

SIXTH FORM AES CHEMISTRY TRANSITION UNIT

Bridging the gap between GCSE and AS-Level

Name: _____

Secondary School _____

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Introduction

Some students find the transition from GCSE to A-level Chemistry very challenging. To help make this transition smoother and to give you the best possible start, we have prepared this booklet for you.

It is important that you read through this booklet and then complete all the questions. If you require more space then you can use lined paper. The tasks cover GCSE topics which you should have already covered. You will need a secure knowledge of these topics before you start the course in September.

At the beginning of the course you will be given a test to check how well you have understood the topics. If you do not pass this test, you will be put into an intervention class. This class will help you to bring your knowledge and understanding up to the required standard.

To help you complete this booklet the following resources may be useful:

- <http://www.bbc.co.uk/schools/gcsebitesize/>
- <http://www.s-cool.co.uk/gcse>
- Any GCSE Additional Science/ Chemistry revision guide
- Your own old GCSE Science/ Chemistry exercise books

For A level students only, you may wish to purchase: CGP New A-Level Chemistry Essential Maths Skills OCR ISBN 978 1 78294 472 0 and/or CGP New A level Chemistry for OCR A Year 1 & 2 Complete Revision & Practice with online edition. ISBN-13: 978-1789080384

For A level or IB students who have not done UK KS4 Science or Chemistry, you may wish to purchase or borrow from a library: New Head Start to A-level Chemistry (CGP A-Level Chemistry) ISBN-13: 978-1782942801

The tasks in this booklet must be completed by the first week in September and will be presented to the teacher in your first Chemistry lesson.

Task 2: Atoms and ions

You will need to look at the Periodic Table to help you answer the following questions.

1 a Complete the table to show the electronic structure of the following ions.

Ion	F ⁻	Na ⁺	Al ³⁺	K ⁺	S ²⁻	H ⁺	O ²⁻	Ca ²⁺	Li ⁺	Mg ²⁺	Cl ⁻	Be ²⁺
Electronic structure												

b Complete the table below to show the electronic structure of some Group 0 elements (noble gases). Place the ions from part a into the correct row of the table.

Element	Electronic structure	Ions with the same electronic structure
He		
Ne		
Ar		

c i Complete the table with the ions from part a. Ions for Group 1 have been done for you. Do not include the H⁺ ion.

Group	1	2	3	4	5	6	7	0
Ions	Li ⁺ Na ⁺ K ⁺							
Charge	+1							

ii Predict the charge that the following ions would have using the Periodic Table and your table.

strontium ions _____ iodide ions _____ rubidium ions _____

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

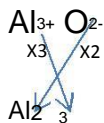
Particle	Atom or ion	Atomic number	Mass number	Number of protons	Number of neutrons	Number of electrons	Electronic structure
¹⁶ O ²⁻	ion	8	16	8	8	10	[2, 8] ²⁻
³¹ P							
		13	27			13	

		13	27			10	
	atom	2	4				
		16	32				[2, 8, 8] ²⁻
				12	12		[2, 8] ²⁺

Task 3: Writing formulae

Use the table of ions to write the formula of the following ionic compounds. Use the general rule of cross-multiply and then simplify where possible.

Eg: Aluminium oxide:



Positive ions				Negative ions			
aluminium	Al^{3+}	lead	Pb^{2+}	bromide	Br^-	oxide	O^{2-}
ammonium	NH_4^+	lithium	Li^+	carbonate	CO_3^{2-}	sulfate	SO_4^{2-}
barium	Ba^{2+}	magnesium	Mg^{2+}	chloride	Cl^-	sulfide	S^{2-}
calcium	Ca^{2+}	potassium	K^+	fluoride	F^-		
copper (II)	Cu^{2+}	silver	Ag^+	hydrogencarbonate	HCO_3^-		
hydrogen	H^+	sodium	Na^+	hydroxide	OH^-		
iron (II)	Fe^{2+}	zinc	Zn^{2+}	iodide	I^-		
iron (III)	Fe^{3+}			nitrate	NO_3^-		

1 a potassium iodide

b sodium oxide

c aluminium bromide

d magnesium chloride

e silver oxide

f iron (II) oxide

g iron (III) oxide

h calcium sulfide

i copper (II) chloride

j lithium fluoride

k barium chloride

l lead sulfide

2 a potassium sulfate

b magnesium sulfate

c magnesium hydroxide

d copper (II) nitrate

e zinc carbonate

f potassium hydroxide

g sodium carbonate

h aluminium hydroxide

i ammonium hydroxide

j ammonium chloride

k aluminium sulfate

l iron (III) nitrate

Task 4: Relative masses

Element	Ar
aluminium Al	27
bromine Br	80
calcium Ca	40
carbon C	12
chlorine Cl	35.5
copper Cu	63.5
fluorine F	19

Element	Ar
hydrogen H	1
iodine I	127
iron Fe	56
magnesium Mg	24
nitrogen N	14
oxygen O	16

Element	Ar
phosphorus P	31
potassium K	39
silver Ag	108
sodium Na	23
sulfur S	32
zinc Zn	65

Calculate the relative formula mass of the following substances on page 7. You will need to use the relative atomic masses (A_r) shown above.

(HINTS: 1. If there is formulae in brackets everything in the brackets need to be multiplied by the number outside.

2. The dot means to add. So for $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ add CuSO_4 to 5 lots of H_2O).

- | | |
|--------------------------------|---|
| a $\text{Mg}(\text{OH})_2$ | e $(\text{NH}_4)_2\text{SO}_4$ |
| b $\text{Al}(\text{NO}_3)_3$ | f $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ |
| c $\text{Fe}_2(\text{SO}_4)_3$ | g $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$ |
| d $\text{Ca}(\text{HCO}_3)_2$ | h $\text{Fe}(\text{NH}_4)_2(\text{SO}_4)_2 \cdot 6\text{H}_2\text{O}$ |

2 Calculate the percentage by mass of the element shown in each of the following substances. You will need to use the formula masses calculated in Q1.

- | | |
|-------------------------------------|---|
| a O in $\text{Mg}(\text{OH})_2$ | e N in $(\text{NH}_4)_2\text{SO}_4$ |
| b O in $\text{Al}(\text{NO}_3)_3$ | f O in $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ |
| c O in $\text{Fe}_2(\text{SO}_4)_3$ | g Na in $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$ |
| d H in $\text{Ca}(\text{HCO}_3)_2$ | h Fe in $\text{Fe}(\text{NH}_4)_2(\text{SO}_4)_2 \cdot 6\text{H}_2\text{O}$ |

Task 5: Balancing equations

Balance the following equations.

- a $\text{N}_2 + \underline{\hspace{1cm}} \text{H}_2 \rightarrow \underline{\hspace{1cm}} \text{NH}_3$ b $\underline{\hspace{1cm}} \text{Ca} + \text{O}_2 \rightarrow \underline{\hspace{1cm}} \text{CaO}$
- c $\text{Br}_2 + \underline{\hspace{1cm}} \text{KI} \rightarrow \underline{\hspace{1cm}} \text{KBr} + \text{I}_2$
- d $\underline{\hspace{1cm}} \text{Fe} + \underline{\hspace{1cm}} \text{H}_2\text{O} \rightarrow \text{Fe}_3\text{O}_4 + \underline{\hspace{1cm}} \text{H}_2$
- e $\text{C}_3\text{H}_8 + \underline{\hspace{1cm}} \text{O}_2 \rightarrow \underline{\hspace{1cm}} \text{CO}_2 + \underline{\hspace{1cm}} \text{H}_2\text{O}$
- f $\underline{\hspace{1cm}} \text{NH}_3 + \underline{\hspace{1cm}} \text{O}_2 \rightarrow \underline{\hspace{1cm}} \text{NO} + \underline{\hspace{1cm}} \text{H}_2\text{O}$

Task 6: Writing symbol equations from words

Write symbol equations for the following reactions taking place. You will first need to convert the names of the materials into formulae and then balance the equation.

1. Zinc metal reacts with copper sulphate solution to produce solid copper metal and zinc sulphate solution.
2. Solid calcium hydroxide reacts with solid ammonium chloride on heating to produce solid calcium chloride, steam and ammonia gas.
3. When lead (II) nitrate is heated in a dry test tube lead (II) oxide, nitrogen dioxide gas and oxygen are produced.
4. Silicon tetrachloride reacts with water to produce solid silicon dioxide and hydrogen chloride gas.
5. When octane (C_8H_{18}) vapour is burned with excess air in a car engine carbon dioxide and water vapour are produced.
6. When rubidium reacts with water a solution of the hydroxide of the metal is produced as well as hydrogen gas.
7. When strontium reacts with water a solution of the hydroxide of the metal is produced as well as hydrogen gas.

Task 7: Different types of structures

Complete the table about substances with each of the types of structures shown.

Type of structure	Simple molecular	Ionic	Giant covalent	Metallic
Description of the structure				
Type of bonding				
Melting and boiling points (with reason)				
Electrical conductivity (with reason)			Exception: Graphite	
Which types of substances have this structure				

Task 9: Products from fuels

Burning fossil fuels

- 1 a Name the product from the complete combustion of carbon. (1 mark)
- b Name the product from the complete combustion of hydrogen. (1 mark)
- 2 Coal is mostly carbon. Name the main product from the complete combustion of coal. (1 mark)
- 3 Paraffin wax is a hydrocarbon.
- a Name the two products made during the complete combustion of paraffin wax. (2 marks)
- b Which gas, found in air, is needed for combustion to happen? (1 mark)
- d Use your answers to parts b and c to write a word equation for the complete combustion of paraffin wax. (2 marks)

Other products of combustion

- 4 Incomplete combustion happens when the supply of air is not plentiful.
- a Name the solid product released during the incomplete combustion of hydrocarbon fuels. (1 mark)
- b Name the gaseous product released during the incomplete combustion of hydrocarbon fuels. (1 mark)
- 5 Fossil fuels often contain sulfur.
- a Name the gaseous product formed when sulfur is burned. (1 mark)
- b The product named in part a is a cause of acid rain. NO_x form at high temperatures and are also a cause of acid rain. Which gas reacts with oxygen to form NO_x ? (1 mark)

Balanced equations

- 6 Correctly balance these equations.
- a $\text{C}_3\text{H}_8 + \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O}$ (1 mark)
- b $\text{C}_3\text{H}_8 + \text{O}_2 \rightarrow \text{CO} + \text{H}_2\text{O}$ (1 mark)
- c $\text{N}_2 + \text{O}_2 \rightarrow \text{NO}_2$ (1 mark)