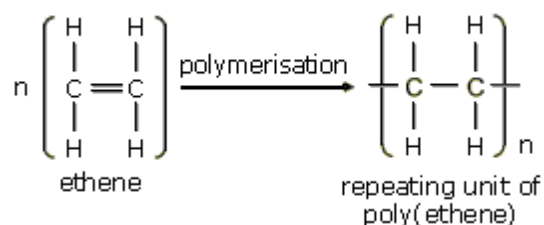


The Alkenes

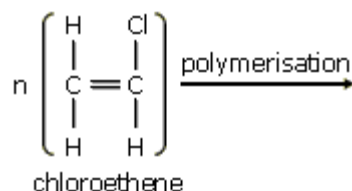
The alkenes are a second group of hydrocarbons with the general formula C_nH_{2n} , they differ from the alkanes due to their C=C double bond and are said to be **UNSATURATED**. Complete the table for the first five alkenes.

Name	Formula	Display Formula
Ethene		$\begin{array}{c} \text{H} & & \text{H} \\ & \diagdown & / \\ & \text{C} = \text{C} \\ & / & \diagdown \\ \text{H} & & \text{H} \end{array}$
	C_3H_6	
		$\begin{array}{cccc} & \text{H} & \text{H} & \text{H} & \text{H} \\ & & & & \\ \text{H} & - \text{C} & - \text{C} & - \text{C} & = \text{C} \\ & & & & \\ & \text{H} & \text{H} & & \text{H} \end{array}$

The alkenes are often used for the starting materials for the production of polymers such as polyethene; polypropene and polystyrene, see equation below showing the formation of the repeat unit of poly(ethene) from its monomer ethene.



Complete the equation below showing the repeat unit for polymer - Poly(chloroethene)

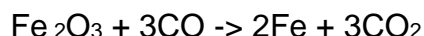


Task 8 – More Calculations

1. Which of the following iron ores has the greatest amount of iron in it by percentage mass?

- a) Siderite FeCO_3 b) Haematite Fe_2O_3 c) Magnetite Fe_3O_4 d) iron pyrite FeS_2

2. Pure iron can be obtained by reducing it with carbon monoxide.



What mass of iron will make 8.8g of Carbon dioxide?

3. Copper oxide can be reduced to copper using methane.



- a) How much copper oxide is needed to make 19.2g of copper?
b) How much copper can you make from 26.5kg of copper oxide
c) If only 15kg of copper is made in b) what is the percentage yield?
d) What is the atom economy of the above reaction

4. I have 54g of water (H_2O) and 84g of Chlorine (Cl_2). Do I have more molecules of water or more molecules of Chlorine?

5. Which has the greatest number of atoms? 230g of sodium or 230 g of potassium?

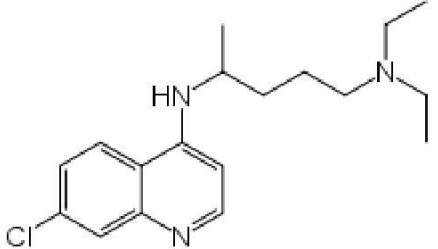
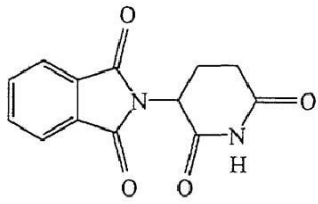
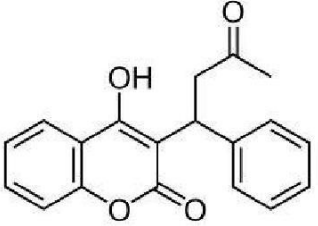
6. Chlorine exists as two different isotopes, Cl^{35} and Cl^{37} in a ratio of 3:1

- a) What is meant by an isotope?
b) What are all of the possible values for the relative formula masses of a chlorine molecule?
c) What are the different proportions of these molecules?

Task 9 – Research

Choose one (or more) of the following medicines/drugs and find out:

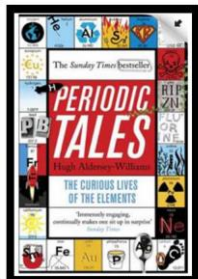
1. Common brand names
2. Class of drug
3. Brief history of discovery
4. State the chemical functional group found in the compound
5. Uses
6. List any side effects

Chloroquine	Thalidomide	Warfarin
 <chem>CCN(CC)CCCCNC1=CN=C2C=C(Cl)C=CC2=N1</chem>	 <chem>O=C1C(=O)c2ccccc2N1C3CC(=O)NC(=O)C3</chem>	 <chem>CC(=O)CC(c1ccc(cc1)C2=C(O)C(=O)Oc3ccccc23)C4=CC=CC=C4</chem>

Book Recommendations

We recommend the first three texts as interesting texts for Chemistry / Science students, the final text will be of use to those who are not studying A-level maths as it covers the various different types of calculations encountered throughout the A-level course. This book contains many worked through examples. We are hoping to obtain a class set for September 2017.

Periodic Tales: The Curious Lives of the Elements (Paperback) Hugh Aldersey-Williams

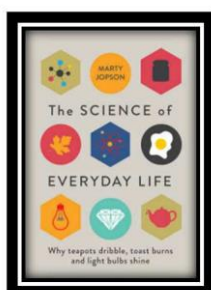


ISBN-10: 0141041455

<http://bit.ly/pixlchembook1>

This book covers the chemical elements, where they come from and how they are used. There are loads of fascinating insights into uses for chemicals you would have never even thought about.

The Science of Everyday Life: Why Teapots Dribble, Toast Burns and Light Bulbs Shine (Hardback) Marty Jopson

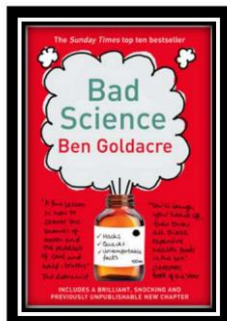


ISBN-10: 1782434186

<http://bit.ly/pixlchembook2>

The title says it all really, lots of interesting stuff about the things around you home!

Bad Science (Paperback) Ben Goldacre

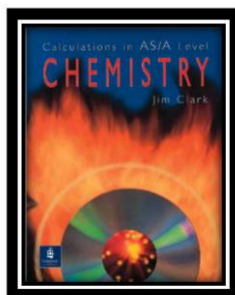


ISBN-10: 000728487X

<http://bit.ly/pixlchembook3>

Here Ben Goldacre takes apart anyone who published bad / misleading or dodgy science – this book will make you think about everything the advertising industry tries to sell you by making it sound 'sciency'.

Calculations in AS/A Level Chemistry (Paperback) Jim Clark



ISBN-10: 0582411270

<http://bit.ly/pixlchembook4>

If you struggle with the calculations side of chemistry, this is the book for you. Covers all the possible calculations you are ever likely to come across. Brought to you by the same guy who wrote the excellent chemguide.co.uk website.

Note these links are to Waterstones, should you wish to acquire any of these books you may find them cheaper elsewhere.