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 **Year: 2022**

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. Section A and C carry **fifteen (15)** marks each and section B carries **seventy (70)** marks.
4. Non - programmable calculators may be used.
5. Cellular phones and any unauthorised materials are **not** allowed in the examination room.
6. Write your **Examination Number** on every page of your answer booklet(s).
7. The following constants may be used.

   Atomic masses: H = 1, C = 12, N = 14, O = 16, Na = 23.

   Avogadro's number = 6.02×10^{23}

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

   1 Faraday = 96,500 coulombs.

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

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SECTION A (15 Marks)

Answer **all** questions in this section.

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

(i) Which is a chemical property of water?

A It is a very good solvent.
B It is neither acidic nor basic.
C It has higher surface tension.
D It can exist in three states of matter.
E It expands when it freezes.

(ii) What is the maximum number of electrons in the innermost shell of atoms?

A 3 B 1 C 4
D 2 E 8

(iii) What feature is essential for a good fuel?

A High speed of continuous energy supply.
B High energy value supplied.
C Low carbon dioxide supplied.
D High carbon dioxide production.
E High content of non-combustible material.

(iv) What conclusion can be drawn from the random movement of pollen grains suspended in air?

A Matter is lighter in nature. B Matter is solid in nature.
C Matter is particulate in nature. D Matter is gaseous in nature.
E Matter is wave in nature.

(v) Which energy source that can be reused after being exploited?

A Combustible source. B Non-renewable source.
C Renewable source. D Synthetic source.
E Natural source.

(vi) Which one is the molecular formula for prop-1-ene?

A C_3H_5 B CH_3CCH C C_3H_4
D HCH_2CCH E CH_3CHCH_2

(vii) Which of the following is **not** a component of the First Aid Kit?

A Goggles B A pair of scissors
C Knife D Gloves
E Razor blade

(viii) Which element is oxidised in the following reaction?

$$2FeSO_4 + Cl_2 + H_2SO_4 \longrightarrow Fe(SO_4)_3 + 2HCl.$$

A Chlorine B Hydrogen C Oxygen
D Sulphur E Iron

(ix) Which of the following are the components needed to start fire?

A Match box, fire wood and kerosene
B Match box, fire wood and oxygen
C Oxygen, fuel and fire wood
D Oxygen, heat and match box
E Oxygen, fuel and heat

(x) Why is nitrogen formed first during the fractional distillation of air?

A It has got high boiling point. B It has got low density.
C It has got low melting point. D It has got high density.
E It has got low boiling point.

2. Match the effects on the rate of chemical reactions in **List A** with the corresponding physical conditions 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) Increases colliding particles per time	A Increase in temperature
(ii) Favours endothermic reaction	B Increase in surface area
(iii) Increases the speed to reach equilibrium	C Increase in pressure
(iv) Favours the side with fewer molecules	D Increase in concentration
(v) Favours more products on opposite side	E Introducing a catalyst
	F Decrease in temperature
	G Decrease in pressure

SECTION B (70 Marks)

Answer **all** questions in this section.

3. (a) How useful is matter in our daily life? Give four points with an example for each.
(b) Why are the chemical symbols important in Chemistry? Give three reasons.

4. Zinc granules were placed in a beaker containing excess dilute sulphuric acid standing on a direct reading balance. The mass of the beaker and its contents were recorded after every two seconds as shown in Table 1.

Table 1

Time (s)	0	2	4	6	8	10
Mass (g)	110.20	110.10	110.00	108.50	107.20	107.20

(a) Why there was a loss in mass?
(b) Why did the mass remain constant after the eight seconds?
(c) Briefly explain what would happen to the rate of reaction if zinc powder was used instead of granules.

5. A certain compound with the molecular mass of 28 was analyzed and found to be composed of 0.6 g of carbon and 0.1 g of hydrogen.

(a) Work out its empirical formula and molecular formula.
(b) Classify the compound to its homologous series.

6. A Form Three student prepared an experiment to prepare a gas in the laboratory by decomposing a compound using electricity. A steady current was allowed to flow through the solution for 3 hours. At s.t.p 4.12 dm^3 of the gas which relighted the glowing splint was produced.

(a) What terminology is used to refer to such experimental set up?

(b) Work out the current flowing in the circuit.

7. Classify the following salts on the basis of solubility in water: Sodium carbonate, Lead nitrate, Silver chloride, Copper (II) sulphate, Barium sulphate, Zinc chloride and Lead sulphate.

8. Table 2 shows the volume of soap solution needed to form lather with three samples of water of equal volumes. Use the data from the table to answer the questions that follow:

Table 2

Water Sample	**Volume of Soap Solution (cm^3)**
E	6.5
F	0.2
G	3.7

(a) Identify two things other than the volume of water that must be kept constant for such data to be meaningful.

(b) (i) Identify which water sample has the highest hardness. Give a reason.

(ii) Give three causes of hardness of water.

9. Consider the following substances: milk, copper, soap, steel, chlorine and sugar.

(a) Identify the elements, compounds and mixtures from the list.

(b) Give four differences between the elements identified in 9(a).

10. (a) Explain the function of coke and hot air in the extraction of iron from its ore.

(b) Account for the fact that aluminium is a vital element in our daily life. Give four points.

11. An unknown green sample was mixed with dilute HNO_3 and gave a blue solution and a gas which precipitated lime water. The resulting solution was evaporated to dryness and upon further heating black residues was formed together with a brown gas which relighted a glowing splint.

(a) Identify the green sample, blue solution, the black solid and the two gases.

(b) Give balanced chemical equation for the reaction between the green sample and nitric acid, and the equation for the formation of black residues.

12. (a) Distinguish alkanes from alkenes by giving three points.

(b) Why carbon has been given special attention in organic chemistry rather than other elements? Give four reasons.

SECTION C (15 Marks)

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

13. Explain six effects of water pollution in Tanzania.

14. Describe six ways that can be adopted by the farmers to maintain soil fertility in Tanzania.

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032/2A

CHEMISTRY 2A
ACTUAL PRACTICAL A
(For Both School and Private Candidates)

Time: 2:30 Hours **Year: 2022**

Instructions

1. This paper consists of **two (2)** questions. Answer **all** the questions.
2. Each question carries **twenty five (25)** marks.
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. You may use the following constants:
   Atomic masses: H=1, C=12, O = 16, Na = 23.
   1 litre = 1 dm^3 = 1000 cm^3.

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You are provided with solutions **A** and **D**. One of this is acidic and the other is a basic solution. The basic solution was made by dissolving 3.5 g of an impure sodium hydroxide (NaOH) in a distilled water making up to a litre of solution. The acidic solution is 0.03 M sulphuric acid (H_2SO_4). Perform the following procedures and then answer the questions that follow.

Procedure

(i) Pour about 1 cm^3 of a solution **A** into a test tube and use a litmus paper to test if it is an acid or a base.

(ii) Discard the content and wash the test tube.

(iii) Repeat the procedures (i) and (ii) using a solution **D**.

(iv) Titrate the acid solution (in a burette) against the base solution (in a titration flask) using methyl orange (**MO**) as an indicator up to the end point.

(v) Repeat the step (iv) to obtain three more readings and record the results in a tabular form.

Questions

(a) (i) What was the volume of the pipette used?

(ii) What was the colour change at the end point?

(iii) Calculate the average volume of the acid used to neutralize the base.

(b) Write a balanced chemical equation for the neutralization reaction between solution **A** and **D**.

(c) Calculate the percentage purity of sodium hydroxide.

2. You are provided with the following:

LL: A solution of 0.13 M $Na_2S_2O_3$ (sodium thiosulphate);

NN: A solution of 2 M HCl;

Distilled water;

Stopwatch or stop clock;

A sheet of white paper marked **X**.

Procedure

(i) Measure 20 cm^3 of solution **LL** and put it into a 100 cm^3 beaker.

(ii) Place the beaker containing solution **LL** on the top of a letter **X** drawn on a sheet of paper.

(iii) Measure 10 cm^3 of **NN**; pour it into a beaker containing solution **LL** and immediately start the stopwatch. Swirl the beaker with contents twice.

(iv) Look down vertically through the mouth of the beaker so as to see the cross at the bottom of the beaker. Stop the clock when the letter **X** is invisible.

(v) Record the time taken for the letter **X** to disappear completely.

(vi) Repeat the experiment using the data shown in the following table.

Table: Experimental data

Experiment No.	Volume of NN (cm^3)	Volume of LL (cm^3)	Volume of distilled water (cm^3)	Time (sec)	$\frac{1}{t}$ (sec^{-1})
1	10	20	0		
2	10	15	5		
3	10	10	10		
4	10	5	15		

Questions

(a) Complete filling the experimental table.

(b) What does $\frac{1}{t}$ represent in the experimental table?

(c) Write a balanced chemical equation for the reaction between **LL** and **NN**.

(d) How was the factor of concentration varied in this experiment?

(e) Plot a graph of volume of solution **LL** against $\frac{1}{t}$.

(f) Use the graph you have drawn in (e) above to explain how the variation of concentration affects the rate of chemical reaction.