Centre Number	Candidate Number

Candidate Name_____

EXAMINATIONS COUNCIL OF ZAMBIA

Joint Examination for the School Certificate and General Certificate of Education Ordinary Level

SCIENCE 5124/3

PAPER 3 (CHEMISTRY)

Friday **4 NOVEMBER 2011** **1 hour 15 minutes**

Additional materials:
Answer Booklet
Mathematical tables

Time: 1 hour 15 minutes

INSTRUCTIONS TO CANDIDATES

Write your **name**, **centre number** and **candidate number** at the top of this page and all separate answer paper used.

There are **11 questions** in this question paper.

Section A

Answer **all** the questions.

Write your answers in the spaces provided on the question paper.

Section B

Answer any **two** questions.

Write your answers on the separate Answer Booklet provided.

1. Fasten the separate Answer Booklet securely to the question paper.
2. Enter the numbers of the **Section B** questions you have answered in the grid.

Candidate's Use	Examiner's Use
Section A	
Section B	
Total	

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [ ] at the end of each question or part question.

A copy of the **Periodic Table** is on page 9.

Cell phones are **not** allowed in the Examination room.

This question paper consists of 9 printed pages.

Section A

[45 MARKS]

Answer **all** the questions in this section.

Write your answers in the spaces provided.

1 Use the information in the table to answer the following questions.

Substance	Conducts electricity when solid	Melting point/°C	Dissolves in water
Sodium chloride	No	808	Yes
Sulphur	No	113	No
Tungsten	Yes	3377	No
Wax	No	35 – 50	No
Aluminium	Yes	660	No

(a) (i) Name **one** metal from the table.

_____ [1]

(ii) How can you tell from the table that the substance you have chosen in **a(i)** is a metal?

_____ [1]

(b) How can you tell from the table that wax is a mixture?

_____ [1]

(c) (i) Name a compound from the table.

_____ [1]

(ii) Explain the meaning of the word compound.

_____

_____ [1]

Total [5]

2 Use the list of separation techniques below to answer the questions that follow.

Fractional distillation, Simple distillation, Use of separating funnel, Magnetism, Chromatography, Evaporation and Filtration.

Choose **one** method from the list above which can be used to separate:-

(a) Sand from water

_____ [1]

(b) Oil from water

_____ [1]

(c) Water from ink

_____ [1]

(d) Sulphur powder from iron filings

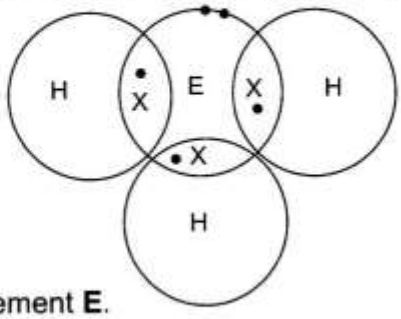
_____ [1]

(e) Salt from paraffin

_____ [1]

Total [5]

3 Element **E** whose proton number is 7 combines with hydrogen to form a gas. The diagram below shows the bonding in **one** molecule of this gas.



(a) Identify element **E**.

_____ [1]

(b) What is the name of the gas?

_____ [1]

(c) Write the chemical formula of the gas.

_____ [1]

(d) What type of bonding holds the atoms together in this compound?

_____ [1]

(e) State **one** physical property of the gas that is due to the type of bonding it has.

_____ [1]

(f) Name another compound which has the same type of bonding.

_____ [1]

Total [6]

4 Use the Periodic Table to answer this question.

(a) Give the symbol of:

(i) a non-metal used to sterilise water,

_____ [1]

(ii) an element which forms diatomic molecules,

_____ [1]

(iii) an element which reacts with water to give an alkaline solution.

_____ [1]

(iv) an element which forms an ion of the type X^{2-},

_____ [1]

(b) (i) Oxygen, sulphur and selenium are in Group VI of the Periodic Table. At room temperature oxygen is a gas and sulphur is a solid. Predict whether selenium is a liquid, a solid or a gas, at room temperature.

_____ [1]

(ii) The trend in reactivity of Group VI is similar to that in Group VII. Suggest the most reactive element in Group VI.

_____ [1]

Total [6]

5 Urea, $(NH_2)_2CO$ and water are formed when ammonia reacts with carbon dioxide. Urea is obtained as a solid from the reaction mixture.

(a) (i) Write a balanced chemical equation including state symbols for this reaction.

_____ [3]

(ii) How many atoms of hydrogen are present in one molecule of urea?

_____ [1]

(b) What mass of urea in tonnes can be formed from 34 tonnes of ammonia?

_____

_____

_____ [2]

Total [6]

6 **(a)** Name **three** of the components of clean, dry air.

(i) _____

(ii) _____

(iii) _____ [3]

(b) Air can be polluted by various chemicals.

(i) Give the chemical name for **one** of these air pollutants.

_____ [1]

(ii) Name the source of the pollutant mentioned in **b(i)** above.

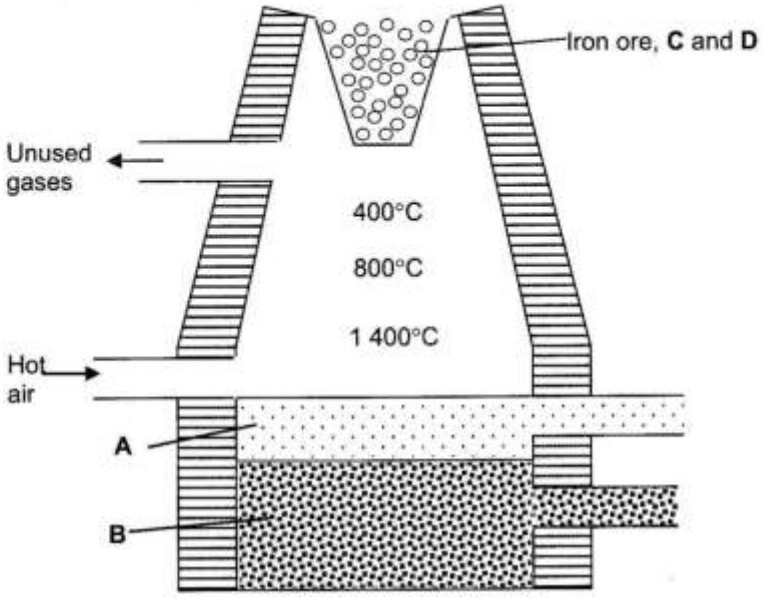
_____ [1]

(iii) State the process by which it is produced.

_____ [1]

Total [6]

7 Study the diagram below on extraction of iron.



(a) (i) Apart from iron ore, name **two** other materials (**C** and **D**) that are fed into the reaction chamber.

_____ [2]

(ii) Write the balanced chemical equation for the reduction reaction of iron ore to iron metal.

_____ [2]

(b) Name substances **A** and **B**.

A: _____

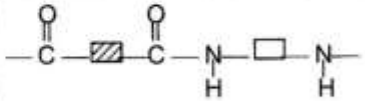
B: _____ [2]

(c) State **one** physical characteristic of the brick lining in the furnace.

_____ [1]

Total [7]

8 Plastics are organic polymers. The table below describes two types of plastics. Complete the table. Part of the table has been completed for you as an example.

Name	**Repeating Unit**	**Use**	**Type of polymerisation used in manufacture**
Poly(ethene)		Making plastic bags	
			Condensation polymerisation

Total [4]

Section B

[20 MARKS]

Answer any two questions in this section.

Write your answers on the separate Answer Booklet provided.

9 Caesium, lithium, potassium and sodium are all in Group 1 of the Periodic Table.

(a) Place these metals in order of reactivity, **starting** with the **most** reactive. [1]

(b) All Group 1 elements react in a similar manner with water.

(i) Name the chemical products of the reaction between caesium and water. [2]

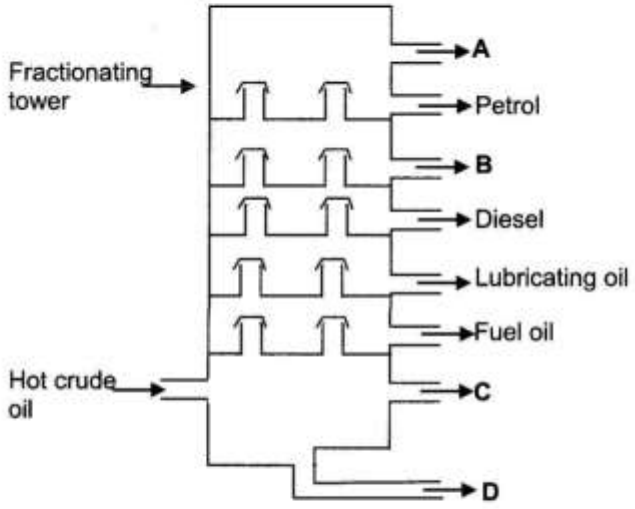
(ii) Write a chemical equation for the reaction of caesium with water. Include state symbols. [3]

(iii) What **three** things would you expect to **see** if small pieces of caesium were dropped in water in a glass trough? [3]

(c) What is the other name for Group 1 elements? [1]

Total [10]

10 Crude oil is an important raw material that we need in modern life. Engineers process and refine crude oil in a tower to produce a number of fractions as shown in the diagram below.



(a) Name the process used to separate the fractions of crude oil. [1]

(b) Name the **two** major elements that are found in crude oil. [2]

(c) State **two** differences in physical properties between fractions extracted at **C** and **B**. [2]

(d) A large proportion of fraction **A** has the molecular formula CH_4.
Write a balanced chemical equation for the complete combustion of the compound with chemical formula CH_4. [2]

(e) Crude oil is a non-renewable energy source. Explain what is meant by a non-renewable source. [1]

(f) Give **two** reasons why the sun is a better source of energy than crude oil. [2]

Total [10]

11 Barium sulphate ($BaSO_4$) is an insoluble salt which is prepared by precipitation.

(a) Using sodium sulphate as one of the reactants:

(i) name the other reactant you would use to prepare barium sulphate. [1]

(ii) write a balanced chemical equation for the reaction. Include state symbols [2]

(iii) write an ionic equation for the reaction. [1]

(b) Briefly explain how you would obtain a fairly pure dry sample of the salt. [3]

(c) Name **one** salt that can be prepared by the reaction of a metal with a dilute acid. [1]

(d) Calcium chloride ($CaCl_2$) can be prepared by reacting calcium carbonate and dilute hydrochloric acid as shown in the equation below:

$$CaCO_{3\,(s)} + 2HCl_{(aq)} \longrightarrow CaCl_{2\,(aq)} + CO_{2(g)} + H_2O_{(l)}$$

Calculate the mass of calcium chloride produced by 150g of calcium carbonate. [2]

Total [10]

DATA SHEET

The Periodic Table of the Elements

Group I	Group II											Group III	Group IV	Group V	Group VI	Group VII	Group 0
							1 H Hydrogen 1										4 He Helium 2
7 Li Lithium 3	9 Be Beryllium 4											11 B Boron 5	12 C Carbon 6	14 N Nitrogen 7	16 O Oxygen 8	19 F Fluorine 9	20 Ne Neon 10
23 Na Sodium 11	24 Mg Magnesium 12											27 Al Aluminium 13	28 Si Silicon 14	31 P Phosphorus 15	32 S Sulphur 16	35.5 Cl Chlorine 17	40 Ar Argon 18
39 K Potassium 19	40 Ca Calcium 20	45 Sc Scandium 21	48 Ti Titanium 22	51 V Vanadium 23	52 Cr Chromium 24	55 Mn Manganese 25	56 Fe Iron 26	59 Co Cobalt 27	59 Ni Nickel 28	64 Cu Copper 29	65 Zn Zinc 30	70 Ga Gallium 31	73 Ge Germanium 32	75 As Arsenic 33	79 Se Selenium 34	80 Br Bromine 35	84 Kr Krypton 36
85 Rb Rubidium 37	88 Sr Strontium 38	89 Y Yttrium 39	91 Zr Zirconium 40	93 Nb Niobium 41	96 Mo Molybdenum 42	Tc Technetium 43	104 Ru Ruthenium 44	103 Rh Rhodium 45	106 Pd Palladium 46	108 Ag Silver 47	112 Cd Cadmium 48	115 In Indium 49	119 Sn Tin 50	122 Sb Antimony 51	128 Te Tellurium 52	127 I Iodine 53	131 Xe Xenon 54
133 Cs Caesium 55	137 Ba Barium 56	139 La Lanthanum 57 *	178 Hf Hafnium 72	181 Ta Tantalum 73	184 W Tungsten 74	186 Re Rhenium 75	190 Os Osmium 76	192 Ir Iridium 77	195 Pt Platinum 78	197 Au Gold 79	201 Hg Mercury 80	204 Tl Thallium 81	207 Pb lead 82	209 Bi Bismuth 83	Po Polonium 84	At Astatine 85	Rn Radon 86
Fr Francium 87	226 Ra Radium 88	227 Ac Actinium 89 +															

140 Ce Cerium 58	141 Pr Praseodymium 59	144 Nd Neodymium 60	Pm Promethium 61	150 Sm Samarium 62	152 Eu Europium 63	157 Gd Gadolinium 64	159 Tb Terbium 65	162 Dy Dysprosium 66	165 Ho Holmium 67	167 Er Erbium 68	169 Tm Thulium 69	173 Yb Ytterbium 70	175 Lu Lutetium 71
232 Th Thorium 90	Pa Protactinium 91	238 U Uranium 92	Np Neptunium 93	Pu Plutonium 94	Am Americium 95	Cm Curium 96	Bk Berkelium 97	Cf Californium 98	Es Einsteinium 99	Fm Fermium 100	Md Mendelevium 101	No Nobelium 102	Lr Lawrencium 103

*58-71 Lanthanoid series
+90-103 Actinoid series

Key

a
X
b

a = relative atomic mass
X = atomic symbol
b = proton (atomic) number

The volume of one mole of any gas is 24 dm^3 at room temperature and pressure (r.t.p.).

[Turn over