

The United Republic Of Tanzania

President's Office

REGIONAL ADMINISTRATION AND LOCAL GOVERNMENT

RUVUMA REGION



SONGEA MUNICIPAL COUNCIL

FORM FOUR MIDTERM EXAMINATION MARCH 2024

032/2

CHEMISTRY

TIME: 3 Hours

March, 2024

Instructions

1. This paper consists of sections A, B and C with a total of fourteen (14) questions
2. Answer all questions in section A and B and one (01) question from section C
3. Non – programmable calculators may be allowed
4. Cellular phones and any unauthorized materials 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:
 - o Atomic masses: H=1, O=16, Na=23, C=12, Cl=35.5, N=14, Zn=65, S=32, Ca=40, Fe=56, Cu=64, M=27
 - o GMV at S.t.p= $22.4 dm^3$, Avogadro's number = 6.02×10^{-23}
 - o 1 Faraday = 96500 Coulombs

This paper consists of 5 printed pages

SECTION A – (15 Marks)

Answer all questions in this section

1. For each of the item (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 of the following set of symbols represent cations?
 - A. k^+ and mg
 - B. m^{3+} and Cl^-
 - C. mg and Al
 - D. k^+ and m^{3+}
- ii. Milk is a mixture of water and fats. This type of mixture is called:
 - A. Suspension
 - B. Solution
 - C. Precipitate
 - D. Emulsion
- iii. Temporary hardness of water may be caused by one of the following pairs of facts.
 - A. $MgCO_3$ and $CaCO_3$
 - B. $ZnCl_2$ and $CuCO_3$
 - C. $Mg(HCO_3)_2$ and $Ca(HCO_3)_2$
 - D. $NaHCO_3$ and $KHCO_3$
- iv. The empirical formula of a certain compound is CH_3 . Its molar mass is $30g/mol$. What will be its molecular formula.
 - A. CH_4
 - B. C_2H_8
 - C. C_2H_6
 - D. C_2H_4
- v. ----- is the general term used to explain a mixture of different metals.
 - A. Alloy
 - B. Amphoteric
 - C. Allotrope
 - D. Isotope
- vi. Acovalent bond is formed when
 - A. Ammonia is formed
 - B. Potassium and oxygen combine
 - C. A metal combines with non-metal
 - D. An atom losses an electron
- vii. An example of a homologous series
 - A. Propane and Butane
 - B. Propane and Butane
 - C. Propane and Butane
 - D. Propane and Butyne
- viii. $AgNO_{3(aq)} + NaCl_{(aq)} \longrightarrow AgCl_{(s)} + NaNO_{3(aq)}$. This is a good example of:
 - A. Neutralization reaction
 - B. Double decomposition reaction
 - C. Redox reaction
 - D. Synthesis reaction
- ix. The volume of $0.2M$ or H_2SO_4 acid required to neutralize completely $23.00cm^3$ of $0.05M$ KOH is
 - A. $0.626cm^3$
 - B. $3.125cm^3$
 - C. $12.50cm^3$
 - D. $6.315cm^3$
- x. An electric current was passed through concentrated Hydrochloric acid using carbon electrodes. The substance liberated as the anode was
 - A. Water
 - B. Chlorine
 - C. Oxygen
 - D. Hydrogen

2. Match the item in LIST A with the correct response in LIST B

LIST A	LIST B
i. Fractional distillation	A. Water and kerosene
ii. Layer separation	B. Water and Ethanol
iii. Sublimation	C. Iodine and sand
iv. Evaporation	D. Water and sand
v. Filtration	E. Water and sugar

- | | |
|--|---|
| | F. Sulphur from iron filling
G. Sand and sugar |
|--|---|

SECTION B – (70 Marks)

Answer all questions in this section

3. (a) What is the molarity of a solution containing 10% by mass of calcium hydroxide in $0.5dm^3$ of solution? (3.5 Marks)
- (b) $25cm^3$ of a molar solution of sodium hydroxide is diluted to $85cm^3$. Calculate the concentration of the solution after dilution (3.5 Marks)
4. (a) Write balanced equation of:
 - i. Sodium hydroxide react with sulphuric acid
 - ii. Calcium carbonate decomposed by heat. (03 Marks)
- (b) (i) With aid of a balanced chemical equation name the products formed when nitrates of potassium and zinc decompose by heat (03 Marks)
- (ii) Suggest why nitrates of zinc and potassium have differently on heating. (01 Mark)
5. (a) (i) People suffering from heart burn usually use wood ashes for relief. Mention two characteristics which makes the ashes to be used for heart burn relief. (02 Marks)
- (ii) Give four compounds found in the laboratory which show the same characteristics as ashes.
- (b) List three (3) applications of neutralization reaction. (3 Marks)
6. (a) State three (3) characteristics of homologous series (3 Marks)
- (b) Study the following organic compounds A, B, C, D and E.
 CH_2CH_2 A, CH_3COOH B, $CHCCH_2CH_3$ C, $CH_3CH_2CH_3$ D, $CH_3CH_2CH_2CH_2OH$ E
 Write the chemical equation for the following reaction
 - i. E and B
 - ii. B and sodium hydroxide
 - iii. Hydrogenation of A in the presence of catalyst
 - iv. Oxidation of E in the presence of potassium dichromate as an oxidizing agent (4 Marks)
7. (a) What is oxidation number of iron in iron (iii) chloride? (1 Mark)
- (b) Classify the following reactions as oxidation or reduction
 - i. $Fe^{3+} + (aq) + e^- \rightarrow Fe^{2+} + (aq)$
 - ii. $Fe^{2+} + (aq) \rightarrow e^- + Fe^{3+} + (aq)$
 - iii. $N_{2(g)} + 3H_{2(g)} \rightarrow 2NH_{3(g)}$
 - iv. $S_{(s)} + O_{2(g)} \rightarrow SO_{2(g)}$ (4 Marks)
- (c) In the following reaction state the name of a reducing agent and oxidizing agent.
 $H_{2(g)} + CuO_{(s)} \rightarrow Cu_{(s)} + H_2O_{(g)}$ (2 Marks)
8. (a) Give two examples in each of the following:
 - i. Solid fuel
 - ii. Gaseous fuel (2 Marks)

- (b) The reaction which produces methanol from carbon monoxide and hydrogen is represented by the equation.
- $$CO_{(g)} + 2H_{2(g)} \rightleftharpoons CH_3OH_{(aq)} \quad \Delta H = -94 \text{ kJ mol}^{-1}$$

The reaction is carried out at high pressure to give a better yield of methanol.

- Explain why increase in pressure gives a better yield of methanol. (2 Marks)
- The value of ΔH is negative. What does this tell about the reaction? (01 Mark)
- With reason state whether a high temperature or low temperature will give a better of methanol (2 Marks)

9. (a) Give the meaning of the following terms:

- Temporary hardness of water
- Permanent hardness of water (2 Marks)

- (b) Name a substance which when dissolved in water causes:

- Temporary hardness of water
- Permanent hardness of water (2 Marks)

- (c) Explain with the help of one chemical equation in each case below:

- Temporary hardness of water can be removed by boiling
- Permanent hardness of water can be removed by chemical means (3 Marks)

10. (a) Arrange the following elements in order of increasing in electronegativity.

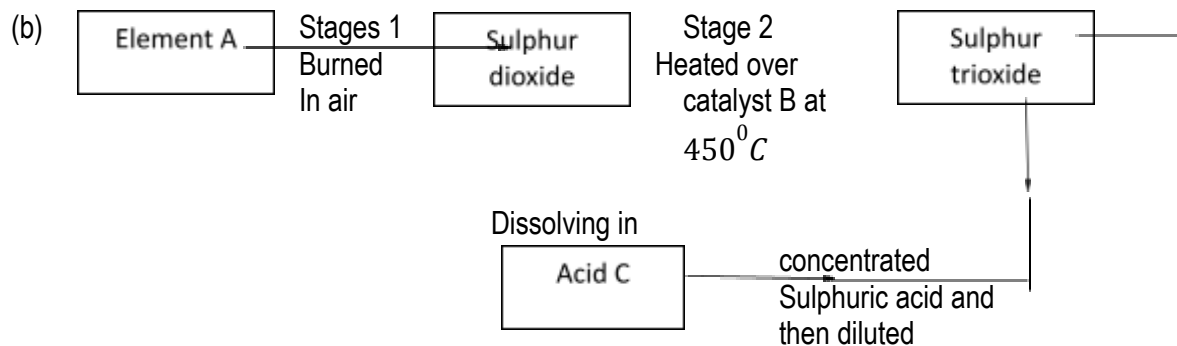
F , Br , I and Cl . (4 Marks)

- (b) Predict the product in the following reactions and give reason if any

- $Br_{2(g)} + NaCl_{(aq)} \longrightarrow$
- $Cl_{2(g)} + HF_{(g)} \longrightarrow$
- $Cl_{2(g)} + 2KI_{(aq)} \longrightarrow$ (3 Marks)

11. (a) Copper obtained from copper pyrites ($CuFeS_2$) is impure for electrical wiring and has to be purified by electrolysis.

- Name the electrolyte and the electrodes used during electrolysis.
- Write the observations that you can made during electrolysis.



The flowchart (diagram) above shows the stages in contact process.

- Give the names of element A, catalyst B and acid C.
- Write a balanced chemical equation for the formation of sulphur trioxide in stage 2. (3 Marks)

12. (a) Differentiate the following:

- Strong acid and concentrated acid
- Alkali and base (2 Marks)

- (b) i. List two advantages of liming
- ii. Outline any three advantages of manure over fertilizers. (5 Marks)

SECTION C

Answer only one question from this section

13. (a) i. Define the term terrestrial pollution.
ii. Mention three (3) materials that contribute to terrestrial pollution
iii. Mention three (3) gases which cause acidic rains.
- (b) Explain the effects of the following to the environment.
i. Acidic rain
ii. Artificial fertilizer
iii. Plastic containers
14. Fertile soil is not necessary to be productive. Justify this statement by giving four factors which affect productivity of the fertile soil.