CHRISTIAN SOCIAL SERVICES COMMISSION

An Ecumenical Body of Tanzania Episcopal Conference and Christian Council of Tanzania

P.O. Box 9433, Dar es Salaam, Tanzania

CSSC-SOUTHERN ZONE, FORM FOUR JOINT EXAMINATION 2024

032/01 **CHEMISTRY 1**

Time 3:00 hours **AUGUST 2024.**

INSTRUCTIONS:

1. This paper consists of three sections A, B and C
2. Answer all questions from both sections A and B and **only two** questions from section C.
3. Arrange your work well and incase of any calculation show your work clearly.
4. Cellular phones and any other unauthorized materials are **not** allowed in the examination room.
5. Write your **Examination Number** on every page of your answer booklet(s).
6. You may use the following constants where necessary

CSSC

Mg= 24, Si=28, H=1, O=16, C= 12, Na=23, C= 12, Ca=40, Al=27, Ag=108, Cu=64, Zn=65, N=14, K= 39 Cr=52.

GMV= 22.4 dm^3 at STP.

1F=96500 Coulombs

SECTION A: (16 MARKS)
Answer all questions from this section

1. . For each of the items (i)-(x), choose the answer from the given alternatives and write its letter besides the item number in the answer booklet provided.

i. In the preparation of one experiment, a chemistry teacher at Luqman Islamic added some water to the concentrated acid. In this procedure 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 down
   D. Less acidic and its pH goes up
   E. Neutral and its pH become 7

ii. Organic compound Y has one carbon atom, and can decolorize bromine water only in presence of light. Compound Y belong to which homologous series with general formula?.
   A. C_nH_{2n+2}
   B. $C_nH_{(2n+1)}OH$
   C. C_nH_{2n}
   D. C_nH_{2n-2}
   E. C_nH_{2n+1}

iii. Anita dissolved 5g of calcium chloride in water and then she was having a trouble to find the number of chloride ions which had disociated from that, as an expert in chemistry what will be the right answer?
   A. 0.049
   B. 0.09
   C. 0.09×10^{22}
   D. 5.418×10^{22}
   E. 0.045

iv. Imagine your brother was preparing dinner in the kitchen, he started chopping potatoes into small pieces to make chips, what was the purpose of his action?
   A. Shorten the cooking time
   B. Make them delicious
   C. Make them dry
   D. To increase the amount of potato chips
   E. Increase concentration of potatoes.

v. When performing an experiment which involves heating ethanol, normally it is advised to immerse the containing vessel in hot sand or boiling water. Why do you think so?
   A. The colour of ethanol
   B. Flammability of ethanol
   C. Viscosity of ethanol
   D. Density of ethanol
   E. Fluidicity of ethanol

vi. Your chemistry teacher was demonstrating an experiment by dissolving sugar in water until the solute was not dissolving any more. What type of solution formed at the end of experiment?
   A. Emulsion
   B. Saturated solution
   C. Unsaturated solution
   D. Super saturated solution
   E. Suspension

vii. Form four were preparing the gas in the laboratory by using different Apparatus and reagents. After collecting that gas and tested, it ignited with "pop" sound explosion. What was the gas prepared by form four?

A. Carbon dioxide gas
B. Hydrogen gas
C. Oxygen gas
D. Carbon monoxide gas
E. Methane

viii. A District commissioner (DC) of Njombe visited Mwanza market, he advised people to use renewable source of energy like wind and prohibited to use non-renewable source of energy like charcoal. As a chemistry student state why DC recommended to use such kind of energy source?

A. It does not produce harmful gases that pollute environment
B. There are no chemical reactions involved in harnessing wind power
C. It cannot be seen
D. It has high content of non-combustible materials
E. The scarcity of the energy source

ix. Form three students were given a task to prepare barium sulphate.They then mixed barium chloride and sodium carbonate solutions in a container, the results were shown below.How could they obtain the solid sample from the mixture?

$$BaCl_{2(aq)} + Na_2CO_{3(aq)} \xrightarrow{yields} BaSO_{4(s)} + 2NaCl_{(aq)}$$

A. Evaporation
B. Filtration
C. Chromatography
D. Sublimation
E. Distillation

x. A piece of land requires 120kg of N, 60 kg of P_2O_5 , and 80 kg of K_2O to be applied per hectare. The following fertilizers are available for application: sulphate of ammonia, SA (21% N), single superphosphate, SSP (18% P_2O_5) and nitrate of potash, NoP (60% K_2O). As an agricultural expert what will be the amount of each fertilizer needed to be applied per hectare on the piece of that land from the following?

A. 571.43 kg SA/ ha ,333.33 kg SSP/ha and 133.33 kg of nitrate of potash / ha.
B. 501.43 kg SA/ ha ,333.33 kg SSP/ha and 133.33 kg of nitrate of potash / ha.
C. 571.43 kg SA/ ha ,333.33 kg SSP/ha and 133.33 kg of nitrate of potash / ha.
D. 571.43 kg SA/ ha ,303.33 kg SSP/ha and 133.33 kg of nitrate of potash / ha.
E. 572 kg SA/ ha ,333.33 kg SSP/ha and 134.33 kg of nitrate of potash / ha

2. Match the properties of gases in **list A** with the corresponding gases in **list B** by writing the letter of the correct response beside the item number in the answer sheet provided.

List A	List B
i. It is a greenish-yellow gas with a pungent irritating smell	A. Sulphur dioxide
ii. A gas that is very important in production of sulphuric acid	B. Hydrogen chloride gas
iii. It forms white dense fumes with ammonia gas	C. Carbon dioxide
iv. A gas that can reduce orange dichromate (vi) to chromate (iii) which is green	D. Ammonia gas
v. It is important in manufacturing nitric acid	E. Hydrogen gas
vi. Used in manufacturing fizzy drinks	F. Chlorine gas
	G. Carbon monoxide
	H. Nitrogen dioxide
	I. Sulphur trioxide

SECTION B (54 MARKS)

Answer all questions from this section

3.

A. Chemistry laboratory is equipped with apparatus used for various purposes. State four classes of laboratory apparatus based on their materials, and provide one example for each class.

B. Suppose form one students asked you about the factors affecting scientific processes because they knew that you are an expert on that area. How will you respond to them by listing down 3 factors affecting experiment during scientific processes

C. Why your laboratory technician always insists you to use a non-luminous flame during experimentation sessions and not otherwise?Give two reasons

4.

A. In an experiment to determine the heat value of ethanol, some ethanol was put in a lamp and used to heat 800cm^3 of water in a tin calorimeter. The following results were obtained: -Initial temperature of water = 25°C, Final temperature of water =75°C. Initial mass of the lamp + its contents = 186.7g, Final mass of the lamp + its contents = 36.7g. Given that, the S.H.C of water = 4.2J/gK, density of water = 1g/cm^3 and density of a fuel used = 0.8g/cm^3

i) What volume of the liquid fuel was used in the combustion reaction?

ii) Calculate the heat value of the fuel

B. It is now recognized worldwide that the supply of fossil fuels and wood fuel is limited and insufficient to sustain rapid rates of development. Suggest and explain briefly any three (3) alternative energy resources for the future.

5. A chloride of salt.(P) was heated with slaked lime. A colourless gas (Q) with a characteristic smell was evolved. A large quantity of this gas was passed through an inverted filter funnel into water and a colourless solution (R) was obtained which turned litmus paper red to blue. (R) was heated with equivalent volume of dilute sulphuric acid and the resulting solution was evaporated. A white solid (S) was obtained.

A.

i. Give the name and formula of gas (Q)

ii. Identify salt (P)
iii. Write a balanced equation for the reaction in which (Q) was formed.
iv. Briefly explain a chemical test of gas (Q)

B.

i. Explain the purpose of inverted filter funnel.
ii. Write the equation in which (S) was formed.
iii. Copper(II)oxide was heated in a pure sample of gas (Q). Describe and explain your observation , giving fully balanced equation for the reaction.

6.

A. State Le Chatelier's principle.
B. Ammonia is manufactured by reacting hydrogen and nitrogen gas through Haber process.
i. Write a balanced chemical equation for this equilibrium reaction.
ii. Suppose you are employed as a chemist in the industry for manufacturing ammonia gas, explain how you would adjust temperature and pressure to obtain maximum yield of ammonia gas.
iii. Give two uses of ammonia gas.
iv. Explain how temperature and concentration affects the rate of chemical reaction.

7.

A. 11.5g of a non-electrolyte Q with a formula on oxidation formed 22g of carbon dioxide and 13.5g of water. The substance contains Carbon, Hydrogen and Oxygen. When 2.3g of the substance was vaporized, it formed 1.12dm^3 of vapour at s.t.p. Find the empirical and molecular formula of compound Q
B. How many atoms are in compound Q?

8.

A. Compound A ($C_4H_{10}O$) is oxidized with acidified potassium permanganate to give compound B. when it is hydrated with conc H_2SO_4 at 70^0C, compound A gives compound C which undergoes Hydrogenation to give compound D, which is capable of undergoing substitution reaction
i. Identify the compounds A, B, C and D and write their structure
ii. Write equations for the reactions taking place
B. Using balanced chemical equation, show steps on how methane undergoes complete chlorination in the presence of sunlight.

SECTION C (30 Marks)

Answer only two (02) questions from this section

9.

A. Suppose the soil pH of soil sample is very high, explain how you can manage such soil to a suitable pH for normal plant growth and productivity.
B. Why does the increase of the concentration of carbon dioxide gas in the atmosphere results into increase of the earth's surface temperature?
i. What is the function of ozone layer at the top of Earth's atmosphere?
ii. List down any two gases produced by industries that destroy the ozone layer.

10.

A.

i. If you want to electroplate a spoon with chromium using $Cr(NO_3)_3$ solution, would you make it the anode or cathode? Explain your answer accompanied by its half reaction equation.

ii. How many electrons are needed to electroplate out 0.49g of chromium?

B. A current of 1.5A was passed through $250cm^3$ of an aqueous of $AgNO_3$ solution of concentration 0.5M for 1 hour and 10 minutes. The anode was platinum and the cathode was silver.

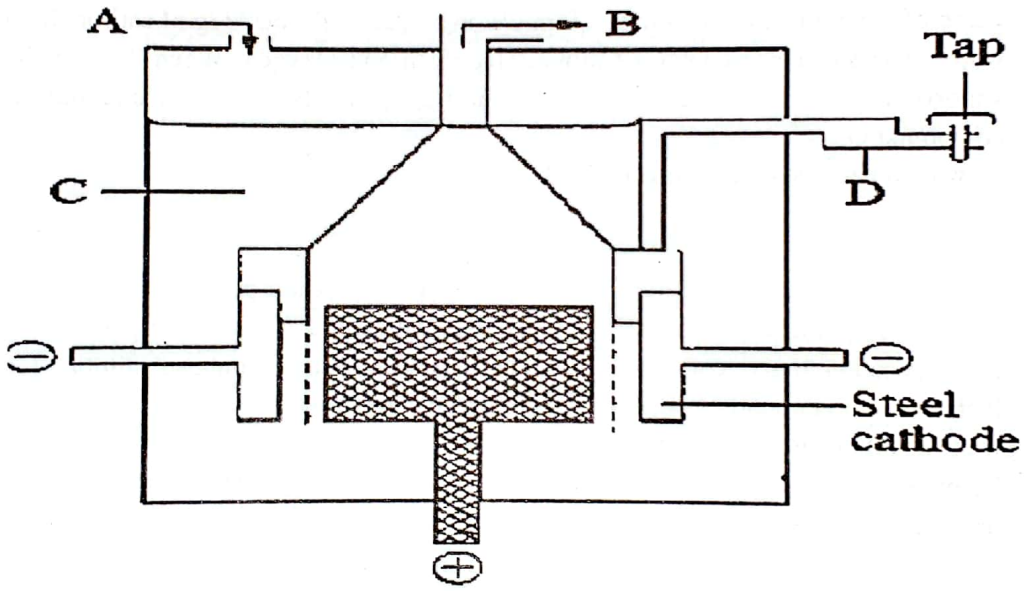
i. Give the equations for the reaction taking place at cathode and anode.

ii. Calculate the concentatrion of silver nitrate solution which was left out?

iii. What changes would occur if the platinum anode was replaced with silver anode? Support your observation with an equation.

C. During the electrolysis of aqueous hydrochloric acid between silver electrodes, the anode mass increases and a white coating forms on it. Suggest an explanation on it.

11. The following figure is a set-up used in the extraction of sodium by the Down's cell



A. What is the major ore from which sodium is extracted in this cell?

B. What form of the ore is placed in the cell for the extraction?

C. Why is sodium not extracted by reduction using carbon?

D. What role does calcium chloride play in the extraction of sodium from sodium chloride?

E. Explain the roles of the parts marked A, B, C, and D

F. Mention six uses of sodium