

THE UNITED REPUBLIC OF TANZANIA

PRESIDENT'S OFFICE
REGIONAL ADMINISTRATION AND LOCAL GOVERNMENT

FORM FOUR EXAMINATION - SERIES 10

CHEMISTRY

Time: 3:00 Hrs

YEAR: 2024

INSTRUCTIONS

1. This paper consists of three sections A, B and C with total of fourteen (14) questions.
2. Answer all questions in section A and B and one (1) question from section C.
3. Calculators and cellular phones are not allowed in the examination room.
4. Write your Examination number on every page of your answer sheets/booklet(s).

The following constants may be used:

- Atomic masses: H = 1, C = 12, N = 14, O = 16, Na = 23, Mg = 24, Al = 27, S = 32, Cl = 35.5, K = 39, Ca = 40, Fe = 56, Cu = 63.5, Zn = 65, Ag = 108, I = 127, Ba = 137, Pb = 207
- Avogadro's number = $6.02 \times 10^{23} \text{ mol}^{-1}$
- GMV at s.t.p = $22.4 \text{ dm}^3 \text{ mol}^{-1}$
- 1 Faraday = 96500 Coulombs
- Standard temperature = 273 K
- 1 litre = 1 $\text{dm}^3 = 1000 \text{ cm}^3$

SECTION A (15 Marks)

Answer all questions in this section

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

(i) Which one of the following is a physical change?

- A. Rusting of iron
- B. Burning of magnesium ribbon
- C. Boiling of water
- D. Fermentation of glucose
- E. Decomposition of hydrogen peroxide

(ii) The number of protons in an atom is equal to its:

- A. Mass number
- B. Atomic number
- C. Neutron number
- D. Nucleon number
- E. Isotopic number

(iii) Which gas is produced when dilute hydrochloric acid reacts with zinc granules?

- A. Carbon dioxide
- B. Hydrogen
- C. Chlorine
- D. Oxygen
- E. Sulphur dioxide

(iv) A solution with $\text{pH} = 3$ is:

- A. Strongly alkaline
- B. Weakly alkaline
- C. Neutral
- D. Acidic
- E. A buffer solution

(v) Which one of the following is an example of an alkene?

- A. Ethane
- B. Ethanol
- C. Ethene
- D. Ethanoic acid
- E. Ethyne

(vi) The main ore of aluminium is:

- A. Hematite
- B. Bauxite
- C. Galena
- D. Chalcopyrite
- E. Magnetite

(vii) Which of the following is the correct ionic equation for precipitation of silver chloride?

- A. $\text{Ag(s)} + \text{Cl}_2\text{(g)} \rightarrow \text{AgCl(s)}$
- B. $\text{Ag}^+(\text{aq}) + \text{Cl}^-(\text{aq}) \rightarrow \text{AgCl(s)}$
- C. $\text{Ag}^-(\text{aq}) + \text{Cl}^+(\text{aq}) \rightarrow \text{AgCl(s)}$
- D. $\text{Ag}^{2+}(\text{aq}) + 2\text{Cl}^-(\text{aq}) \rightarrow \text{AgCl}_2\text{(s)}$
- E. $\text{AgCl(aq)} \rightarrow \text{Ag}^+(\text{aq}) + \text{Cl}^-(\text{aq})$

(viii) The process of separating a mixture of ethanol and water is best done by:

- A. Filtration
- B. Sublimation
- C. Fractional distillation
- D. Simple distillation
- E. Evaporation to dryness

(ix) How many moles are present in 11.2 dm³ of carbon dioxide gas at s.t.p?

- A. 0.25 mol
- B. 0.50 mol
- C. 1.00 mol
- D. 2.00 mol
- E. 22.4 mol

(x) Which one of the following is an oxidizing agent?

- A. Hydrogen gas
- B. Carbon monoxide
- C. Potassium permanganate
- D. Zinc metal
- E. Sulphur dioxide

2. Match the items in List A with the responses in List B by writing the letter of the correct response beside the item number provided. (One response in List B may be used more than once.)

List A

- (i) A compound that turns blue litmus red
- (ii) A substance that speeds up a reaction without being consumed
- (iii) The smallest particle of an element that can take part in a chemical reaction
- (iv) Process of loss of electrons
- (v) A solution that resists change in pH

List B

- A. Atom
- B. Catalyst
- C. Gases
- D. Base
- E. Acid
- F. Buffer solution
- G. Reduction
- H. Salt
- I. Distillation

SECTION B (70 Marks)

Answer all questions in this section

3.

- (a) Define the following terms:
- (i) Electrolysis
 - (ii) Mole
 - (iii) Homologous series
- (b) State two (2) differences between ionic and covalent compounds.

4.

- (a) A sample of bottled water was analyzed for the ions shown in the table below.

Ion	Concentration (mg/L)
Ca ²⁺	40
Mg ²⁺	12
Na ⁺	8
Cl ⁻	15
HCO ₃ ⁻	120

- (i) Name two ions that contribute to temporary hardness of water.
- (ii) Give one method used to remove temporary hardness of water.
- (iii) State one advantage of drinking water containing calcium ions.

(b) Explain why distilled water does not conduct electricity but tap water can conduct electricity.

5.

- (a) Write balanced chemical equations for the following reactions:
- (i) Sodium reacts with water to form sodium hydroxide and hydrogen gas.
 - (ii) Calcium carbonate decomposes on heating.
- (b) A metal M reacts with dilute sulphuric acid to produce 2.24 dm³ of hydrogen gas at s.t.p. Calculate the number of moles of hydrogen produced.

6.

- (a) State three (3) laboratory safety precautions to be observed when handling concentrated acids.
- (b) Mention two (2) uses of sulphuric acid in industries.

7.

- (a) Explain the following observations:
- (i) Ammonia gas turns red litmus paper blue.
 - (ii) Aqueous sodium chloride conducts electricity but solid sodium chloride does not.
- (b) Draw and label the apparatus used to prepare oxygen gas in the laboratory (diagram not required here; describe the set-up).

SECTION C (15 Marks)

Answer only one (1) question in this section

13. Describe the extraction of iron from hematite ore in a blast furnace. Your answer should include the role of coke and limestone, and the chemical equations involved.

14. A solution contains 5.85 g of sodium chloride (NaCl) dissolved in water to make 500 cm³ of solution. Calculate: (a) the molarity of the solution, and (b) the number of chloride ions present in the solution. (Avogadro's number = 6.02 x 10²³ mol⁻¹).