THE UNITED REPUBLIC OF TANZANIA
NATIONAL EXAMINATIONS COUNCIL
CERTIFICATE OF SECONDARY EDUCATION EXAMINATION

032/1 **CHEMISTRY 1**

(For Both School and Private Candidates)

Time: 3 Hours **Thursday, 02nd November 2017 a.m.**

Instructions

1. This paper consists of sections A, B and C with a total of **thirteen (13)** questions.

2. Answer **all** questions in this paper.

3. Calculators, cellular phones and any unauthorised materials are **not** allowed in the examination room.

4. Write your **Examination Number** on every page of your answer booklet(s).

5. The following constants may be used:
   Atomic masses:
   H = 1, C = 12, O = 16, S = 32, Ca = 40, Fe = 56, Cu = 64, Zn = 65.
   Avogadro's number = 6.02×10^{23}.
   GMV at s.t.p. = 22.4 dm^3.
   1 Faraday = 96,500 coulombs.
   Standard pressure = 760 mm Hg.
   Standard temperature = 273 K.
   1 litre = 1 dm^3 = 1000 cm^3.

SECTION A (20 Marks)

Answer **all** questions in this section.

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

(i) Which of the following sets of elements is arranged in order of increasing electronegativity?

A Chlorine, fluorine, nitrogen, oxygen, carbon
B Fluorine, chlorine, oxygen, nitrogen, carbon
C Carbon, nitrogen, oxygen, chlorine, fluorine
D Nitrogen, oxygen, carbon, fluorine, chlorine
E Fluorine, nitrogen, oxygen, chlorine, carbon.

(ii) Which type of a fire is associated with electrical equipment.

A Class E B Class C C Class F
D Class B E Class A.

(iii) Which of the following is the electronic configuration of an element Y found in period 3 and group II of the periodic table?

A 2:8 B 2:8:2 C 2:6
D 2:8:8:2 E 2:8:4

(iv) Technicians prefer to use blue flame in welding because

A it is bright and non-sooty
B it is light and non-sooty.
C it is very hot and large.
D it is very hot and non-sooty.
E it is not expensive.

(v) WHich method could be used to separate the products in the following equation?

$\underset{\textbf{colourless}}{Pb(NO_3)_{2(aq)}} + \underset{\textbf{colourless}}{2KI_{(aq)}} \rightarrow \underset{\textbf{yellow}}{PbI_{2(S)}} + \underset{\textbf{colourless}}{2KNO_{3(aq)}}$.

A Chromatography B Crystallisation C Distillation
D Filtration E Condensation.

(vi) The metal nitrate which will NOT give a metal oxide on heating is

A calcium nitrate B silver nitrate C lead nitrate
D copper nitrate E zinc nitrate.

(vii) Which of the following compounds does NOT belong to the alkane homologous series?

A C_2H_4 B CH_4 C C_4H_{10}
D C_3H_8 E C_5H_{12}.

(viii) Which of the following is NOT among the composition of air?

A Noble gases B Carbon dioxide C Nitrogen
D Hydrogen E Water vapour.

(ix) Chlorine ion, Cl^- differs from chlorine atom because it has

A more protons. B less protons. C more electrons.
D less electrons. E more neutrons.

(x) Which of the following pairs of compounds can be used in the preparation of calcium sulphate?

A Calcium carbonate and sodium sulphate
B Calcium chloride and ammonium sulphate
C Calcium hydroxide and barium sulphate
D Calcium nitrate and lead (II) sulphate
E Calcium chloride and barium sulphate.

2. Match the items in **LIST A** with the responses in **LIST B** by writing the letter of the correct response beside the item number in the answer booklet provided.

LIST A	**LIST B**
(i) An element with electronic configuration of 2:8	A Fluorine
(ii) An element in which its oxide can be prepared by the action of nitric acid and heat.	B Rhombic
(iii) An element which acts as an oxidant or reductant.	C Amorphous
(iv) A gas that explodes when a flame is applied in the presence of air.	D Diamond
(v) A gas which is prepared in the laboratory by isolation from air.	E Argon
(vi) An element with atomic mass of 40.	F Zinc
(vii) An element which reacts with water to produce hydroxide and hydrogen gas.	G Phosphorus
(viii) A element which is used in making jewellers.	H Nitrogen
(ix) An element which is an allotrope of sulphur.	I Hydrogen
(x) The most electronegative element.	J Mercury
	K Neon
	L Sulphur
	M Oxygen
	N Potassium
	O Chlorine

SECTION B (54 Marks)

Answer **all** questions in this section.

3. (a) Define the following terms:
   (i) Soil.
   (ii) Leaching.
   (iii) Denitrification.

   (b) With the aid of a chemical equation, briefly explain how
   (i) temporary hardness of water can be removed by boiling.
   (ii) permanent hardness of water can be removed by chemical means.

4. (a) State four steps employed in the extraction of moderate reactive metals.

   (b) Write balanced chemical equations to show how chlorine reacts with the following:
   (i) water.
   (ii) aqueous iron (II) chloride solution.
   (iii) hydrogen sulphide.

5. (a) Copper can be obtained from the ore, copper pyrites ($CuFeS_2$). The ore is heated in a limited amount of air giving the following reaction:
   $4CuFeS_2 + 11O_2 \rightarrow 4Cu + 2Fe_2O_3 + 8SO_2$.
   (i) Calculate the maximum mass of copper that can be obtained from 367 kg of copper pyrites.
   (ii) State why the gaseous product from this reaction must not be allowed to escape into the atmosphere.

   (b) Find the oxidation state of sulphur in the sulphate ion, SO_4^{2-}.

6. (a) List two classes of oxides. Give one example in each case.

   (b) Write the chemical formula of tetrachloromethane and state the type of bond that exists.

7. (a) State three main physical properties of water and show the usefulness of each property.

   (b) State three industrial application of electrolysis.

8. (a) You are provided with CH_3CH_2OH, $CH_3CH_2CH_3$, CH_3COOH, and $CH_2=CH_2$.
   (i) Which compounds are gases at room temperature?
   (ii) How can you distinguish compound $CH_3CH_2CH_3$ and $CH_2=CH_2$?
   (iii) Which compound would react with sodium carbonate? Write the balanced chemical equation for the reaction.

(b) Hydrogen peroxide breaks down slowly to form water and oxygen; the reaction can be speed up by using a catalyst.
(i) How does the catalyst speed up the rate of reaction?
(ii) Name a possible catalyst that can be used to speed up the reaction.
(iii) Show that the catalyst always remains unchanged at the end of the reaction.

9. (a) An atom M has an atomic number 14 and mass number 28.
(i) What is the number of protons and neutrons?
(ii) Write the electronic configuration of atom M.

(b) Calculate the volume of water which was produced when 1,120 cm^3 of oxygen at s.t.p. was liberated during the decomposition of hydrogen peroxide. The density of water = 1.0 g/cm^3.

10. (a) Complete the following equations and determine the type of chemical reaction involved in each case.
(i) $Zn_{(s)} + H_2SO_{4(aq)} \rightarrow$
(ii) $AgNO_{3(aq)} + NaCl_{(aq)} \rightarrow$
(iii) $N_{2(g)} + H_{2(g)} \rightarrow$

(b) How long a current of 5A should be passed through a solution of silver chloride in order to deposit 3.24 g of silver metal at the cathode? Given that, the electrochemical equivalent of silver = $1.118 \times 10^{-3} ge^{-1}$.

11. (a) Briefly explain why the mixture with equal boiling point cannot be separated by simple fractional distillation.

(b) The preparation of ammonia in the laboratory is done by heating any ammonium salt with an alkali.
(i) Write a balanced chemical equation for the preparation of ammonia gas.
(ii) State two uses of ammonia.

SECTION C (26 Marks)

Answer **all** questions from this section.

12. A student attempted to prepare hydrogen gas by reacting zinc metal with dilute sulphuric acid. In this experiment zinc metal granules of about 0.5 cm diameter and 0.20 moles of acid were used. The rate of formation of hydrogen gas was found to be slow.
(a) Explain three ways in which the rate of formation of hydrogen gas could be increased.

(b) If the student wanted 36 cm^3 of hydrogen gas at s.t.p, what amount of the acid would be required.

13. Using four examples, explain how the process of neutralization is important in day to day life.