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

032/1

CHEMISTRY 1
(For Both School and Private Candidates)

Time: 3 Hours **Year : 2021**

Instructions

1. This paper consists of sections A, B and C with a total of **fourteen (14)** questions.
2. Answer **all** questions in sections A and B and **one (1)** question from section C.
3. Sections A and C carry **fifteen (15)** marks each and section B carries **seventy (70)** marks.
4. Cellular phones and any unauthorised materials are **not** allowed in the examination room.
5. Write your **Examination Number** on every page of your answer booklet(s).
6. The following constants may be used.
   Atomic masses: H = 1, O = 16, C = 12, N = 14, Na = 23, Ca = 40, Cl = 35.5, 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 dm^3 = 1000 cm^3.

SECTION A (15 Marks)

Answer **all** questions in this section.

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

(i) Which among the following sets of materials can cause fire outbreak?

A Oxygen, carbon dioxide and fuel
B Oxygen, heat and fuel
C Oxygen, heat and carbon dioxide
D Oxygen, foam and fuel
E Oxygen, heat and foam

(ii) What type of fire occurs in vapour air mixture over the surface of flammable liquids?

A Class A B Class B C Class C
D Class D E Class E

(iii) Which one of the following processes is a chemical change?

A Butter melts on warm toast
B Water evaporates from the surface
C Juice in a bottle freezes
D Food scrap turns into compost
E Wet cloth dries

(iv) The simplest formula of a compound formed when combining 36 g of magnesium and 14 g of nitrogen is:

A MgN B Mg_2N C Mg_3N_2
D MgN_2 E Mg_4N_2

(v) What is the IUPAC name for H_2SO_4?

A Sulphuric acid
B Sulphuric (VI) acid
C Hydrogen sulphate
D Dihydrogen sulphate
E Hydrogen tetrasulphate

(vi) What type of chemical reaction is represented by the equation $Zn(s) + 2HCl(aq) \longrightarrow ZnCl_2(aq) + H_2(g)$?

A Displacement reaction
B Combination reaction
C Precipitation reaction
D Decomposition reaction
E Redox reaction

(vii) What does the random movement of pollen grains suspended in air demonstrates?
A Matter is lighter in nature.
B Matter is solid in nature.
C Matter is particulate in nature.
D Matter is gaseous in nature.
E Matter is wave in nature.

(viii) "Organic matter is among the components of soil." Which role does it play?
A Improving water infiltration of the soil.
B Accelerating break down of organic matter.
C Reserving nutrients thus providing soil fertility.
D Converting of nitrogen into nitrates.
E Providing a room for organic material such as nylons.

(ix) Which of the following sets represents isotopes of an element?
A ${}^{16}_{7}Z, {}^{7}_{8}Z$ and ${}^{18}_{9}Z$
B ${}^{16}_{7}Z, {}^{16}_{9}Z$ and ${}^{16}_{8}Z$
C ${}^{16}_{8}Z, {}^{17}_{8}Z$ and ${}^{18}_{8}Z$
D ${}^{16}_{8}Z, {}^{17}_{8}Z$ and ${}^{18}_{9}Z$
E ${}^{16}_{9}Z, {}^{16}_{8}Z$ and ${}^{17}_{8}Z$

(x) What is to be considered when choosing the best method to extract a particular metal from its ore?
A The metal's economic value.
B Its availability in an area.
C The metal's ore impurities.
D How it reacts with other materials.
E The metal's shininess.

2. Match the uses of First Aid Kit items in **List A** with the respective items in **List B** by writing the letter of the correct response besides the item number in the answer booklet provided.

List A		List B	
(i)	Washing out foreign particle from eye and cleaning wounds.	A	Antiseptic
(ii)	Cleaning wounds to kill germs and bacteria.	B	Detergent
(iii)	Preventing the skin from moisture loss through evaporation.	C	Gentian violet
(iv)	Treating fungal infection.	D	Iodine tincture
(v)	Washing hands, wounds and equipment.	E	Petroleum jelly
		F	Saline
		G	Sterile gauze

SECTION B (70 Marks)

Answer **all** questions in this section.

3. (a) Different salts behave differently when heated. Use balanced chemical equations to show how carbonates and sulphates behave when subjected to heat.

   (b) Ammonium nitrate does not react like other nitrates (with exception of the alkali metal nitrates). Explain this fact with the aid of chemical equations. **(7 marks)**

4. (a) A Form IV student was asked to react phosphate ion and sodium ion forming compound W. Suggest the IUPAC name of W and find the oxidation state of phosphorous in W.

   (b) Calculate the percentage composition of lead in the compound $Pb(NO_3)_2$. **(7 marks)**

5. (a) How can the society minimize the energy loss encountered in the use of charcoal and fire wood? Give two points.

   (b) State whether the following processes are exothermic or endothermic.
   (i) Dissolving ammonium chloride in water.
   (ii) Photosynthesis.
   (iii) Combustion reactions.
   (iv) Mixing water and potassium chloride.
   (v) Mixing water and strong acids such as concentrated sulphuric acid.

   (7 marks)

6. (a) Briefly explain the concept of scientific procedure.

   (b) What is the importance of the scientific procedure in daily life? Give two points.

   (7 marks)

7. Use the following components to construct a diagram of water cycle: clouds, animal, water in the soil, rain, plants, water spring, rivers, lakes and water vapour in the atmosphere.

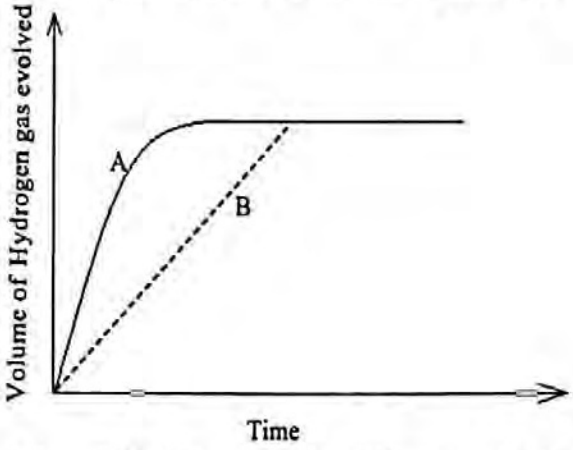
   (7 marks)

8. Suppose that two gas jars; one containing gas "A" and another one containing gas "B" are made available to you. Gas "A" is used in hardening of margarine whereas gas "B" is used by mountain climbers.

   (a) What tests will you conduct to identify each of the two gases?

   (b) Give two physical properties and three chemical properties that can be used to distinguish gas "A" from gas "B". **(7 marks)**

9. Two experiments A and B were conducted to prepare hydrogen gas by varying the size of zinc granules which were reacted with dilute hydrochloric acid. All other factors were kept constant in the two experiments. Data obtained were used to plot the following graph:



(a) Briefly explain the differences in the results of experiments A and B.

(b) What factors can be adjusted to increase the yield of the product? **(7 marks)**

10. If 2.0 g of $CaCO_3$ were reacted with excess dilute HCl acid;

(a) what volume of CO_2 would be given out at s.t.p?

(b) calculate the mass of CO_2 produced. **(7 marks)**

11. (a) In three points, differentiate homogenous mixtures from heterogeneous mixtures.

(b) By giving four points, justify the fact that common salt is a compound. **(7 marks)**

12. (a) Give three ways in which environmental destruction is likely to occur during extraction of metals.

(b) The following equations represent the steps involved in the conversion stages of iron extraction in Bussener converter. Arrange the equations in chronological order from the first step to the last by writing the respective letter so as to get a complete explanation of the conversion stage.

V: $2Cu_2O(s) + Cu_2S(s) \longrightarrow 6Cu\ (l) + SO_2(g)$

W: $FeO(l) + SiO_2(g) \longrightarrow FeSiO_3(l)$

X: $2Cu_2S(s) + 3O_2(g) \longrightarrow 2Cu_2O(s) + 2SO_2(g)$

Y: $2FeS(l) + 3O_2(g) \longrightarrow 2FeO(l) + 2SO_2(g)$ **(7 marks)**

SECTION C (15 Marks)

Answer **one** (1) question from this section.

13. By giving six points, explain how to maintain soil fertility of a particular area. **(15 marks)**

14. How electrolysis is applied in industries? Describe by giving six points. **(15 marks)**

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032/2A

CHEMISTRY 2A
ACTUAL PRACTICAL A
(For Both School and Private Candidates)

Time: 2:30 Hours **Year: 2021**

Instructions

1. This paper consists of **two (2)** questions. Answer **all** the questions.
2. Each question carries **twenty five (25)** marks.
3. Cellular phones and any unauthorised materials are **not** allowed in the examination room.
4. Write your **Examination Number** on every page of your answer booklet(s).
5. You may use the following constants:
   Atomic masses: H=1, C=12, O = 16, Na = 23, S = 32, Cl =35.5.
   1 litre = 1 dm^3 = 1000 cm^3.

1. You are provided with the following:

LL: 6.3 g of dibasic acid, $H_2C_2O_4.XH_2O$ dissolved to make 1 litre of a solution;

MM: 4.0 g of NaOH dissolved to make 1 litre of a solution.

Determine the value of X in the acid $H_2C_2O_4.XH_2O$. Proceed as follows:

(i) Fill the burette with solution **LL**.

(ii) Pipette 20/25 cm^3 of solution **MM** and put it in a conical flask.

(iii) Titrate **LL** against **MM** using two drops of POP indicator.

(iv) Repeat the titration to obtain three more titre values and record your results in a tabular form.

Questions

(a) (i) Indicate the volume of the pipette used.

(ii) Complete the table of results and compute the average volume of acid used for complete neutralization of **MM**.

(b) Calculate the molarity of the base.

(c) Write a balanced chemical equation for the reaction taking place.

(d) Calculate the molarity of the acid.

(e) Calculate;

(i) the value of X in $H_2C_2O_4.XH_2O$.

(ii) the percentage of water of crystallization in $H_2C_2O_4.XH_2O$.

2. You are provided with the following:

L1: 0.05 M sodium thiosulphate,

L2: 1.0 M nitric acid,

Stop watch,

A thermometer,

White sheet of paper marked with letter **X** on one side.

Procedure

(i) Place a 100 cm^3 beaker on top of letter **X** in such a way that the letter **X** is visible when viewed from above.

(ii) Measure 20 cm^3 of solution **L2** and put it into a 100 cm^3 beaker placed on top of a sheet of paper marked letter **X**.

(iii) Measure 40 cm^3 of solution **L1,** put it into boiling test tube and heat it on a water bath until it reaches a temperature of 40 °C.

(iv) Pour the heated content of solution **L1** into a 100 cm^3 beaker placed on top of the sheet of paper marked letter **X**, and immediately start the stop watch.

(v) Swirl the content and look through it from above. Record the time taken for the letter **X** to disappear.

(vi) Repeat the procedures (i) – (v) using similar solutions at 50 °C, 60 °C, 70 °C and 80 °C as indicated in the following table of experimental data.

Table: Experimental data

Volume of L1 (cm^3)	Volume of L2 (cm^3)	Temperature of L1 (°C)	Time (s)	Rate (1/t) (s^{-1})
40	20	40		
40	20	50		
40	20	60		
40	20	70		
40	20	80		

Questions

(a) What is the aim of the experiment?

(b) Complete filling in the data in the table.

(c) Plot a graph of temperature (°C), Y - axis against Rate (s^{-1}), X - axis.

(d) What does the shape of the graph indicate?

(e) Write the ionic equation for the reaction between **L1** and **L2**.

(f) Why did the letter **X** disappear?