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 **5 NOVEMBER 2010** **1 hour 15 minutes**

Additional materials:
Answer Booklet
Mathematical tables
(Do not allow calculators)

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 11.

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

This question paper consists of 11 printed pages.

Section A

[45 MARKS]

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

Write your answers in the spaces provided.

A1 Use your knowledge of the kinetic theory of matter to suggest a reason for each of the following

(a) Wet clothes dry more quickly on warm days than cold days.

_____

_____ [1]

(b) Solid ice loses its shape when it melts.

_____

_____ [1]

(c) Salt dissolves faster in hot water than cold water.

_____

_____ [1]

(d) When sugar is dissolved in a glass of water without stirring, all of the water soon tastes sweet.

_____

_____ [1]

Total [4]

A2 Below are some processes which are used in a laboratory, industry and at home:

-crystallisation
-distillation
-filtration
-neutralisation
-combustion
-esterification
-galvanizing
-polymerisation

(a) Which one of the processes listed above can be used to separate the following from a sample of sea water?

(i) Salt _____

(ii) Water _____

(iii) Sand _____

(a) State the process from the list of processes above that can be used to:

(i) Manufacture plastic for making buckets.

_____

(ii) Produce carbon dioxide from carbon.

_____ [2]

Total [5]

A3 An element has an isotope with the nucleon number of 7. Each neutral atom of this isotope has three electrons and a nucleus containing two different types of particles.

(a) (i) Give the names of these particles and the number of each particle present in each nucleus.

Name of Particle	**Number of Particles**

[2]

(ii) Compare the masses and the electrical charges of these particles.

Masses: _____

_____

Electrical charges: _____

_____ [2]

(b) What is the difference in the nuclei of this isotope and its isotope whose nucleon number is 6? _____

_____ [1]

Total [5]

A4 Part of the Periodic Table is shown below. Use it to answer the questions that follow.

H							He
Li	Be	B	C	N	O	F	Ne
Na	Mg	Aℓ	Si	P	S	Cl	Ar

(a) State the chemical symbol for:

(i) an element which is a noble gas.

_____ [1]

(ii) the most reactive metal.

_____ [1]

(iii) the most reactive halogen.

_____ [1]

(iv) the element which supports burning.

_____ [1]

(b) (i) Write the formula of the compound which would be formed if the element whose atomic number is 13 reacted with an element whose atomic number is 8. _____

_____

(ii) State the type of bonding which would be present in the compound in **(b)(i)** above. _____ [2]

Total [6]

A5 A spillage of 9.8 tonnes of sulphuric acid results from an accident by a road tanker. Slaked lime is used to neutralize the acid.

(a) State the effect of the acid on the vegetation.

_____

_____ [1]

(b) The chemical equation for the neutralization reaction is given below:

$H_2SO_4(aq) + Ca(OH)_2(s) \longrightarrow CaSO_4(s) + H_2O(\ell)$ [1]

(i) Balance the equation. [1]

(ii) Calculate the mass of slaked lime needed to neutralize 9.8 tonnes of spilt sulphuric acid.

_____

_____

_____ [2]

(iii) State one use of lime in agriculture.

_____

_____ [1]

(c) Explain why sulphuric acid is said to be a strong acid.

_____

_____ [1]

Total [6]

A6 Iron, calcium and copper are metals. The table below describes the reactions of these metals with cold water and steam.

(a) (i) Put a tick (✓) if a reaction will take place and a cross (x) if a reaction will not take place.

Metal	Reaction of metal with cold water	Reaction of metal with steam
Copper		
Iron		
Calcium		

[3]

(ii) Place these three metals in order of chemical activity, starting with the most reactive.

_____ [1]

(b) Before experimenting with aluminium to place it in the above series, the surface of the aluminium must first be scraped. Why is this necessary?

_____

_____

_____ [2]

(c) Give two reasons why it is important to recycle metals.

_____

_____

_____ [2]

Total [8]

A7 Oxidation can be described as either the addition of oxygen to a substance or the removal of hydrogen from a substance. Study the reactions given below and state whether the substance underlined has been reduced or oxidized.

(a) **(i)** Copper (ii) oxide + <u>ammonia</u> ⟶ copper + nitrogen + water

(ii) <u>Carbon dioxide</u> + carbon ⟶ carbon monoxide

(iii) Iron(ii) oxide + <u>aluminium</u> ⟶ aluminium oxide + iron.

(i) _____

(ii) _____

(iii) _____ [3]

(b) Steam reacts with carbon as shown in the chemical equation below.

$H_2O(g) + C(s) \longrightarrow H_2(g) + CO(g)$

Identify the oxidizing agent. Give a reason for your answer.

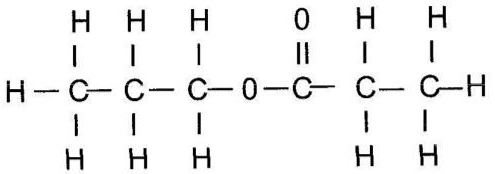
Oxidizing agent _____

Reason _____

_____ [2]

Total [5]

A8 Below is a structure of an ester made in a reversible reaction between a carboxylic acid and an alcohol.



(a) **(i)** Draw the structure of the carboxylic acid used in the reaction.

[1]

(ii) State one condition necessary for the formation of the ester above.

_____ [1]

(b) A student carried out an experiment to compare the relative strengths of dilute methanoic acid and dilute sulphuric acid.

(i) Describe a test that can be used to distinguish between the two acids.

_____

_____

_____

_____ [2]

(ii) Name a metal that will react with both acids. Describe what you would see during the reaction.

Metal _____

Observation _____ [2]

Total [6]

Section B

[20 MARKS]

Answer any two questions in this section.

Write your answers on the separate Answer Booklet provided.

B9 A carbohydrate is formed from the reaction of many small molecules, one of which is represented by the diagram below:

(a) **(i)** What is the general name of the small molecules which combine to form very large molecules? [1]

(ii) Show how two of the small molecules like the one drawn above would join together to form a bond. [2]

(b) *Starch is hydrolysed to glucose by the enzymes in yeast and the glucose* is then converted to an alcohol by a second process. Name:

(i) the second process.

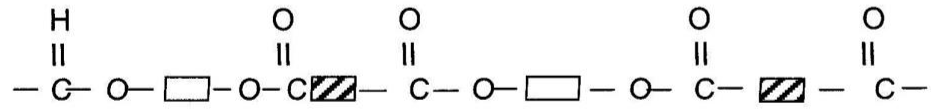
(ii) the alcohol produced. [2]

(c) State two uses of alcohol named in **(b) (ii)** above [2]

(d) Terylene is an ester.

(i) state one use of terylene [1]

The structure of terylene is represented in the diagram below.



(ii) Draw a box around a repeating unit in this structure. [1]

(iii) Why does terylene cause pollution? [1]

Total [10]

B10 Air is a mixture of gases

(a) What does the word mixture mean? [1]

(b) Rusting is one of the processes that uses oxygen.

(i) Name two other processes in nature that use up oxygen. [2]

(ii) State three ways of preventing rusting [3]

(c) Oxides of lead are among the pollutants found in air. For these pollutants:

(i) State the major source

(ii) One effect they have on human beings.

(iii) One way of minimizing or eliminating their presence in air. [3]

(d) Green house gases are gases that retain heat energy and this raises the average air temperature over the earth. This is known as global warming. State one disadvantage of global warming. [1]

Total [10]

11 **(a)** Define a salt and give one example. [2]

(b) Iron(ii) sulphate ($FeSO_4$) can be prepared by reacting iron metal and dilute sulphuric acid.

(i) Write a balanced equation for the reaction. [2]

(ii) Which reactant should be in excess? Give a reason for your answer. [2]

(c) How would you obtain fairly pure dry crystals of iron(ii) sulphate from its solution? [3]

(b) Name a salt that can be prepared by precipitation. [1]

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
							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 Yitterbium 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.).

[Turn over