

**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, 06th November 2014 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, N = 14, Na = 23, S = 32, O = 16, Al = 26, Cl = 35.5

Ca = 40, Mn = 55, Fe = 56, K = 39.

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) An element in the periodic table with atomic number 18 belongs to which of the following?
- A Group I and period I.
 - B Group O and period III.
 - C Group III and period III.
 - D Group V and period IV.
 - E Group VII and period IV.
- (ii) The ionic equation when aqueous ammonium chloride reacts with sodium hydroxide solution is represented as:
- A $2\text{NH}_4^+(\text{aq}) + 2\text{Cl}^-(\text{aq}) \rightarrow 2\text{NH}_3(\text{g}) + \text{Cl}_2(\text{g}) + \text{H}_2(\text{g})$
 - B $\text{NH}_4^+(\text{aq}) + \text{OH}^-(\text{aq}) \rightarrow \text{NH}_3(\text{g}) + \text{H}_2\text{O}(\text{l})$
 - C $\text{Na}^+(\text{aq}) + \text{Cl}^-(\text{aq}) \rightarrow \text{NaCl}(\text{g})$
 - D $\text{H}^+(\text{aq}) + \text{OH}^-(\text{aq}) \rightarrow \text{H}_2\text{O}(\text{l})$
 - E $2\text{NH}_4^+(\text{aq}) + 2\text{Cl}^-(\text{aq}) \rightarrow 2\text{NH}_3(\text{g}) + 2\text{HCl}(\text{g})$.
- (iii) The reason why white anhydrous copper (II) sulphate turns blue when exposed in atmosphere is that it,
- A reacts with carbon dioxide.
 - B reacts with oxygen.
 - C becomes dry.
 - D absorbs water vapour.
 - E decomposes.
- (iv) Chemical change means;
- A the change is reversible.
 - B can easily be separated.
 - C the change is complete.
 - D new substance is produced.
 - E produces no change of mass.
- (v) If a steady current of 2 amperes was passed through an aqueous solution of iron (II) sulphate for 15 minutes, then the mass of iron deposited at the cathode will be:
- A 54 g.
 - B 56 g.
 - C 0.54 g.
 - D 28 g.
 - E 0.52 g.
- (vi) 10 cm³ of 0.4 M sodium hydroxide are added to 40 cm³ of 0.2 M hydrochloric acid. The resulting mixture will be
- A Neutral
 - B Alkaline
 - C Dilute
 - D Acidic
 - E Amphoteric
- (vii) The only metal which does not react with dilute hydrochloric acid is
- A Magnesium
 - B Aluminum
 - C Copper
 - D Zinc
 - E Sodium.
- (viii) Which of the following solutions is the most concentrated?
- A 50 g of calcium carbonate in 100 cm³ of water
 - B 60 g of sodium chloride in 200 cm³ of water
 - C 65 g of potassium nitrate in 100 cm³ of water
 - D 120 g of potassium sulphate in 200 cm³ of water
 - E 50 g of sodium hydroxide in 200 cm³ of water.

(ix) Alcohols react with carboxylic acids to form a group of organic compounds called

- A alkynes B aldehydes C ethers
 D esters E alkanols.

(x) Which of the following statement is true about water gas?

- A It is poisonous.
 B Contains hydrogen.
 C Is the same as biogas.
 D Contains hydrogen and nitrogen.
 E Contains carbon monoxide and hydrogen.

2. Match the items in **List A** which the responses in **List B** by writing the letter of the correct response beside the item number in the answer booklet provided.

List A	List B
(i) Its nitrate decomposes to the metal, nitrogen dioxide and oxygen.	A Potassium
(ii) Its chloride is used as a drying agent for most gases.	B Copper
(iii) Its carbonate is used to remove hardness of water.	C Argon
(iv) Has maximum valency of five.	D Calcium
(v) Burn with a lilac colour flame.	E Sulphur
(vi) Used in the manufacture of ammonia.	F Chlorine
(vii) Exists in two main physical forms.	G Carbon
(viii) Greenish-yellow gas.	H Boron
(ix) The second abundant element in the earth's crust.	I Silicon
(x) Reacts with steam only at red heat to produce metal oxide and hydrogen gas.	J Zinc
	K Beryllium
	L Neon
	M Hydrogen
	N Helium
	O Sodium
	P Lead
	Q Iodine
	R Manganese
	S Phosphorus
	T Silver

SECTION B (54 Marks)

Answer **all** questions in section.

3. (a) (i) Why chemistry laboratory exits open outward?
(ii) State the uses of any four items found in a First Aid Kit.
- (b) (i) Arrange the following metals in order of increasing reactivity; zinc, magnesium, calcium, copper and mercury.
(ii) Which one of the metals in (b) (i) above reacts with steam to form an oxide which is white when cold and yellow when hot?
4. (a) 20 cm^3 of a solution containing 7 g dm^{-3} of sodium hydroxide were exactly neutralized by 25 cm^3 of 0.10 M hydrochloric acid. Calculate the concentration of sodium hydroxide in moles per dm^3 .
- (b) Give two examples in each of the following solution.
(i) Gaseous solution.
(ii) Solid solution.

5. (a) Study the following part of the periodic table and List down the names of all the missing elements.

Table 1

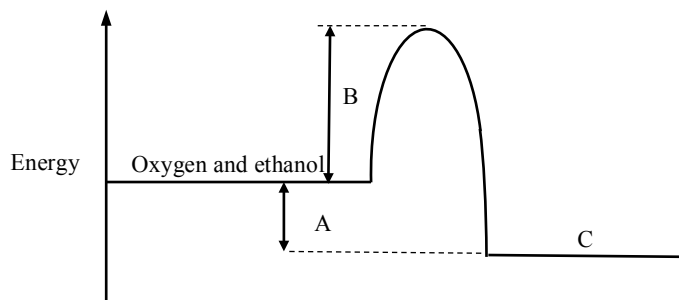
H							He
Li	Be	B				F	
		Al	Si	P	S	Cl	Ar

- (b) (i) Write the reaction equations involved in the industrial manufacturing of sulphuric acid starting with sulphur dioxide in the contact process.
(ii) Explain why sulphur trioxide is not dissolved directly in water to obtain sulphuric acid in contact process.
6. (a) With the aid of chemical equations, explain what will happen when aluminium chloride reacts with water.
- (b) A student accidentally broke a beaker containing copper (II) sulphate crystals. He decided to separate the blue crystals from the small pieces of glass by first dissolving the mixture and then filtering. What were his next steps?
7. (a) Table 2 gives some information about the composition of three samples of water from wells in Kahama, Maswa and Bukombe districts.

Table 2

Ions	Mineral content of water in mg per litre		
	Kahama	Maswa	Bukombe
Calcium, Ca^{2+}	28	82	18
Magnesium, Mg^{2+}	14	41	13
Chloride, Cl^-	53	7	22
Sodium, Na^+	7	143	39
Hydrogencarbonate, HCO_3^-	281	5	93
Sulphate, SO_4^{2-}	2	14	16

- (i) State two ways in which these ions get into the samples of water.
- (ii) Giving two reasons, state the hardest sample of water.
- (iii) State two ways that can be used to remove ions in (ii).
- (b) State and describe the type of reaction in the following chemical equations:
- (i) $\text{Fe}_{(s)} + \text{CuSO}_{4(aq)} \rightarrow \text{FeSO}_{4(aq)} + \text{Cu}_{(s)}$.
- (ii) $\text{Na}_2\text{SO}_{4(aq)} + \text{BaCl}_{2(aq)} \rightarrow \text{BaSO}_{4(s)} + 2\text{NaCl}_{(aq)}$.
8. The following are the general structural formulae of certain organic compounds: R-OH, R-COOH, and RCOOR'.
- (a) Name the:
- (i) Homologous series represented by R-OH, R-COOH and RCOOR'.
- (ii) Functional groups represented by R-OH and R-COOH.
- (b) When a burning splint is introduced into a gas jar containing carbon dioxide, the flame goes out.
- (i) What two properties of carbon dioxide does this experiment illustrate?
- (ii) What type of equipment used widely in everyday life makes use of these two properties?
9. (a) Differentiate between:
- (i) A base and an alkali.
- (ii) Atom and isotopes.
- (b) An organic compound P consist of 52.2% of carbon, 13% of hydrogen and 34.8% of oxygen. The vapour density of P is 23. Calculate the molecular formula of the compound P and write possible isomer(s) from the molecular formula determined.
10. (a) Aluminium reacts with oxygen to form aluminium oxide. How many grams of potassium chlorate would be heated to produce enough oxygen to form 5.1 g of aluminium oxide?
- (b) The preparation of chlorine gas can be represented by the following equation:
 $\text{MnO}_2 + 4\text{HCl} \rightarrow \text{MnCl}_2 + 2\text{H}_2\text{O} + \text{Cl}_2$. How many moles of HCl are needed to react with 25 g of MnO_2 ?
11. (a) (i) List four effects of excessive nitrogen to plants.
 (ii) State two ways through which soil nitrogen can be lost.
- (b) Oxygen and ethanol react to produce carbon dioxide and water according to the following energy level diagram:



- (i) What is represented by letter A, B and C?
- (ii) What type of reaction is represented by this energy level diagram?

SECTION C (26 Marks)

Answer **all** questions in this section.

- 12. Assume that you are a chemist in a chemical plant that deals with the production of chlorine gas. You want to produce 100 litres of chlorine gas per hour so that you can reach the company's goal of producing 2400 litres every day. What current of electricity will you allow to flow per hour?
- 13. Describe five causes and effects of soil pollution.