

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

032/1

CHEMISTRY 1
(For School Candidates Only)

TIME: 3 Hours

Thursday, 7th 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, O = 16, Na = 23, Mg = 24, C = 12
Cl = 35.5, K = 39, Pb = 207.

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 among the given alternatives and write its letter beside the item number in the answer booklet provided.
- (i) 1.4 g of potassium hydroxide is dissolved in water to form 250 cm³ of solution. What is the molarity of this solution?
- A 0.01 M
 - B 0.1 M
 - C 1.4 M
 - D 5.6 M
 - E 6.0 M
- (ii) In the blast furnace carbon monoxide is prepared by passing carbon dioxide over a red-hot coke. Carbon dioxide is
- A an accelerator
 - B an oxidizing agent
 - C a reducing agent
 - D a catalyst
 - E oxidized.
- (iii) A catalyst can be described as a substance
- A that alters the rate of reaction
 - B that slows down the rate of reaction
 - C used in every reaction so as to speed up rate of reaction
 - D that starts and speeds up the rate of reaction
 - E that terminates chemical reaction.
- (iv) A covalent bond is formed when
- A a metal combines with a non-metal
 - B potassium and oxygen combine
 - C ammonia is formed
 - D two metals combine
 - E atom loses an electron.
- (v) A solvent can be obtained from a solution by
- A evaporation followed by decantation
 - B filtration and condensation
 - C evaporation and filtration
 - D evaporation and condensation
 - E crystallization followed by sublimation.

- (vi) Aqueous sugar solution is a poor conductor of electricity because
A water and sugar are covalent compounds
B water is a non-electrolyte
C sugar is a non-electrolyte
D sugar is covalent when in liquid form
E sugar dissolves completely in water.
- (vii) The process of giving away water of crystallization to the atmosphere by a chemical substance is called
A efflorescence
B deliquescence
C hygroscopic
D sublimation
E vapourisation.
- (viii) Copper can be separated from a mixture of zinc and copper by adding to the mixture
A concentrated H_2SO_4
B dilute H_2SO_4
C aqueous solution of ZnSO_4
D concentrated HNO_3
E a catalyst.
- (ix) Among the factors that determine the ions to be discharged at electrodes when salt solutions are electrolysed are their
A non metallic nature
B relative concentrations in the solution
C relative ionic masses
D electronic configuration
E position in the periodic table.
- (x) The mass of sodium hydroxide contained in 25 cm^3 of 0.1 M NaOH is
A 0.5 gm
B 2.85 gm
C 250 gm
D 0.2 gm
E 25 gm

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) Oxygen | A Green-yellow gas which rapidly bleaches damp litmus paper |
| (ii) Sulphur dioxide | B Heats with cracking sound |
| (iii) Ammonia | C It rekindles a glowing splint of wood |
| (iv) Hydrogen Chloride | D Colourless gas, extremely poisonous since it combines with hemoglobin in red blood cells. |
| (v) Carbon monoxide | E Brown-ring test |
| (vi) Nitrogen | F Produces a white precipitates of silver chloride in a drop of a solution of silver nitrate |
| (vii) Hydrogen | G It is the only alkaline gas |
| (viii) Chlorine | H Substitution reaction |
| (ix) Nitrogen dioxide | I Explodes with air when flame applied |
| (x) Carbon dioxide | J Sweet - aroma smell |
| | K It is a brown gas |
| | L It is very irritating smell and decolorizes potassium manganate (VII) solution with no precipitation left |
| | M It turns lime water milky |
| | N Colourless, odourless, non-poisonous gas commonly used as a refrigerant |
| | O Characteristic yellow flame |
| | P Good solvent for fats and grease, non-poisonous |
| | Q Blackens lead (II) ethanoate paper |
| | R Turns brown on exposure to air |
| | S Freezes at 0°C and boils at 100°C |
| | T Rotten-egg smell |

SECTION B (60 marks)

Answer **all** questions in this section.

3. (a) Asubuhi Njema's child was sick. When she took her to the hospital, she was prescribed some medicine including a bottle of syrup. The bottle was written, Shake before you use. What does this statement signify? **(3 marks)**
- (b) (i) What is the first step to take when you want to identify the contents of a given salt containing one anion and one cation?
(ii) In a solution of water, identify a solute and a solvent. Justify your answer. **(4 marks)**
- (c) Sodium is a solid while chlorine is a gas at room temperature although they are in the same period in the periodic table. What is the cause of this difference? **(3 marks)**
4. (a) Draw a well labeled diagram of a non-luminous Bunsen burner flame **(3 marks)**
- (b) Explain the meaning of the following:
(i) Malleable
(ii) Ductile
(iii) Brittle **(3 marks)**
- (c) Give an account of the following:
(i) Anhydrous copper (II) sulphate becomes coloured when exposed to the air for a long time.
(ii) Carbon dioxide can be collected by the downward delivery method.
(iii) Concentrated sulphuric acid is not used for drying hydrogen sulphide gas.
(iv) Sodium metal is kept in paraffin oil. **(4 marks)**
5. (a) Classify the following reactions into oxidation and reduction reactions.
(i) $S_{(s)} + O_{2(g)} \rightarrow SO_{2(g)}$
(ii) $N_{2(g)} + 3H_{2(g)} \rightarrow 2NH_{3(g)}$
(iii) $Fe^{2+}_{(aq)} - e^- \rightarrow Fe^{3+}_{(aq)}$
(iv) $Fe^{3+}_{(aq)} - e^- \rightarrow Fe^{2+}_{(aq)}$ **(4 marks)**
- (b) What is the oxidation number of iron in iron (III) chloride? **(3 marks)**
- (c) In the following reaction, name a reducing agent substance and an oxidizing agent:
 $CuO_{(s)} + H_{2(g)} \rightarrow Cu_{(s)} + H_2O_{(g)}$ **(3 marks)**
6. (a) Which homologous series of organic compounds can be represented by the following general formula?
(i) C_nH_{2n+2}
(ii) C_nH_{2n}
(iii) $C_nH_{2n+1}OH$ **(3 marks)**

- (b) Give the name of the first compound in each series. **(3 marks)**
- (c) (i) Describe a reaction by which a named compound of series in (a) (ii) can be converted to a compound of series in (a) (ii).
 (ii) How can a compound of series (a) (iii) be converted to a compound of series in (a) (ii)? **(4 marks)**
7. (a) Differentiate empirical formula from molecular formula. **(2 marks)**
- (b) Calculate the percentage composition by mass of water in a hydrated magnesium chloride $\text{MgCl}_2 \cdot 6\text{H}_2\text{O}$. **(3 marks)**
- (c) Calculate the empirical formula for a compound with the following composition: lead 8.32 g, sulphur 1.28 g, oxygen 2.56 g (relative atomic wt of lead = 207, sulphur = 32, oxygen = 16) **(5 marks)**
8. (a) Ammonia gas can be prepared by heating an ammonium salt with an alkali.
 (i) Name the most common pair of reagents suitable for this reaction.
 (ii) Write the equation for the reaction. **(4 marks)**
- (b) Ammonia is very soluble in water and less dense than air. How does each of the properties determine the way in which ammonia is collected in a gas jar? **(4 marks)**
- (c) Give reasons for the following:
 (i) Solution of chlorine in water is acidic.
 (ii) Yellow phosphorus is stored under water. **(2 marks)**

SECTION C (20 marks)

Answer **all** questions from this section.

9. (a) (i) What are the natural causes of soil acidity?
 (ii) What cations prevail in acidic soils? **(2 marks)**
- (b) (i) On treatment with calcium hydroxide the soil pH was raised from 5 to 7. What can you say about the properties of calcium hydroxide?
 (ii) What effects can the alkalinity of a soil have on the availability of nutrients?
 (iii) Is it sensible to add lime to a field which has received an application of ammonium sulphate fertilizer? Explain. **(5 marks)**
- (c) With reference to pH, solubility and any other factors, list the main properties of the following fertilizers used in our country:
 (i) Ammonium sulphate
 (ii) Super phosphate
 (iii) Urea **(3 marks)**

10. (a) (i) State Avogadro's law of gaseous volume.
 (ii) Find the volume of oxygen gas required to burn completely 1 dm³ of methane.
 $\text{CH}_4 + 2\text{O}_{2(\text{g})} \rightarrow \text{CO}_2 + 2\text{H}_2\text{O}$.
 (iii) What is the volume of carbon dioxide formed in the reaction at (ii)? **(4 marks)**
- (b) Define the following terms:
 (i) Mole
 (ii) Molecular weight **(2 marks)**
- (c) Calculate the total number of
 (i) molecules in 0.18g of water
 (ii) electrons present in 0.0001 moles of pure magnesium metal **(4 marks)**
11. (a) Elements A, B, C and D have atomic numbers 6, 8, 17 and 20 respectively. Write electronic structures of these elements. **(4 marks)**
- (b) Write down the formulae of the simplest compounds you would expect when
 (i) A and B combine chemically
 (ii) C and D combine chemically. **(2 marks)**
- (c) (i) What types of bonding you would expect to occur in each of the compounds formed in (b)?
 (ii) List three (3) differences in properties you would expect to find between the compounds in (i) as a result of their difference in types of bonding. **(4 marks)**
12. Read the following information carefully then answer questions that follow: 25 cm³ of potassium hydroxide were placed in a flask and a few drops of phenolphthalein indicator were added. Dilute hydrochloric acid was added until the indicator changed colour. It was found that 21 cm³ of acid were used.
- (a) (i) What piece of apparatus should be used to measure out accurately 25 cm³ of sodium hydroxide solution?
 (ii) What colour was the solution in the flask at the start of the titration?
 (iii) What colour did it turn when the alkali had been neutralized? **(3 marks)**
- (b) (i) Was the acid more concentrated or less concentrated than the alkali? Give reasons for your answer.
 (ii) Name the salt formed in the neutralization.
 (iii) Write an equation for the reaction. **(4 marks)**
- (c) Utilizing the given information describe how you can obtain pure crystals of the salt. **(3 marks)**