

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

032/1

CHEMISTRY 1

(For Both School and Private Candidates)

Time: 3 Hours

Thursday, 07th November 2013 p.m.

Instructions

1. This paper consists of sections A, B and C.
2. Answer **all** questions in this paper.
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, Na = 23, Mg = 24,

Al = 26, S = 32, Cl = 35.5, Ca = 40, Fe = 56, Cu = 64,

Ag = 108.

Avogadro's number = 6.02×10^{23} .

GMV at s.t.p. = 22.4 dm^3 .

1 faraday = 96,500 coulombs.

Standard pressure = 760 mm Hg.

Standard temperature = 273 K.

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

SECTION A (20 Marks)

Answer **all** questions in this section.

1. For each of the items (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 action should be taken immediately after concentrated sulphuric acid spilled on the skin?
- A Its should be rinsed off with large quantities of running water.
B It should be neutralized with solid CaCO_3
C It should be neutralized with concentrated NaOH .
D The affected area should be wrapped tightly and shown to a medical health provider.
E It should be neutralized with concentrated KOH .
- (ii) In the titration of a monoprotic acid with a solution of sodium hydroxide of known concentration, what quantities will be equal at the equivalence point?
- A concentration of hydroxide solution and hydronium ions.
B number of moles of hydroxide ions added and number of moles of hydronium ion initially present.
C number of moles of hydroxide solution added and volume of acid solution initially present.
D number of moles of hydroxide ion added and the number of moles of monoprotic acid initially present.
E volume of sodium hydroxide solution added and volume of acid solution initially present.
- (iii) The charge of one mole of electrons is represented by the term
- A one ampere B one coulomb C one volt
D one faraday E one gram.
- (iv) 65.25 g sample of $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ ($M = 249.7$) was dissolved in water to make 0.800 L of solution. What volume of this solution must be diluted with water to make 1.00 L of 0.100 M CuSO_4 ?
- A 3.27 ml B 383 ml C 209 ml
D 65.25 ml E 306 ml.
- (v) Consider the system at equilibrium: $\text{H}_2\text{O}_{(l)} \rightleftharpoons \text{H}_2\text{O}_{(g)}$ for which $\Delta H > 0$. Which change(s) will increase the yield of $\text{H}_2\text{O}_{(g)}$.
- A Increase in temperature
B Increase in the volume of the container
C Increase in temperature and volume of the container
D Increasing surface area of oxygen
E Increasing surface area of reactants.
- (vi) As water is added to an acid, the acid becomes
- A more acidic and its pH goes down B more acidic and its pH goes up
C less acidic and its pH goes up D less acidic and its pH goes down
E neutral and its pH becomes 7.

- (vii) Three elements, X, Y and Z, are in the same period of the periodic table. The oxide of X is amphoteric, the oxide of Y is basic and the oxide of Z is acidic. Which of the following shows the elements arranged in order of increasing atomic number?
A X, Y, Z B Y, Z, Y C Z, X, Y
D Y, X, Z E X, Z, Y.
- (viii) Which of the following compounds contains only two elements?
A Magnesium hydroxide B Magnesium nitride
C Magnesium phosphate D Magnesium sulphite
E Magnesium sulphate.
- (ix) An atom has 26 protons, 26 electrons and 30 neutrons. The atom has
A atomic number 26, mass number 52 B atomic number 56, mass number 30
C atomic number 30, mass number 82 D atomic number 52, mass number 56
E atomic number 26, mass number 56.
- (x) The following equation is a propagation step in the chlorination of methane:
A $\text{Cl}_2 \rightarrow \text{Cl}^\bullet + \text{Cl}^\bullet$ B $\text{CH}_3^\bullet + \text{Cl}^\bullet \rightarrow \text{CH}_3\text{Cl}$
C $\text{CH}_3^\bullet + \text{Cl}_2 \rightarrow \text{CH}_3\text{Cl} + \text{Cl}^\bullet$ D $\text{CH}_4 + \text{Cl}^\bullet \rightarrow \text{CH}_3\text{Cl} + \text{H}^\bullet$
E $\text{CH}_3^\bullet + \text{Cl}_2 \rightarrow \text{CH}_2\text{Cl} + \text{Cl}^\bullet$.

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 in the answer book provided.

List A	List B
(i) Atoms of the same element that contain different numbers of neutrons.	A Atomic number
(ii) Display both metallic and non metallic characteristics.	B Covalent bond
(iii) Sub-atomic particle not found in the nucleus of the atom.	C Electron
(iv) The number of protons found in the nucleus of the atom.	D Radical
(v) The total number of protons and neutrons in the nucleus of the atom.	E Metalloids
(vi) The number of unpaired electrons on an atom.	F Isotopes
(vii) Incredibly stable and rarely reacts.	G Mass number
(viii) Form diatomic molecules.	H Neutron
(ix) Sub-atomic particle with no charge.	I Allotropes
(x) A group of atoms with unpaired electrons.	J Noble gases
	K Period
	L Group
	M Proton
	N Valence
	O Ions
	P Atomic radii
	Q Molecules
	R Group II elements
	S Transition metals
	T Halogens

SECTION B (54 Marks)

Answer **all** questions in section.

3. (a) Study the following portion of the periodic table with some elements represented by letters and answer the questions that follow.

I	II	III	IV	V	VI	VII	O
						B	
	A				C	D	

- (i) State how electronegativity varies from A to C and from B to D
(ii) Write the electronic configurations of A, C²⁻, D and B.
- (b) In the blast furnace, iron ore can be reduced using coke at a temperature of about 1300°C.
(i) Write an equation for the exothermic reaction that causes this high temperature.
(ii) State how carbon monoxide is formed.
(iii) Write a word equation for the formation of slag.
4. (a) Consider elements with atomic number 1, 11, 12 and 17.
(i) What are the types of oxides formed by elements with atomic number 11 and 12?
(ii) Write an equation which represents a reaction between the element with atomic number 1 and 17.
(iii) Write a balanced chemical equation between the oxide of the element with atomic number 11 and aqueous solution of the compound formed in 4 (a) (ii).
- (b) (i) What is soil erosion?
(ii) Explain four factors affecting soil erosion.
5. (a) Giving four reasons, explain why people who use hard water can expect higher costs than people who use soft water.
- (b) Suggest one method for the separation of each of the following:
(i) Iodine and sand.
(ii) Green solution from leaves.
(iii) Alcohol and water.
(iv) Iron filings and powdered calcium carbonate.
6. (a) (i) State three characteristics of a homologous series.
(ii) Draw the displayed/open structure formula of 2, 2-dichlorohexane.
(iii) Giving two reasons, explain why 2, 2-dichloro-3-methylbutane is a structural isomer of 2, 2-dichloropentane.
- (b) Carbon monoxide and hydrogen are used in the manufacture of methanol and the equilibrium is established according to the following equation.
$$\text{CO}_{(g)} + 2\text{H}_{2(g)} \rightleftharpoons \text{CH}_3\text{OH}_{(g)} \quad \Delta H = -80 \text{ kJ mol}^{-1}$$

(i) Give two features of the reaction at equilibrium.
(ii) Explain why an increase in temperature causes a decrease in equilibrium yield of methanol.

7. (a) Briefly explain how aluminum is obtained from its oxide.
- (b) Write down the chemical equations of the reactions between the following:
- Ethanol and sodium metal.
 - Propanol warmed with excess acidified potassium permanganate.
 - Propanol and acetic acid warmed together in the presence of concentrated sulphuric acid.
8. (a) 25 cm³ of 0.1 M HCl were neutralized by 23 cm³ of sodium hydroxide solution. Calculate the concentration of the alkali in grams per litre.
- (b) Give the meaning of the following terms:
- Soil structure.
 - Acidic soil.
 - Liming.
9. (a) A current of 0.5 A were made to flow through silver voltameter for 30 minutes. Calculate the mass of silver deposited and the equivalent weight of silver.
- (b) Explain the following reactions giving one example in each:
- Addition reaction.
 - Elimination reaction.
10. (a) Calculate the number of oxygen molecules and atoms in 0.5 moles of oxygen gas at room temperature.
- (b) Giving three reasons, explain why air is said to be a mixture of gases.
11. (a) For each of the following reactions, identify which of the gases, chlorine, sulphur dioxide, and hydrogen sulphide is either an oxidizing agent or reducing agent. Explain how you arrived at your answers.
- $\text{Cl}_{2(g)} + 2\text{H}_2\text{O}_{(l)} + \text{SO}_{2(g)} \rightarrow 2\text{HCl}_{(g)} + \text{H}_2\text{SO}_{4(aq)}$.
 - $\text{SO}_{2(g)} + 2\text{H}_2\text{S}_{(g)} \rightarrow 2\text{H}_2\text{O}_{(l)} + 3\text{S}_{(s)}$.
- (b) Fill in the missing value in the following table.

Particle	Relative mass	Charge
Proton		
Neutron		
Electron	$\frac{1}{1836}$	

SECTION C (26 Marks)

Answer **all** questions in this section.

12. Describe the cause, two effects and measures to be undertaken in order to prevent/reduce the amounts of acid rain.
13. The formation of oxides of non-metals can be both beneficial and harmful to man. Justify the statement focusing on the oxides of carbon, nitrogen and sulphur.