3051/2 BGCSE

School Number	Candidate Number
Surname and Initials	

CHEMISTRY

PAPER 2 3051/2

Wednesday **20 MAY 2009** 1.50 – 3.20 P.M.

No additional materials required

MINISTRY OF EDUCATION
NATIONAL EXAMINATIONS

BAHAMAS GENERAL CERTIFICATE OF SECONDARY EDUCATION

INSTRUCTIONS AND INFORMATION TO CANDIDATES

Do not open this booklet until you are told to do so.

Write your school number, candidate number, surname and initials in the spaces provided above.

Answer **ALL** the questions on this paper.

Read each question carefully and make sure you know what you have been asked before starting your answer.

The instruction **NAME** . . . requires an answer in words not chemical symbols.

Show **ALL** your working when answering numerical questions. Lines are provided on the question paper for your answers. You should write your answers on these lines only.

The mark for each part-question is given in brackets[ ].

A copy of the Periodic Table is printed on page 2.

For Examiner's Use	
1	
2	
3	
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8	
TOTAL	

This question paper consists of 14 printed pages and 2 blank pages.

1 The information lists the typical contents that a family of four throws out as garbage in one week.

aluminium	0.55 kg	glass	8.25 kg
polythene/plastic	1.75 kg	paper	4.15 kg
waste food	4.50 kg	iron	1.30 kg

Much of this waste material can be processed into useful metal, plastic, glass or paper products. First, however, it must be separated into its components.

(a) (i) Give one method which could be used to separate objects made of iron from the rest of the garbage.

_____ [1]

(ii) State what must be added to pure iron to convert it to mild steel.

_____ [1]

(iii) State one important use of steel and the property of steel that makes it suitable for the use you choose.

use _____

property _____ [2]

(b) State why re-cycling waste glass uses up energy.

_____ [1]

(c) (i) Find the mass of **inorganic** waste produced by this family during one week.

[1]

(ii) Calculate what percentage of this family's total waste is plastic.

[2]

(iii) Give one reason why plastic is such a serious pollution problem.

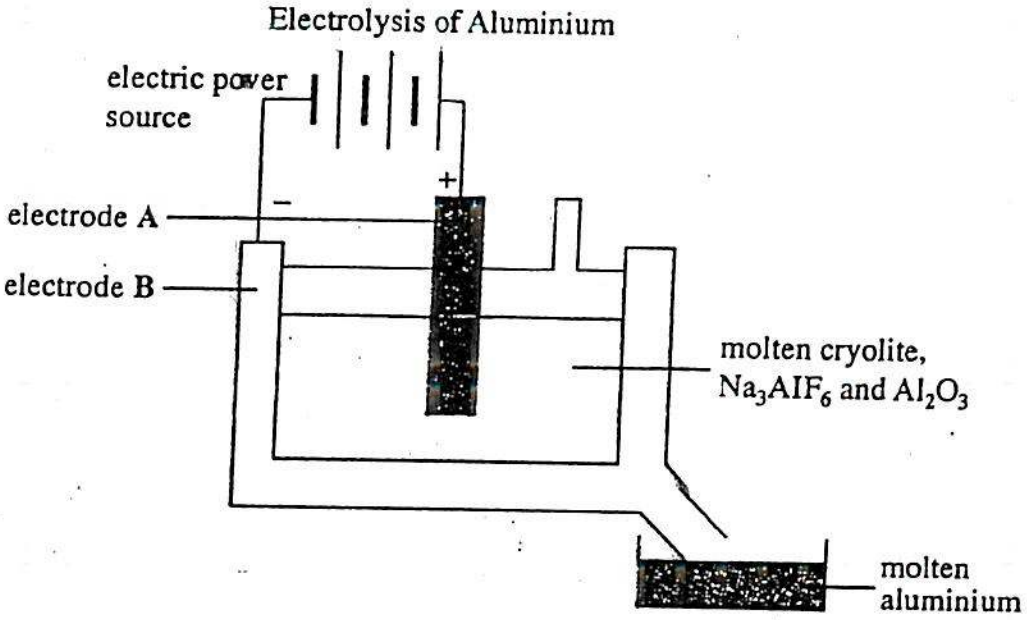
_____ [1]

(d) State the use made of most of the recycled aluminium.

_____ [1]

Total marks [10]

2. The Hall-Heroult process is used to extract aluminium by the electrolysis of dissolved alumina, Al_2O_3 in cryolite.



Bauxite ore is purified to Al_2O_3, which is mixed with cryolite, a mixture of NaF and AlF_3, which melts at 100 °C.

(a) On the diagram

(i) Identify which electrode, A or B, is the cathode _____. [1]

(ii) Show the direction of flow of electrons in the circuit by completing the sentence.

Electrons flow from electrode _____ to electrode _____. [1]

(b) (i) Name the process which occurs at the cathode.

_____ [1]

(ii) Suggest a reason why carbon dioxide and carbon monoxide are produced during the production of aluminium.

_____

_____ [2]

(c) (i) Explain why cryolite is used in the extraction of aluminium.

_____

_____ [1]

(ii) Calculate the molar mass of cryolite, Na_3AlF_6.

[1]

(d) (i) Describe the property of aluminum that makes it useful in the aerospace industry.

_____ [1]

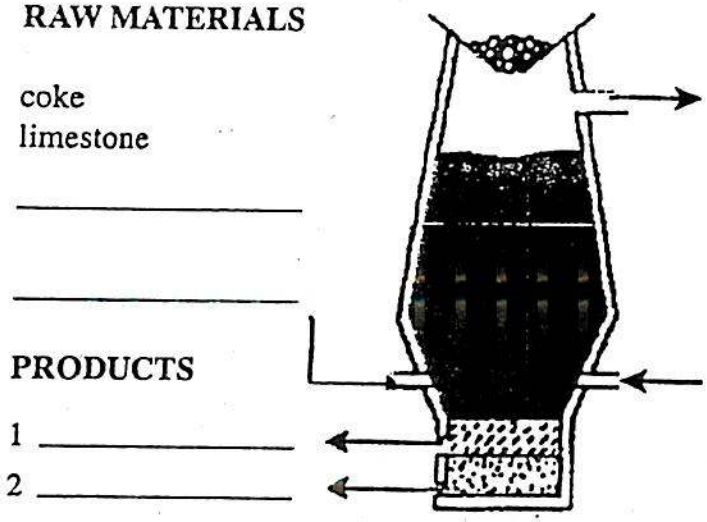
Aluminium dissolves in moderately concentrated hydrochloric acid.

(ii) Balance the equation by filling in the blanks.

$$\_\_ Al + \_\_ HCl \rightarrow \_\_ AlCl_3 + \_\_ H_2$$ [2]

Total marks [10]

3. Crude iron is produced in a Blast furnace from a mixture of raw materials.



(a) (i) On the diagram, name the raw material which enters the Blast furnace, other than limestone and coke. [1]

(ii) On the diagram, name the **two** products removed from the Blast furnace. [2]

(b) Complete the equations for the blast furnace process.

(i) coke + carbon dioxide → _____ [1]

(ii) $Fe_2O_3 + \_\_ CO \rightarrow \_\_ Fe + 3CO_2$ [2]

(iii) Name the reducing agent in the equation given in (b)(ii).

_____ [1]

(c) State why limestone is used in the Blast furnace.

_____ [1]

(d) List one way in which a steel chain-link fence could be treated to prevent rusting.

_____ [1]

(e) Historically, man was able to extract gold and silver before iron was extracted from its ore. Give a chemical reason for this order of extraction.

_____

_____ [1]

Total marks [10]

4. Hydrogen exists as three isotopes, H^1, H^2 and H^3.

(a) (i) Define ***isotope***.

_____

_____ [1]

(ii) State what the numbers 1, 2 and 3 represent about each isotope.

_____ [1]

(iii) List the two features that all of the atoms of the isotopes of hydrogen have in common.

1. _____

2. _____ [2]

(b) Hydrogen gas can be used to power automobiles that do not produce greenhouse gases.

(i) Draw the bonding diagram for hydrogen molecules.

[2]

(ii) Name the type of bonding present in (b)(i).

_____ [1]

(c) (i) Hydrogen gas can be prepared in the school's laboratory by using two common chemicals.

Name these two chemicals

1 _____

2 _____ [2]

(ii) Describe a positive test to identify the gas as hydrogen.

test _____

result _____ [1]

Total marks [10]

5. The table gives the electronic configuration of four elements identified as **W**, **X**, **Y** and **Z**. Note that the letters do not represent the symbols of elements.

element	electron configuration
W	2,4
X	2,8,7
Y	2,8,8
Z	2,8,8,2

(a) (i) Identify two of the elements **W**, **X**, **Y** and **Z** which are in the same Period of the Periodic Table.

_____ and _____ [1]

(ii) State which of the elements is the most chemically unreactive.

_____ [1]

(b) (i) When elements **W** and **X** chemically combine they produce a compound with the formula WX_4. State the valency of **W** in the formula.

_____ [1]

(ii) Name the type of bonding present in (b)(i).

_____ [1]

(c) (i) Write the molecular formula of the compound of the elements **Z** and **X**.

_____ [1]

(ii) Showing only the outer shell electrons, draw a bonding diagram for the compound written in (c)(i).

[2]

(d) Compare **two** physical differences between covalent and ionic compounds.

1 _____

2 _____ [2]

(e) State which one of the elements **W, X, Y** and **Z** exists as a monatomic gas.

_____ [1]

Total marks [10]

6. Use the list of oxides to answer this question.

aluminium oxide	**calcium oxide**	**carbon monoxide**
carbon dioxide	**sulfur dioxide**	**water**

(a) Name the two oxides which are acidic.

1 _____

2 _____ [2]

(b) Name the oxide that is produced when methane burns in insufficient oxygen.

_____ [1]

(c) Name the oxide which reacts with water in the air to form acid rain.

_____ [1]

(d) Aluminium oxide reacts with aqueous sodium hydroxide. It will also react with dilute sulfuric acid.

State the term which best describes the behaviour of aluminium hydroxide.

_____ [1]

(e) Name a mineral from which calcium oxide can be made.

_____ [1]

(f) Calcium oxide and water react together to form a solution of calcium hydroxide.

(i) Write the balanced symbol equation for dissolving calcium oxide in water to give calcium hydroxide.

[2]

(ii) Name the salt formed from calcium hydroxide and hydrochloric acid.

_____ [1]

(g) Name the type of reaction occurring in (f)(ii).

_____ [1]

Total marks [10]

7. Organic compounds occur naturally in plants and animals, or they may be derived from crude oil.

(a) (i) Define ***homologous series***.

_____

_____ [2]

(ii) Name the homologous series that contains one double bond between carbon atoms, give its general formula and draw the structure of the first member of this homologous series.

name _____ [1]

general formula

_____ [1]

structure

[2]

(b) (i) Organic compounds are often used as fuel. Write a word equation for the complete combustion of propane.

[2]

(ii) The fuel used most often by the human body is glucose. Write the formula of glucose and calculate its M_r.

formula _____ M_r _____ [2]

Total marks [10]

8 Sulfuric acid is an important industrial product. It is considered a **strong acid**.

(a) Define what is meant by the term **strong acid**.

_____ [2]

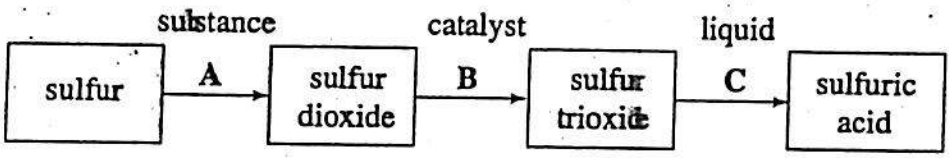
(b) (i) Write the formula of sulfuric acid.

_____ [1]

(ii) State the basicity of sulfuric acid.

_____ [1]

An outline of the process to make sulfuric acid is given.



(c) (i) Name the industrial process for the conversion of sulfur dioxide to sulfur trioxide.

_____ [1]

(ii) Identify substance **A**; _____ [1]

catalyst **B**; _____ [1]

liquid **C**. _____ [1]

(d) (i) Name the salt produced when sodium hydroxide reacts with sulfuric acid.

_____ [1]

(ii) Name **ONE** household product made using sulfuric acid.

_____ [1]

Total marks [10]