

THE UNITED REPUBLIC OF TANZANIA  
NATIONAL EXAMINATIONS COUNCIL  
CERTIFICATE OF SECONDARY EDUCATION EXAMINATION

032/1

CHEMISTRY 1  
(For Private Candidates Only)

Time: 3 Hours

Thursday, 7<sup>th</sup> October 2010 p.m.

Instructions

1. This paper consists of sections A, B and C.
2. Answer all questions in sections A and B, and two (2) questions 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 booklet(s).
5. The following constants may be used.

Atomic masses: H = 1, C = 12, O = 16, N = 14, Mg = 24, Al = 26, S = 32,  
Cl = 35.5, K = 39, Cu = 63.5, Ag = 108.

Avogadro's Number =  $6.02 \times 10^{23}$ .

GMV at s.t.p. =  $22.4 \text{ dm}^3$ .

1 Faraday = 96,500 coulombs.

Standard pressure = 760 mm Hg.

Standard temperature = 273 K.

1 litre =  $1 \text{ dm}^3 = 1000 \text{ cm}^3$ .

This paper consists of 7 printed pages.

## SECTION A (20 Marks)

Answer **all** questions in this section.

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

(i) Isotopes of the same elements have

- A different atomic number
- B different atomic masses
- C the same number of neutrons
- D different number of electrons
- E different number of protons.

(ii) A colourless gas is soluble in water. Its aqueous solution is acidic and gives white precipitate with aqueous silver nitrate acidified with dilute nitric acid. What is the name of the gas?

- A Carbon dioxide
- B Sulphur dioxide
- C Hydrogen chloride
- D Carbon monoxide
- E Nitrogen dioxide.

(iii) Choose the set of elements that is arranged in order of increasing electronegativity.

- A Chlorine, fluorine, nitrogen, oxygen, carbon
- B Fluorine, chlorine, oxygen, nitrogen, carbon
- C Carbon, nitrogen, oxygen, chlorine, fluorine
- D Nitrogen, oxygen, carbon, fluorine, chlorine
- E Oxygen, carbon, fluorine, chlorine, nitrogen.

(iv) The preparation of charcoal by local or modern methods is an example of

- A destructive distillation
- B a process of sublimation
- C simple distillation
- D fractional distillation
- E a process of cracking.

(v) Example of a weak acid in the following list is

- A dilute sulphuric acid
- B dilute acetic acid
- C dilute nitric acid
- D dilute hydrochloric acid
- E saturated nitric acid.

(vi) The chemical equation

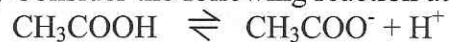
$\text{CH}_4 + \text{Cl} \rightarrow \text{CH}_3\text{Cl} + \text{HCl}$  represents an example of

- A substitution reaction
- B addition reaction
- C esterification
- D polymerization
- E oxidation reaction.

(vii) The weight of oxygen in 90 g of water is

- A 60 g
- B 70 g
- C 80 g
- D 90 g
- E 85 g.

(viii) Consider the following reaction at equilibrium:



In order to produce more acetic acid we need to

- A increase the concentration of  $\text{CH}_3\text{COO}^-$  ions
- B increase the concentration of  $\text{H}^+$  ions
- C decrease the concentration of  $\text{H}^+$  ions
- D increase the initial concentration of  $\text{CH}_3\text{COOH}$
- E decrease the concentration of  $\text{CH}_3\text{COO}^-$  ions.

(ix) An example of an alkene that decolourises potassium permanganate solution is

- A methane
- B ethyne
- C ethene
- D ethane
- E butyne.

(x) The empirical formula of a certain organic compound is  $\text{CH}_3$ . If its vapour density is 15, then its molecular formula is

- A  $\text{C}_2\text{H}_6$
- B  $\text{C}_2\text{H}_4$
- C  $\text{CH}_4$
- D  $\text{C}_4\text{H}_{12}$
- E  $\text{C}_3\text{H}_8$ .

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.

List A	List B
(i) Milk souring	A Two miscible liquids
(ii) Air P	B Gaining hydrogen
(iii) Decomposition reaction F	C Suspension
(iv) Precipitation reaction	D Sublimation
(v) Oxidation reaction R	E Physical change
(vi) Reversible reaction I	F Two liquids with very close boiling points
(vii) Water and ethanol A	G $\text{CaCO}_3(\text{s}) \xrightarrow{\text{heat}} \text{CaO}(\text{s}) + \text{CO}_2(\text{g})$ .
(viii) Solid phase $\xrightleftharpoons[\text{cool}]{\text{heat}}$ vapour phase	H $\text{AgNO}_3(\text{aq}) + \text{NaCl}(\text{aq}) \rightarrow \text{AgCl}(\text{s}) + \text{NaNO}_3(\text{aq})$ .
(ix) Solution and filtration F	I $\text{CH}_4(\text{s}) + 2\text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g}) + 2\text{H}_2\text{O}(\text{g})$ .
(x) Water K	J $\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightleftharpoons 2\text{NH}_3(\text{g})$
	K Compound
	L Element
	M Decantation
	N Fractional distillation
	O Soluble in water
	P Mixture
	Q Chemical change
	R Separating an insoluble substance from a soluble one
	S Evaporation
	T Incomplete combustion of hydrocarbon

### SECTION B (60 Marks)

Answer **all** questions in this section.

3. (a) Define the following terms:
- (i) Anode (ii) Cathode **(2 marks)**
- (b) State Faradays second law of electrolysis. **(1 mark)**
- (c) A steady current of 2.5A was passed for 15 minutes through two different types of solutions namely copper sulphate and silver nitrate.
- (i) Calculate the masses of copper and silver liberated.
- (ii) From the masses in (i) what were the number of moles of each substance liberated?
- (iii) What is the ratio in moles of Cu and Ag liberated in whole numbers? **(7 marks)**

*Data given*

4. (a) What do you understand by the following terms?  
 (i) Proton  
 (ii) Neutron  
 (iii) Electron. **(3 marks)**
- (b) Sodium has a relative atomic mass of 23 and its atomic number is 11.  
 Draw simple diagrams to show the particles which make up  
 (i) sodium atom  
 (ii) sodium ion. **(3 marks)**
- (c) A and B represent atoms of two isotopes of silver, A is  $^{107}_{47}\text{Ag}$  and  
 B is  $^{109}_{47}\text{Ag}$ . State the number of  
 (i) protons in atom A  
 (ii) electrons in atom B  
 (iii) neutrons in atom A  
 (iv) protons in atom B. **(4 marks)**
5. (a) (i) What is meant by the term reduction?  
 (ii) What is the oxidation number of  $\text{FeSO}_4$ ? Justify your answer.  
 (iii) Name the compound mentioned in (ii) above. **(4 marks)**
- (b) Write the symbols and the valences of the following radicals.  
 (i) Nitrate  
 (ii) Hydrogen carbonate  
 (iii) Sulphate **(3 marks)**
- (c) Write the names and chemical formulae of the two oxides of iron where the metal atom has variable valences. **(3 marks)**
6. (a) Name at least two (2) examples of each of the following:  
 (i) Mineral acid  
 (ii) Organic acid **(4 marks)**
- (b) (i) Why do we use indicators in titrations?  
 (ii) Name two common indicators and give their colours in acidic solution. **(4 marks)**
- (c) (i) Which elements are contained in a table salt (common salt)?  
 (ii) Why common salt is classified as a normal salt? **(2 marks)**

7. The elements magnesium, aluminium, sulphur and argon are in the second period of the periodic table. For the listed elements write
- (a) electronic structure of each element. **(4 marks)**
  - (b) formulae for the hydride of magnesium, aluminium and sulphur. **(3 marks)**
  - (c) formulae for the oxides of magnesium, aluminium and sulphur and classify them into acidic, basic, amphoteric and neutral oxides. **(3 marks)**
8. (a) Define the following:
- (i) Cracking
  - (ii) Combustion **(2 marks)**
- (b) (i) What is a reason of heating coal in the absence of air before using it in homes or factories?
- (ii) Explain how solar panels can help to save energy in homes. **(4 marks)**
- (c) State at least four (4) factors that determine the choice of a good fuel. **(4 marks)**

### SECTION C (20 Marks)

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

9. Bauxite is an important raw material. It is the hydrated oxide of a certain metal. The metal is extracted from the oxide by electrolysis.
- (a) (i) Which metal is extracted from bauxite?
  - (ii) Why bauxite is dissolved in molten cryolite? **(3 marks)**
- (b) (i) Which types of electrodes are recommended for extraction of the metal from bauxite?
- (ii) Write equations for the reactions taking place at the electrodes. **(4 marks)**
- (c) (i) Name the three alloys of the metal.
- (ii) What are the three properties which have made the metal popular in cooking utensils? **(3 marks)**
10. (a) Why preparation of metallic oxides by direct combination is not intensively used? **(2 marks)**

- (b) The following results were obtained in an experiment to find the molecular formula of magnesium oxide when magnesium burnt in the air.

Mass of crucible = 12.5 g

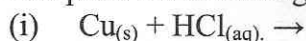
Mass of crucible + magnesium = 14.9 g

Mass of crucible + magnesium oxide = 16.5 g.

- (i) What mass of magnesium was used in the experiment?  
(ii) How many moles of magnesium atoms were used in the experiment?  
(iii) What mass of oxygen combined with magnesium?  
(iv) How many moles of oxygen combined with magnesium? **(6 marks)**

- (c) Use the answers from part (b) to write the equation of the reaction. **(2 marks)**

11. (a) Complete the following reactions:



- (b) Given copper (II) oxide, aqueous solutions of sodium hydroxide and sulphuric acid, and a suitable indicator, describe how you would prepare reasonably pure samples of

- (i) sodium sulphate  
(ii) copper (II) sulphate. **(5 marks)**

- (c) Give reason(s) for the use of nitrates in

- (i) fertilizer industry  
(ii) food preservative  
(iii) antiseptics and photography. **(3 marks)**

12. (a) Give reasons for the following:

(i) Alkanes have lowest melting and boiling points when compared to the other classes of organic compounds.

(ii) Alkenes are more reactive than alkanes. **(2 marks)**

- (b) (i) Why is it dangerous to burn hydrocarbons in too little air?

(ii) Why methane is used as fuel? Write a balanced chemical equation for its combustion. **(4 marks)**

- (c) (i) From which factors does the isomerism of alcohols arise?

(ii) Write and name all the isomers of the following alcohol:  
 $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$  **(4 marks)**

(b) Faraday's second law of electrolysis