Year 12 Chemistry Transition Work - QPHS

Contents

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. These must be organized in a folder. The tasks cover GCSE topics which you should have already covered with one extension task for Double award students.. 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

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
- Head Start to AS Chemistry Published by CGP (copies of this are available in school)

Task1: The structure of atoms

1 Complete the spaces to create a set of notes about the structure of atoms.

Atoms consist of a central ____________________________containing protons and ______________________. The nucleus is ________________________compared to the size of the whole atom. The nucleus is surrounded by _________in energy levels (also called _____). Atoms have no electric charge because they contain the same number of protons and ______________________

Sub-atomic	Relative mass	Relative charge
Proton		
Neutron		
Electron		

Atomic number = number of __________.

Mass number = number of __________ + number of ____________.

mass number 19

Symbol F

atomic number 9

protons = ________

neutrons = _______

electrons = _______

Atoms of the same element have the same number of ______. It is the number of ______________that determines what type of atom it is (e.g. all atoms with six protons are carbon atoms). Atoms of different elements have different numbers of ____________________________. Isotopes are atoms of the same element. They contain the same number of ___but a different number of ____________.

2 Complete the table about some atoms.

Atom	Atomi c	Mass number	Number of	Number of	Number of
$^{23}_{11}Na$					
Li	3	7			
Ar		40	18		
K			19	20	
Al				14	13
Cl	17			18	

Task 2: Writing formulae

Use the table of ions from your GCSE data sheet (AQA GCSE) to write the formula of the following ionic compounds.

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

Task 3: Relative masses

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

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

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

1. Calculate the relative formula mass of the following substances 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.)

. The dot means to add. So for $CuSO_4.5H_2O$ add $CuSO_4$ to 5 lots of H_2O).

$Mg(OH)_2$

$Ca(HCO_3)_2$

$(NH_4)_2SO_4$

$Fe(NH_4)_2(SO_4)_2.6H_2O$

$Na_2CO_3.10H_2O$

2. Calculate the percentage by mass of the element shown in each of the following substances.

O in $Mg(OH)_2$

O in $Al(NO_3)_3$

O in $Fe_2(SO_4)_3$

H in $Ca(HCO_3)_2$

Task 4: Balancing equations

Balance the following equations.

N_2 + ______ $H_2 \rightarrow$ ______NH_3

________$Ca + O_2 \rightarrow$ _____CaO

Br_2 + _______ $KI \rightarrow$ _______$KBr + I_2$

_______ Fe + _______$H_2O \rightarrow Fe_3O_4$ + ___ H_2

C_3H_8 + ______$O_2 \rightarrow$ _______CO_2 + _____ H_2O

________ NH_3 + ______$O_2 \rightarrow$ _____NO + ___ H_2O

Task 5: 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.

. Zinc metal reacts with copper sulfate solution to produce solid copper metal and zinc sulphate solution.

Solid calcium hydroxide reacts with solid ammonium chloride on heating to produce solid calcium chloride, steam and ammonia gas.

When octane (C_8H_{18}) vapour is burned with excess air in a car engine carbon dioxide and water vapour are produced.

Task 6: The mole

Use research resources to find the definition of a mole and then apply it to these questions. Use the following values for A_r

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

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

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

1 Complete the blank parts of the following table.

Substance	Formula	M_r	Mass	Moles
carbon monoxide	CO		560 g	
propane	C_3H_8			0.2
unknown solid	unknown		0.104 g	0.0005
methane	CH_4		6 kg	
sodium	Na_2CO_3			2.5
unknown gas	unknown		0.1 g	0.0025

Space for rough working

Task 7: %Yields

1 Write the equation for the thermal decomposition of limestone

a Calculate the maximum theoretical mass of quicklime that can be made by heating

50 g of limestone (relative atomic masses: C = 12, O = 16, Ca = 40).

b In the reaction, only 26 g of quicklime was produced. Calculate the percentage yield.

2 Hydrazine (N_2H_4) was used as the rocket fuel for the Apollo missions to the moon. It is made by the reaction of ammonia (NH_3) with sodium chlorate (NaOCl) (relative atomic masses:

ammonia + sodium chlorate → hydrazine + sodium chloride + water

$$2\,NH_3 + NaOCl \rightarrow N_2H_4 + NaCl + H_2O$$

a Calculate the maximum theoretical mass of hydrazine that can be made by reacting

340 g of ammonia with an excess of sodium chlorate.

b In the reaction, only 280 g of hydrazine was produced. Calculate the percentage yield.

Task 8: Empirical and molecular formulae

Empirical formula is the simplest whole number ratio of elements. Divide the percentage or mass by the Mr of each element in the compound, divide by the smallest number and simplify to give a whole number ratio.

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

Element		A_r
hydrogen	H	1
iodine	I	127
iron	Fe	56
lead	Pb	207
magnesium	Mg	24
nitrogen	N	14
oxygen	O	16

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

1 Copy and complete the table.

Empirical	M_r	Molecular
CH_2	42	
		C_5H_{10}
		C_4H_8
C_3H_8	44	
		H_2O
CH	78	

2 Find the empirical formula of each of the following substances using the data about composition by mass.

a H 5% F 95%

b Na 3.71 g O 1.29 g

c Pb 90.7% O 9.3%

d C 60.0% H 13.3% O 26.7%

3 3.53 g of iron reacts with chlorine to form 10.24 g of iron chloride. Find the empirical formula for the iron chloride.

4 Analysis of a compound consisting of carbon, hydrogen and oxygen showed it to contain 0.273 g C,
0.046 g H, and 0.182 g O. It has a relative formula mass (M_r) of 88.

a Calculate the empirical formula of the compound.

b Calculate the molecular formula of the compound.

Task 9: Different types of structures

At GCSE you have covered different examples of bonding and should know how to link the bonding type to their physical properties
e.g. melting point, boiling point and conduction of electricity.

Using your GCSE notes and any additional resources make a summary chart for each type of bonding using the following headings:

Type of bonding	
Example	
Melting point High/Low	
Boiling point High/Low	
Conduction of electricity	

Just to remind you the main groups of compounds are;

Simple molecular substances

Giant covalent structures

Metallic structures

Ionic compounds