-THE UNITED REPUBLIC OF TANZANIA
NATIONAL EXAMINATIONS COUNCIL
CERTIFICATE OF SECONDARY EDUCTION EXAMINATION

032/1 **CHEMISTRY 1**

(For Both School and Private Candidates)

Time: 3 Hours ***Tuesday*, October 11, 2005 p.m.**

Instructions

1. This paper consists of sections A, B and C.
2. Answer **all** questions in sections A and B and **two (2)** questions from section C.
3. Electronic calculators are **not** allowed in the examination room.
4. Cellular phones are **not** allowed in the examination room.
5. Write your **Examination Number** on every page of your answer booklet(s).
6. The following constants may be used:

Atomic masses: H = 1 ; C = 12 ; O = 16 : Cu = 64 ; Ca = 40 ; Na = 23 : S = 32 ; Cl = 35.5 ; Fe = 56 ; N = 14 ; K = 39.

Avogadro's Number = 6.02×10^{23}.

GMV at s.t.p. = 22.4 dm^3.

1 Faraday = 96500 coulombs.

1 litre = 1 dm^3 = 1000 cm^3

CPB

This paper consists of 8 printed pages.

SECTION A (20 marks)

Answer **all** questions in this section.

1. For each of the items (i) - (x) choose the correct answer from among the given alternatives and write its letter beside the item number.

(i) Sodium metal is kept in oil because it

A sinks in oil but floats in water
B reacts vigorously with water
C is very alkaline
D forms a protective coat of sodium oxide with oil
E forms a protective coat of sodium oxide with water.

(ii) A gas burned in air forms carbon dioxide and water only. From this experiment the gas is likely to be

A hydrogen
B carbon monoxide
C ethane
D nitrogen
E ozone.

(iii) The molarity of a solution containing 26.5 g of anhydrous sodium carbonate in 5 dm^3 of the solution is _____ M.

A 0.05 B 0.25 C 1.25 D 5.30 E 0.025

(iv) It was found that 3.27 g of zinc metal displaces 10.8 g of silver metal from an aqueous solution of silver nitrate. The correct equation for this reaction is

A $Zn^{2+}_{(aq)} + Ag_{(s)} \rightarrow Ag^{+}_{(aq)} + Zn_{(s)}$

B $Zn_{(s)} + Ag^{+}_{(aq)} \rightarrow Ag_{(s)} + Zn^{2+}_{(aq)}$

C $Zn^{2+}_{(aq)} + 2Ag^{+}_{(aq)} \rightarrow 2Ag_{(s)} + Zn^{2+}_{(aq)}$

D $Zn^{2+}_{(aq)} + 2Ag^{+}_{(aq)} \rightarrow 2Ag^{+}_{(aq)} + Zn_{(s)}$

E $Zn_{(s)} + 2Ag^{+}_{(aq)} \rightarrow Zn^{2+}_{(aq)} + 2Ag_{(s)}$.

(v) The pair of elements which is most likely to form a covalent bond when reacted together is

A sodium and iodine
B magnesium and oxygen
C aluminium and oxygen
D carbon and chlorine
E calcium and carbon.

(vi) The method of collecting hydrogen chloride gas in a class experiment is known as

A downward displacement of water
B downward displacement of air
C upward displacement of air
D fountain
E condensation.

(vii) Sea water contains various salts, which salt is present in the greatest proportion?

A magnesium chloride
B calcium sulphate
C potassium chloride
D sodium chloride
E magnesium sulphate.

(viii) When dilute solutions of calcium chloride and sodium carbonate are mixed,

A a white precipitate of sodium chloride is formed
B carbon dioxide is evolved
C a mixture of precipitates of sodium chloride and calcium carbonate is formed
D a white precipitate of calcium carbonate is formed
E a colourless solution of calcium carbonate and sodium chloride is formed.

(ix) The atomic number of elements chlorine, argon and potassium are 17, 18 and 19 respectively. Which statement best describes all the three elements? These elements

A have the same number of protons
B have the same atomic mass
C occur in the same period
D have the same number of electrons
E have octet stable electronic configuration.

(x) Three test tubes of the same volume separately contain nitrogen dioxide (NO_2), hydrogen (H_2) and carbon dioxide (CO_2) gases at room temperature and pressure. Then, there

A is the same number of atoms in each test tube
B is the same number of molecules in each test tube
C are more molecules of hydrogen gas than nitrogen dioxide and carbon dioxide molecules
D is a 3 : 4 : 2 ratio for the number of molecules of carbon dioxide to nitrogen dioxide to hydrogen respectively
E is a 2 : 4 : 3 ratio of the number of molecules of carbon dioxide to nitrogen dioxide to hydrogen respectively.

2. Match the terms in **List A** with the responses in **List B** by writing the letter of the correct response beside the item number. **(10 marks)**

List A		**List B**	
(i)	Methane	A	Crystallizes
(ii)	Nitrogen	B	Ethyl alcohol
(iii)	Zinc	C	Alkaline gas
(iv)	Detergent	D	Sublimes
(v)	Anion	E	$AlCl_3$
(vi)	Amphoteric oxide	F	${}^{40}_{18}X$ and ${}^{39}_{18}Y$
(vii)	Isotopes	G	Diamond and graphite
(viii)	Soap	H	Rust
(ix)	Isomers	I	A gas present in natural gas
(x)	Ammonia	J	Used to coat iron metal
		K	Turns lime water milky
		L	An acidic gas
		M	Compounds with the same molecular formula but different structural formulae
		N	Cl^-
		O	The most abundant gas in air
		P	Forms lather even with hard water
		Q	Zinc oxide
		R	The sodium salt of fatty acids
		S	MgO
		T	${}^{16}_{8}U$ and ${}^{16}_{7}V$

SECTION B (60 marks)

Answer all questions in this section.

3. (a) Define the term fuel. **(01 marks)**

(b) State two (2) examples in each of the following types of fuel: **(03 marks)**

(i) Liquid.

(ii) Solid.

(iii) Gaseous.

(c) (i) What are two (2) gaseous fuels used in industries? State the composition of each of the two gases.

(ii) List down three (3) advantages of liquid fuels over solid fuels.

(iii) State five (5) characteristics of a good fuel. **(06 marks)**

4. Use the following information about elements F, G, L, M and J shown below and answer the questions that follow.

Element	Atomic mass	Atomic number
F	16	8
G	19	9
L	23	11
M	12	6
J	40	18

(a) (i) Write down the electronic configuration of elements F, G, L, M and J.

(ii) How many neutrons are present in element G? **(06 marks)**

(b) What type of bond will exist in a compound formed when element

(i) F combines with M?

(ii) G combines with L? **(01 mark)**

(c) (i) In what group and period in the periodic table does element J occupy?

(ii) Which element is unreactive towards chemical reactions? **(01 mark)**

(d) (i) Define the term isotopes.

(iii) Below is a list of isotopic atoms:

$^{18}_{8}Q$, $^{18}_{7}R$, $^{18}_{9}U$, $^{17}_{8}T$, $^{16}_{8}V$, $^{19}_{7}W$, $^{19}_{10}X$.

Which isotopes form atoms of the same element? **(02 marks)**

5. 20 cm^3 of a solution containing 7 g/dm^3 of metal hydroxide, XOH, were exactly neutralized by 25 cm^3 of 0.10 M hydrochloric acid.

(a) Write a balanced chemical equation for the neutralization of the metal hydroxide XOH and hydrochloric acid. **(01 mark)**

(b) Calculate the concentration of the metal hydroxide XOH in moles per dm^3. **(3½ marks)**

(c) (i) Calculate the molar mass of XOH.

(ii) Identify element X. **(5½ marks)**

6. (a) (i) List down the **three (3)** factors affecting the selection of ion discharge at the electrodes.

(ii) Define the term electrolyte. **(04 marks)**

(b) A bluish copper sulphate aqueous solution was electrolysed by using copper electrodes.

(i) Write ionic chemical equations for the reactions, which occurred at the cathode and anode.

(ii) Explain what will happen to the blue colour of copper sulphate solution as electrolysis continues. **(04 marks)**

(c) How many moles of electrons are required to produce 27 g of Al during the electrolysis of molten Al_2O_3? **(02 marks)**

7. (a) What are the factors affecting the rate of chemical reaction? **(2½ marks)**

(b) One of the methods used for the preparation of oxygen is by the decomposition of hydrogen peroxide.

$$2H_2O_{2(aq)} \xrightarrow{MnO_2} 2H_2O + O_2.$$

(i) What is the effect of MnO_2 on the rate of production of oxygen?

(ii) What will happen to the rate of production of oxygen if the concentration of hydrogen peroxide is increased? **(02 marks)**

(c) Calculate the volume of oxygen at s.t.p. which theoretically could be obtained from 50 cm^3 of a solution of hydrogen peroxide containing 68 g/dm^3. **(5½ marks)**

8. (a) Define the following terms:

(i) Homologous series.

(ii) Isomerism. **(02 marks)**

(b) Write down the expanded structural formulae of the following compounds

(i) Chloroethane

(ii) 2-Methylbutane

(iii) Ethanol

(iv) 2,2-Dimethly propane. **(04 marks)**

(c) Complete the following reactions:

(i) $CH_2 = CH_2 + O_2 \rightarrow ?$

(ii) $CaC_2 + 2H_2O \rightarrow ?$

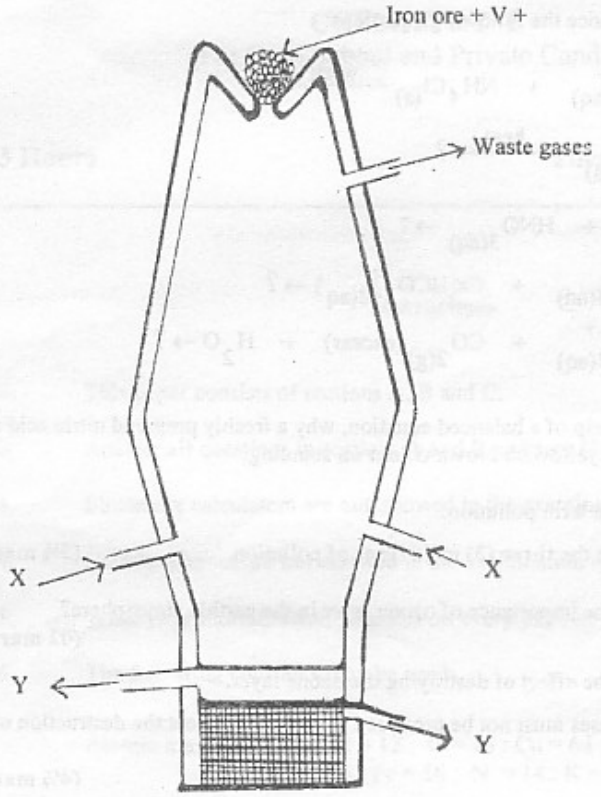
(iii) $CH_4 + Cl_2 \xrightarrow{Ur} ?$

(iv) $C_2H_5OH + O_2 \rightarrow ?$ **(04 marks)**

SECTION C (20 marks)

Answer two (2) questions from this section.

9. A blast furnace is used to convert iron ore, Fe_2O_3 into iron metal. The following is a diagram of the blast furnace used for the extraction of iron.



(a) Write down the names of the

(i) substances represented by materials V, W and X.

(ii) products Y and Z. **(2½ marks)**

(b) (i) Write a balanced chemical equation for the reaction between the iron ore, Fe_2O_3 and carbon monoxide.

(ii) What is the function of carbon monoxide in its reaction with Fe_2O_3? **(2½ marks)**

(d) If 80 kg of iron ore, Fe_2O_3 were allowed to react with carbon monoxide during the extraction process, how many kilograms of iron (Fe), would be obtained? **(04 marks)**

10. (a) What do you understand by the following terms?

(i) Soil erosion.

(ii) Leaching.

(iii) Soil fertility.

(iv) Soil pH. **(06 marks)**

(b) The weight of a fresh soil sample collected from a farmer's field was 24 g. It was oven-dried at 106 °C for 22 hours, cooled in a desiccator and weighed. The oven-dry weight was 19.5 g. What was the percentage of moisture in the soil sample? **(02 marks)**

(c) Explain why a good farmer is advised to include leguminous plants in crop rotation. **(02 marks)**

11. (a) Complete and balance the following equations:

(i) $Ca(OH)^{+}_{(aq)} + NH_4Cl_{(s)} \xrightarrow{warm} ?$

(ii) $AgNO_{3(s)} \xrightarrow{heat} ?$

(iii) $Cu_{(s)} + HNO_{3(aq)} \rightarrow ?$

(iv) $Na_2CO_{3(aq)} + Ca(HCO_3)_{2(aq)} \rightarrow ?$

(v) $Ca(OH)^{+}_{2(aq)} + CO_{2(g)}(excess) + H_2O \rightarrow ?$

(b) Explain with the help of a balanced equation, why a freshly prepared nitric acid changes from colourless to yellowish brown colour on standing.

12. (a) (i) Define the term pollution.

(ii) List down the **three (3)** main types of pollution. **(3½ marks)**

(b) (i) What is the importance of ozone layer in the earth's atmosphere? **(02 marks)**

(ii) Explain the effect of destroying the ozone layer.

(iii) Which gases must not be produced in order to prevent the destruction of ozone layer? **(4½ marks)**