THE UNITED REPUBLIC OF TANZANIA
PRESIDENT'S OFFICE
REGIONAL ADMINISTRATION AND LOCAL GOVERNMENT
DODOMA CITY COUNCIL
DODOMA CATHOLIC SECONDARY ASSOCIATION(DOCASSA)
FORM FOUR MID-TERM EXAMINATION

032/1 **CHEMISTRY 1**
Time 3:00 Hrs **March 2025**

Instructions

1. This paper consists of sections A, B and C with a total of **eleven (11)** questions.
2. Answer **all** questions in sections A and B and **two (2)** questions from section C.
3. Sections A carries **sixteen (16)** marks, section B **fifty-four (54)** marks and section C **thirty (30)** marks.
4. With the exception of non-programmable calculators, any other unauthorized materials are not allowed in the examination room.
5. Write your **Examination Number** on every page of your answer booklet(s) / sheet.
6. The following constants may be used.

   Atomic masses: H=1, C=12, O=16, Mg=24, Cl=35.5, Cu=64, Ag=108, Fe =56, S=32
   Avogadro's constant = 6.02×10^{23}
   GMV at s.t.p. = 22.4 dm^3 = 22400 cm^3
   1 faraday = 96500 C
   Standard pressure =760 mmHg
   Standard temperature = 273K
   1litre = 1 dm^3 = 1000 cm^3
   Density of water = 1 g/cm^3 = 1000 kg/m^3
   Specific heat capacity of water = 4.18 kJ/kg^oC

SECTION A. (16 Marks)

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 in the answer booklet / sheet provided.

(i) When an egg shell is dropped into dilute hydrochloric acid, effervescence occurs because:
   A. Carbon dioxide is evolved
   B. H_2S gas is evolved
   C. O_2 gas is evolved
   D. H_2 gas is evolved
   E. No gas is evolved

(ii) Crystals of electrovalent compounds always possess:
   A. anions held together by electrostatic forces
   B. molecules held together by covalent forces
   C. ions held together by electrostatic forces
   D. molecules as their structural units
   E. neutral atoms that are loosely packed

(iii) The process of refining crude oil consists mainly of:
   A. removal of gaseous products from crude oil
   B. fractional distillation of crude oil
   C. decomposition of crude oil
   D. evaporation and condensation of crude oil
   E. simple distillation of crude oil

(iv) Urban water supplies are treated with potash alum (a crystallised double salt of potassium sulphate and aluminium sulphate) in order to:
   A. add mineral salts to the water
   B. soften the water
   C. prevent corrosion in water pipes
   D. remove bacteria from the water
   E. remove smaller particles through coagulation

(v) The school blackboard chalk is made of calcium:
   A. hydroxide C. bicarbonate E. nitrate
   B. carbonate D. sulphate

(vi) The expression "nitric acid is a strong acid" may be best explained as follows:
   A. Is very corrosive
   B. Dissolves all metals
   C. Is highly ionized
   D. Has high density
   E. Is a strong oxidizing agent

(vii) Red hot carbon can remove oxygen from both copper oxide and zinc oxide but not from magnesium oxide. On this evidence therefore, the order of activity / reactivity of the three metals, putting the most reactive metal first, is:
   A. magnesium, zinc, copper
   B. magnesium, copper, zinc
   C. copper, zinc, magnesium
   D. copper, magnesium, zinc
   E. Zinc, copper, magnesium

(viii) The burning back of a Bunsen burner occurs when the:
   A. air hole is closed
   B. Bunsen burner is overheated
   C. air hole is open
   D. Gas supply is cut off
   E.gas supply is too high

(ix) A galvanized iron is the one which is coated with:
   A. Tin C. Copper E. Chromium
   B. Silver D. Zinc

(x) All elements in the Periodic Table are arranged in Groups according to:
   A. similar orders of discovery
   B. the similarity in their chemical and physical properties
   C. order of increasing number of electrons in their outermost shells
   D. the atomic sizes starting with the element with the largest atomic size
   E. the alphabetical order

2. Match the items on hardness of water in **List A** with the corresponding responses in **List B** by writing the letter of the correct response beside the item number in the answer booklet / sheet provided.

List A	**List B**
i. Soluble stearate. ii. Insoluble stearate. iii. Dissolves in rain water to release ions that cause water hardness.	A. Slaked lime B. Temporarily hard water C. Scum D. Chlorides and nitrates of calcium, magnesium, iron , copper and manganese

iv. Versatile (multipurpose) as it removes both temporary and permanent hardness of water. v. Becomes harder on boiling because the process makes the salts in it to ionize further. vi. If present in water, they also cause permanent hardness of water.	E. Washing soda F. Permanently hard water G. Magnesian limestone (dolomite) H. Soap

SECTION B (54 Marks)

Answer **all** questions in this section

3. (a) When an aqueous solution of sodium nitrate is electrolyzed with inert electrodes, the products are hydrogen (2 vol.) at the cathode and oxygen (1 vol.) at the anode. Also, the cathodic liquid becomes alkaline and the anodic liquid acidic. Explain these results and write ionic equations in illustration.

(b) The same quantity of electricity was passed through three voltameters liberating 300 cm^3 of oxygen in the first, silver in the second and copper in the third. Calculate the mass of silver and copper deposited at the same time.

4. (a) Distinguish between a primary standard reagent and a secondary standard reagent as applied in volumetric analysis. Give only four (4) differences.

(b) A person suffering from indigestion, produces 1.0 litre of gastric juice per day which contains about 2.00 g of hydrochloric acid. How many antacid tablets each containing 400 mg of sodium bicarbonate are needed to neutralize all the hydrochloric acid produced in a day?

5. (a) Mr. Hassan's daughter was sick. When he took her to the hospital, she was prescribed liquid medicine (syrup). The bottle was written **"shake well before use".** What does this statement signify? And suggest the suitable method to separate the components of medicine above.

(b) 4.50g of an oxide of iron was completely reduced by heating in carbon. If 3.15g of iron was produced, Based on this information:

(i) Determine empirical formula of the oxide
(ii). Give the name of compound formed in (i) above

6. Ethanoic acid reacts with ethanol in the presence of concentrated Sulphuric acid.

a) (i) Give the IUPAC name of the organic product formed
(ii) What type of compound is it?
(iii) How would you tell that it had been formed?
(iv) What is the function of the Sulphuric acid?
(v) This reaction is reversible. Write an equation for the reaction.

b) (i) Explain why the reactions between organic acids and alcohols are important in industry.
(ii). Give two (2) examples of things you buy that contain products from these Reactions.

7. (a) Metals are extracted from their ores. Using two important metals in the table below, identify the substance(s) apart from their chief ores which are added during the extraction process and finally, suggest their functions.

Name of the metal to be extracted	Substance(s) added during extraction	Function(s) of the substance(s)
Sodium		
Iron		

(b) Consider the reaction between aqueous solutions of silver nitrate and calcium chloride.

(i) With state symbols, write the balanced molecular with total and net ionic equation for this reaction.

(ii) Give three usefulness of the equation in (b) (i) over word equation.

8. (a) Gas A was prepared in the laboratory by isolating it from atmospheric air. During it's preparation air was allowed to pass through sodium hydroxide then over heated copper metal.

(i) Identify gas A.

(ii). By using equation, explain what happened when gas A passed through sodium hydroxide and in heated copper metal.

(iii). Write four uses of gas A.

(b) Substance A and B consist of molecules A_2 and B_2 respectively. When the two elements react they form molecules A-B. The A-A bonds are as strong as B-B bonds, but A-B bonds are stronger than either A-A or B-B bonds. The equation for the reaction is;

$A_2(g) + B_2(g) \longrightarrow 2AB(g)$

(i) Is the reaction exothermic or endothermic? Give reasons for your answer.

(ii) What will happen to the position of the equilibrium and the effects of the products when temperature is increased? Explain

SECTION C (30 Marks)

Answer only **two (2)** questions from this section

9. The agricultural officer at Kondoa district conducted a meeting with all farmers to discuss on how to apply fertilizer in order to get high crop yields, as a form four student with clear explanation, describe six (6) methods of fertilizer application would you expect to be discussed by the agricultural officer and farmers.

10. (a) When dilute nitric acid is added to a green solid P, a blue solution X is formed and a gas R that forms a white precipitate with limewater. Heating the blue solution of the hydrated salt X, it initially loses its water of crystallization, and then decomposes to form a black solid S, brown fumes of gas Y, and a gas Z that re-lights a glowing splint.

(i) Identify the solid X and gases Y and Z

(ii) Write balanced chemical equation for the reaction between the solid P and dilute nitric acid.

(iii) Give a balanced chemical equation for the formation of the solid S.

(iv) Describe two chemical properties of gas Z

(v) Give the IUPAC name of a green solid P

(b) Write short notes on the identification of the following;

(i) Nitrates

(ii) Chlorides

11. Three moles of Sulphur dioxide gas combine with four moles of oxygen gas to form Sulphur trioxide gas in the contact process.
    (a) Which reactant is present in smaller amount?
    (b) Calculate the mass in grams of the reactant left in the container?
    (c) How many moles of Sulphur trioxide are produced?
    (d) How many litres of Sulphur trioxide are produced at STP?