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)

Thursday **17 OCTOBER 2013**

Additional materials:
Answer Booklet
Mathematical tables
or
Electronic calculators (non-programmable)

Time: 1 hour 15 minutes

INSTRUCTIONS TO CANDIDATES

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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.

The *Periodic Table* is on page 10.

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

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Section A

[45 MARKS]

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

Write your answers in the spaces provided.

1 Chlorine has two isotopes, $^{35}_{17}C\ell$ and $^{37}_{17}C\ell$.

(a) Define the term isotopes.

_____

_____ [1]

(b) State the number of neutrons in each of the following isotopes of chlorine.

(i) chlorine – 35: _____ [1]

(ii) chlorine – 37: _____ [1]

(c) **(i)** Draw the atomic structure of an atom of chlorine.

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[1]

(ii) Give the formula of a chloride ion

_____ [1]

(d) Explain why the relative atomic mass of chlorine on the Periodic Table is not a whole number.

_____

_____

_____ [1]

[Total:6]

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2 The table below shows the properties of an alkali, an acid and a salt solution.

(a) Complete the table.

Solution	Approximate pH	Ions present
(i)	(ii)	Na^+, OH^-
Hydrochloric acid	(iii)	(iv)
Sodium chloride	7	(v)

[5]

(b) Name the two solutions from the table which, when mixed together, form a solution of sodium chloride.

_____ [1]

[Total:6]

3 **(a)** Define relative molecular mass (Mr).

_____

_____

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_____ [1]

(b) Potassium carbonate reacts with dilute sulphuric acid to form potassium sulphate, carbon dioxide gas and water.

(i) Construct a balanced chemical equation, including state symbols for the reaction above.

_____

_____ [2]

(ii) Calculate the mass of potassium sulphate produced when 2.0g of potassium carbonate reacts with an excess of dilute sulphuric acid.

[2]

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(c) What is the identity test of the gas produced in the reaction above.

_____

_____ [1]

[Total:5]

4 Water is an important raw material in the home and in industry.

(a) State **two** uses of water in industry.

(i) _____ [1]

(ii) _____ [1]

(b) Outline the **two** main stages in the purification of water.

(i) _____ [1]

(ii) _____ [1]

[Total:4]

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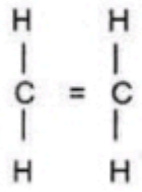
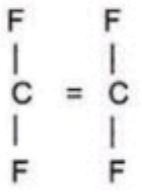
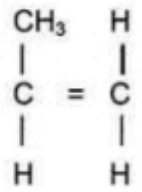
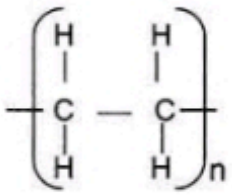
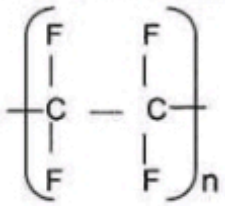
5 The table below shows the structural formulae of various monomers and the polymers that can be made from them.

Monomer	 ethene	 tetrafluoroethene	 **W**
Polymer	 poly(ethene)	 poly (tetrafluoroethene)	**Y**

(a) Identify the monomers which are hydrocarbons.

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[2]

(b) Name the monomer **W**.

[1]

(c) Draw the displayed structure for polymer **Y**.

[1]

[Turn over

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(d) (i) Identify the common feature among the monomers in the table above.

_____ [1]

(ii) Give the name of the compounds with this feature.

_____ [1]

(e) Decane $C_{10}H_{22}$, can be cracked to produce hexane, C_6H_{14} and butene, C_4H_8.

Explain the meaning of the word cracking.

_____ [1]

[Total:7]

6 (a) Give **two** ways by which rusting of iron can be prevented.

(i) _____

(ii) _____ [2]

(b) Burning and rusting are two chemical processes.

Give

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(i) one similarity _____ [1]

(ii) one difference _____ [1]

(c) (i) Name **two** non-metallic oxides which cause atmospheric pollution.

_____

_____ [2]

(ii) State **two** sources of these pollutants.

_____

_____ [2]

[Total:8]

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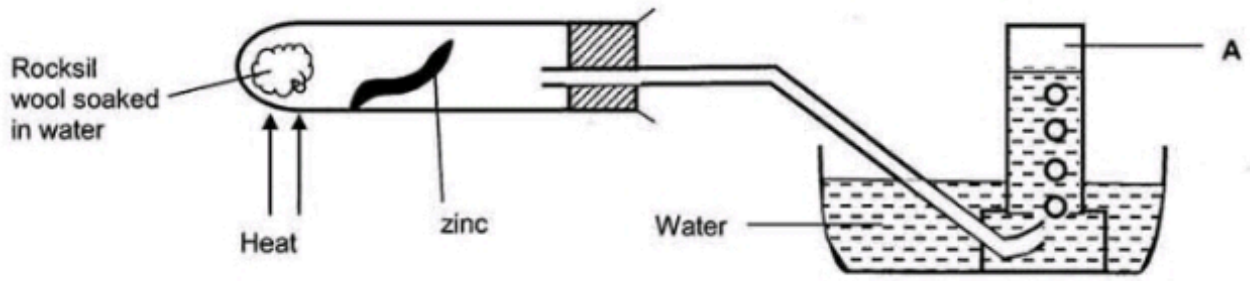
7 Zinc can be reacted with steam using the apparatus shown below in the reaction of zinc with steam, gas **A** and solid **B** are formed.



(a) Name gas **A**.

_____ [1]

(b) State the product formed when gas **A** burns in air.

_____ [1]

(c) Give **two** uses of gas **A**.

_____

_____ [2]

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(d) (i) What is solid **B**?

_____ [1]

(ii) Construct a balanced chemical equation with state symbols for the reaction between substance **B** and dilute hydrochloric acid.

_____

_____ [3]

[Total:8]

[Turn over

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Section B

[20 MARKS]

Answer any **two** questions

8 The main ore of iron, haematite, contains the compound iron (III) oxide, Fe_2O_3. The iron (III) oxide is reduced in a blast furnace to form iron.

(a) Explain how the furnace is heated to the high temperature needed for the reduction of the iron (III) oxide. [2]

(b) Name **two** processes that lead to the production of carbon dioxide in the blast furnace. [2]

(c) Carbon dioxide reacts with carbon to form carbon monoxide, construct a balanced chemical equation for this reaction. [2]

(d) Apart from iron ore, name **two** other substances that are added into the blast furnace as raw materials. [2]

(e) Name **one** element which is added to iron to make steel and state a use for the type of steel made. [2]

[Total: 10]

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9 Copper (II) sulphate ($CuSO_4$) is a soluble salt prepared by using sulphuric acid as one of the starting materials.

(a) Define a salt. [1]

(b) **(i)** Name one other reagent which must be reacted with dilute sulphuric acid to form copper (II) sulphate. [1]

(ii) Construct a balanced chemical equation for the reaction in **b (i)** above. [2]

(c) Describe briefly how a dry sample of copper (II) sulphate can be prepared from the named reagents in **(b).** [4]

(d) Will the method in part **(c)** above be suitable to prepare a sample of potassium chloride? Give a reason for your answer. [2]

[Total: 10]

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10 Below is a list of some organic compounds represented by the letters **A** to **E**.

A CH_4

B C_4H_{10}

C C_4H_9OH

D C_4H_8

E CH_3COOH

(a) Give the name of compound **A**. [1]

(b) Identify the **two** compounds, from the list, that belong to the same homologous series? [2]

(c) **(i)** State the compound which has the same functional group as ethanol. [1]

(ii) Draw the displayed molecular structure of ethanol. [1]

(iii) Construct a chemical equation for the hydration of ethene to form ethanol. [1]

(d) **(i)** Give **one** compound that is an unsaturated hydrocarbon, from the list above. [1]

(ii) Describe a chemical test for an unsaturated hydrocarbon. [1]

(e) Compound **E** is acidic.

(i) State the name of the compound **E**. [1]

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(ii) Describe a test to show that compound **E** is acidic. [1]

[Total: 10]

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DATA SHEET

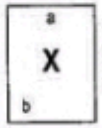
The Periodic Table of the Elements

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 Mecury 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 = 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.).

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