

PRESIDENT'S OFFICE
REGIONAL ADMINISTRATION AND LOCAL GOVERNMENT
ARUSHA REGIONAL
FORM FOUR MOCK EXAMINATION
CHEMISTRY 1

CODE: 0321/1

TIME: 3:00HOURS

MAY, 2025

INSTRUCTIONS: -

- i) This paper consists of three sections A, B and C with a total of eleven (11) questions
- ii) Answer All questions in section A and B and two questions from section C
- iii) Section A carries (16 marks), section B (54 marks) and section C (30 marks)
- iv) Non-programmable calculators are allowed
- v) Write your examination number in every page of your answer booklet(s)
- vi) The following constants may be used.

Atomic masses: - H=1, Cl=35.5, C=12, O=16, Ca=40, Cu=64, Mg=24

1 Faraday = 96500C

GMV = 22.4dm³

1Litre=1dm³ = 10000cm³

Specific heat capacity of water = 4.18Kj/kg/k⁻¹

SECTION A (16 MARKS)

Answer **ALL** questions in this section

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

- i) Which of the following general formula represents an alkyl group
A. C_nH_{2n-1} B. C_nH_{2n+2} C. C_nH_{2n}
D. C_nH_{2n+1} E. C_nH_{2n-2}
- ii) Carbon dioxide gas can be used as a fire extinguisher, but when a burning magnesium is lowered into a gas jar containing carbon dioxide it continues to burn. This is because: -
A. The burning Magnesium splits up carbon dioxide into Carbon and Oxygen, and Oxygen burns with Magnesium.
B. The burning Magnesium can burn without Oxygen
C. Carbon dioxide cannot extinguish burning metal
D. Carbon dioxide supports burning Magnesium metal
E. Magnesium is a powerful oxidizing agent
- iii) A sample of a solid compound x was strongly heated in a test tube. No observable changes were noted during the heating. When dilute nitric acid was added to a solid compound x, some effervescence was observed. The gas produced formed a white precipitate with lime water. Compound x is likely to be: -
A. Zinc nitrate B. Copper Carbonate C. Potassium Carbonate
D. Potassium Hydroxide E. Copper hydroxide.

- iv) 3g of Zinc powder were added in 20cm³ of an acid Q, Zinc sulphate was formed and a gas 'Z' which burns with a pop sound was evolved. Which of the following represents the acid Q and gas Z.
- Sulphuric acid and Carbon dioxide
 - Sulphuric acid and Hydrogen gas
 - Hydrochloric acid and Oxygen gas
 - Hydrochloric acid and Hydrogen gas
 - Sulphuric acid and Oxygen gas
- v) An electric current of 0.2A was passed through an electrolyte for 16.67 minutes. The quantity of electricity passed is: -
- 200.04coulombs
 - 2000.004 coulombs
 - 1000coulombs
 - 0.254coulombs
 - 0.00789coulombs
- vi) What is the simplest test for the hardness of water?
- Shaking water with chalk powder
 - mixing water with soap-less detergent
 - Forming of scum
 - Shaking water with soap solution
 - Formation of dolomite
- vii) Ammonia is a basic gas that can be obtained by reacting ammonium salt and calcium hydroxide. Which of the following is appropriate drying agent for ammonia gas.
- Concentrated sulphuric acid
 - Calcium chloride
 - Calcium oxide
 - Lime water
 - Calcium Carbonate
- viii) An element Z is found in period 4 and group II of the periodic table. If element Z undergoes the reaction $Z \rightarrow Z^{2+} + 2e^-$. The electronic configuration of Z^{2+} ion is
- 2:8:6
 - 2:8:8
 - 2:8:2
 - 2:8:8:2
 - 2:8:4
- ix) A student demonstrated an experiment by dissolving sugar in water until the solute was not dissolving any more. What type of solution was formed at the end of her demonstration.
- Emulsion
 - Saturated solution
 - Unsaturated solution
 - Super saturated solution
 - Suspension
- x) Villagers at Nyasa were advised to use renewable source of energy like solar energy and prohibited to use non-renewable sources like charcoal and firewood. Why are the villagers recommended to use renewable sources
- It doesn't produce harmful gases that cause pollution
 - No chemical reactions are involved
 - It's cheap source of energy
 - It has high content of non-combustible materials
 - The scarcity of the energy source

2. Match the items in list A with corresponding list B by writing the letter of the correct response besides the item number in the answer booklet(s) provided.

LIST A	LIST B
i) A colourless gas which is slightly soluble in water, neutral to litmus paper but used as a rocket fuel. #	A. Oxygen
ii) It supports plants survival but less important in combustion.	B. Nitrogen
iii) A greenish gas, denser than air used as a military weapon since its highly poisonous. e	C. Sulphur dioxide
iv) A colourless acidic gas with a pungent choking smell used to control PH in chemical process J	D. Hydrogen chloride
v) A non-poisonous gas physically isolated from air, used in making fertilizer. 4	E. Carbon dioxide
vi) It has a strong choking smell of urine. c	F. Fluorine
	G. Ammonia
	H. Hydrogen
	I. Chlorine
	J. Sulphur
	K. Carbon

SECTION B: (54 Marks)

Answer ALL questions from this section

3. a) Give an account for the following statements

- Anhydrous copper (II) Sulphate becomes coloured when exposed to atmosphere for a long time
- Oxygen gas can be collected by downward displacement of water
- Concentrated sulphuric acid is not used for drying hydrogen sulphide gas
- Sodium metal is kept in paraffin oil

- b) An ion Q^{3+} has an electronic configuration of 2:8 neon

- What is the atomic number of the element Q?
- In which group and period of the periodic table does element Q belong? $g = VIII$ $p = 2$
- Give the formula of the oxide formed for element Q and state its basic-acidic character. neon

4. a) Define the following terms and give one example in each case: -

- Allotropes - H_2 and O_2
- Isotopes - ^{35}Cl and ^{37}Cl

- b) Chlorine has two isotopes ^{35}Cl and XCl with relative abundances of 75% and 25% respectively. If chlorine has a relative atomic mass of 35.5. Calculate the value of X in Cl isotope

- c) Lyne was given two gas jars, one containing gas 'S' and another containing gas 'R'. Gas 'S' is used to prepare water gas in laboratory and gas 'R' is used to treat sewage plants.

- Identify the two gases S and R
- How can the gas R be collected during its preparation in the laboratory
- Briefly explain the two uses of gas S in our daily life.

5. a) Briefly explain the following terms as applied in chemical kinetics and equilibrium

i) Reversible reaction

ii) Irreversible reaction

b) Considering the formation of nitrogen monoxide gas using the reaction below
$$\text{N}_{2(g)} + \text{O}_{2(g)} \rightleftharpoons 2\text{NO}_{(g)} \quad \Delta H = +180 \text{ kJ mol}^{-1}$$

In order to attain maximum yield of nitrogen monoxide. It's necessary to control the conditions very carefully. State with reasons:

i) Whether high or low temperature should be applied.

ii) If any increase in pressure would have effect on the rate of reaction

iii) Whether the addition of oxygen gas from outside the system will have any effect to the production nitrogen monoxide.

6. a) When carbon undergoes combustion, it forms two oxides. Name these two oxides and state the conditions under which each of them is formed. Write an equation for the formation of each oxide.

b) 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 lime water. On heating the blue solution of *X* it loses its water of crystallization, and then decomposes to form a black solid *S*, brown fumes of gas *Y* and a gas *Z* that relights a glowing splint are produced.

i) Identify the solid *P* and *S*, gases *Y* and *Z*

ii) Write an equation for the reaction between solid *P* and dilute nitric acid

iii) Write an equation for the formation of solid *S*.

7. a) In most laboratories in schools it's always advisable to use non-luminous flame for heating purposes.

i) Explain how a Bunsen burner is set to produce a non-luminous flame

ii) Give a reason why it's advisable to use non-luminous flame

iii) State the functions of air hole and barrel in the Bunsen burner.

b) Why it's always preferred to use hydrogen peroxide rather than potassium chlorate during the preparation of oxygen gas. Give two reasons.

c) Give a reason why construction of steam pipes and boilers it's not recommended to use iron metal

d) What will happen to a well stoppered bottle full of water left in a deep freezer over night? Give one reason.

8. a) Why carbon has been given special attention in organic chemistry rather than other elements? Give four (4) points.

b) A compound *A* ($\text{C}_4\text{H}_{10}\text{O}$) is oxidized with acidified potassium dichromate to give compound *B*. When it is dehydrated with conc. H_2SO_4 , compound *A* gives compound *C* which undergoes hydrogenation to give compound *D*, that is capable of undergoing substitution reaction.

i) Using chemical equation show how compound *B*, *C* and *D* are formed.

ii) Identify compound *B*, *C* and *D* using condensed structure.

SECTION C: (30 MARKS)

Answer ONLY TWO questions from this section

9. Mwanza is among the largest cities in Tanzania and a business hub in the lake region but still has struggled to reduce and eliminating the problem of terrestrial pollution especially solid wastes. As a young chemist, what caution can you provide regarding the potential impacts? Give five (5) points.
10. Manufacturing of concentrated sulphuric acid involves complex and systematic process. By well-balanced chemical equations explain in details the manufacturing process of sulphuric acid by contact process.
11. a) Define the following terms and give three examples in each
- i) Renewable energy source
 - ii) No-renewable energy source
- b) The following results were obtained in an experiment to measure the cost value of biodiesel.
- Initial temperature $T_0 = 24.70^\circ\text{C}$
Final temperature $T_1 = 68.50^\circ\text{C}$
Mass of Biodiesel burnt = 56g

If the volume of water used in the experiment was 12 litres, determine the heat value of the biodiesel. (Specific heat capacity of water = 4.18KJ/kg/K^{-1} and density of water is 1000Kg/m^3)

9. Using your knowledge, state
- i) stop different dangerous human activities
 - ii) Reducing industrial activities.
 - iii) Reducing, Re-using and Recycling wastes