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

032/1 **CHEMISTRY 1**

(For Both School and Private Candidates)

Time: 3 Hours **Thursday, 07th November 2019 a.m.**

Instructions

1. This paper consists of sections A, B and C with a total of **fourteen (14)** questions.

2. Answer **all** questions in sections A and B and **one (1)** question from section C.

3. 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, O = 16, N = 14, S = 32, Zn = 65, Cl = 35.5, Cu = 64
   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 (15 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) "Water is referred to as the universal solvent". What does this mean?
- A Water is neither acidic nor basic as compared to other liquids.
- B Water exists in three states of matter than any other liquid
- C Water dissolves both organic and inorganic solutes.
- D Water is used more domestically than any other liquids
- E Water dissolves more substances than any other known liquids.

(ii) When methane undergoes substitutional reaction with excess chlorine, what is the final product?
- A Chloromethane
- B Dichloromethane
- C Trichloromethane
- D Tetrachloromethane
- E Monochloromethane

(iii) Why is hydrogen gas collected over water and by upward delivery method?
- A It is insoluble in water and less dense than air.
- B It is soluble in water and denser than air.
- C It is insoluble in water and denser than air.
- D It is soluble in water and less dense than air.
- E It is soluble in both water and air.

(iv) Consider the following fuels which are used for different purposes:
1. Coal
2. Fire wood
3. Petrol
4. Charcoal.

Which fuels originate from fossils?
- A 1 and 3
- B 1 and 4
- C 2 and 4
- D 2 and 3
- E 1 and 2

(v) The following are the uses of chromatography **except**
- A to analyse blood in crime scenes.
- B to detect different fibres.
- C to detect water pollution.
- D to bleach dye/colour.
- E to test the purity of organic substances.

(vi) What is the proper set of apparati that you would use to grind granules of a solid substance into fine powder in the laboratory?

A Pestle and filter funnel
B Separating funnel and mortar
C Pestle and filter paper
D Pestle and mortar
E Thistle funnel and mortar

(vii) Oxygen gas can be produced at a large scale by

A condensation of air.
B condensation of liquefied air.
C liquefaction of steam.
D Fractional distillation of liquefied air.
E evaporation of liquefied air.

(viii) Which of the following sets of processes uses a gas that ignites with a "pop sound when a lighted splint is passed through it?

A Balloon filling, welding and diving
B Hardening oil, balloon filling and welding
C Hardening oil, balloon filling and diving
D Fueling rocket, diving and welding
E Balloon filling fueling rocket and diving

(ix) Which statement is the most correct about a chemistry laboratory?

A Is a special room designed for conducting chemical tests.
B Is a special room designed for science practicals.
C Is a special room designed for keeping apparatuses.
D Is a special room where data analysis is carried out.
E Is a special room where students learn chemistry.

(x) Which role does organic matter play in the soil?

A Improving water infiltration of the soil.
B Accelerating break down of organic matter.
C Reserving nutrients thus providing soil fertility
D Converting nitrogen into nitrates.
E Providing a room for organic material such as nylons.

2. Match the descriptions in **LIST A** with the corresponding scientific procedures 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) A statement of how the results relate to the hypothesis.	A Conclusion
(ii) A series of investigations.	B Data analysis
(iii) A statement that identifies an even, fact or situation.	C Data collection
(iv) A tentative explanation.	D Experimentation
(v) A step in which the researcher explains the results.	E Hypothesis
	F Observation
	G Problem identification

SECTION B (70 Marks)

Answer **all** questions in this section.

3. (a) How many chlorine molecules are in 20 cm^3 of chlorine gas at s.t.p.?

   (b) Calculate the number of ions present in 5 g of copper II nitrate. **(7 marks)**

4. (a) Distinguish normal salts from acidic salts based on how they are formed.

   (b) Give four uses of salts in daily life. **(7 marks)**

5. (a) Distinguish temporary hardness from permanent hardness of water.

   (b) With the help of chemical equations, explain how you can remove each type of water hardness in g(a). **(7 marks)**

6. In the industrial preparation of sulphur trioxide, equilibrium is established between sulphur dioxide and oxygen gas as follows:
   $2SO_{2(g)} + O_{2(g)} \rightleftharpoons 2SO_{3(g)}$ $\Delta H = -94.9$ kJ/mol

   (a) (i) Is the forward reaction an endothermic or exothermic process? Give a reason.
   (ii) How would you adjust temperature and pressure to maximize the proportion of the product at equilibrium?

   (b) (i) Why is it unfavourable to work with very high pressure and very low temperature in the Contact process?
   (ii) What catalyst is used to speed up the rate of formation of sulphur trioxide before attaining equilibrium? **(7 marks)**

7. An atom of element X having atomic number 11 combines with an atom of element Y having atomic number 9 to form a compound.

   (a) Write the formula of the compound and state the type of bond formed in the compound.

   (b) Give four properties of the compound formed in 7(a). **(7 marks)**

8. Explain each of the following statements and in each give its balanced chemical equation?
   (i) Sulphur dioxide in solution is a powerful reducing agent.
   (ii) Sulphur dioxide in solution acts as a bleaching agent.
   (iii) Sulphur dioxide can reduce chlorine and itself become oxidized.
   (iv) When hydrogen sulphide is passed through sulphur dioxide gas, yellow deposits are produced. **(7 marks)**

9. (a) Write the chemical symbols for beryllium, boron, neon, nitrogen and phosphorus.

(b) Why some of the elements in 9(a) are assigned symbols with only one letter while others bear symbols with two letters? **(7 marks)**

10. (a) Give three advantages of using chemical equations over word equations.

(b) You are provided with a compound of 22.2% zinc, 11.6% sulphur, 22.3% oxygen, and the rest percentage is water of crystallization. Calculate the molecular formula of the compound if its molecular mass is 283. **(7 marks)**

11. A Form Three student conducted experiments in the laboratory to synthesize nitrogen, ammonia and ethane. The experimental results were tabulated as follows:

Experiment	**Reagents**	**Conditions**	**Products**
1	Lead nitrate	Heat	Lead oxide, oxygen gas and nitrogen gas
2	Gaseous hydrogen and gaseous nitrogen	Catalyst	Ammonia gas
3	Ethene gas and hydrogen gas	Catalyst	Ethane

Write word equations with corresponding chemical equations to summarize the reactions taking place in each of the experiments 1 to 3. **(7 marks)**

12. (a) Which ways are the fossil fuels detrimental to the environment? Give four points.

(b) Briefly explain how biogas is produced by using domestic waste. **(7 marks)**

SECTION C (15 Marks)

Answer **one (1)** question from this section.

13. Explain how to handle chemicals having the warning signs of flammable, corrosive, harmful, explosive and toxic in the laboratory.

14. Explain six measures for minimizing the environmental degradation caused by extraction of metals in tanzania.