

**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

Thursday, 08th November 2018 a.m.

Instructions

1. This paper consists of sections A, B and C with a total of **thirteen (13)** questions.
2. Answer **all** questions in this paper.
3. Calculators, 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. The following constants may be used:
Atomic masses:
H = 1, C = 12, O = 16, N = 14, Cu = 64, Pb = 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 among the given alternatives and write its letter beside the item number in the answer booklet provided.
- (i) Which of the following is an agricultural chemical product made by the application of chemistry?
A Drugs
B Pesticides
C Clothes
D Yeasts
E Cement.
- (ii) A current of 0.2 A was passed through an electrolyte for 16 minutes and 40 seconds. What is the quantity of electricity produced in coulombs?
A 2000 C
B 1000 C
C 200 C
D 0.20 C
E 7686 C.
- (iii) Substance X liberates chlorine gas from acidified potassium chloride. The behaviour of X is described as
A an oxidising agent
B an oxidising and reducing agent
C catalyst
D a reducing agent
E bleaching agent.
- (iv) Which carbonate is the most stable to heat?
A Calcium carbonate
B Copper (II) carbonate
C Lead (II) carbonate
D Zinc carbonate
E Iron (II) carbonate.
- (v) Aluminium does not react with water and does not corrode much in air because
A it is below hydrogen in the reactivity series
B it forms a stable carbonate which prevents reactions
C the metal is covered with a protective coating of an oxide
D aluminium ions have positive charges
E it is very stable.
- (vi) Which of the following compounds does NOT belong to the alkenes homologous series?
A C₂H₄
B C₃H₆
C C₄H₈
D C₅H₁₀
E C₆H₁₄.
- (vii) In the following equilibrium equation, $2\text{SO}_{2(\text{g})} + \text{O}_{2(\text{g})} \rightleftharpoons 2\text{SO}_{3(\text{g})}$ the forward reaction is exothermic. Which change would increase the production of sulphur trioxide at equilibrium?
A Increasing temperature.
B Decreasing temperature.
C Decreasing sulphur trioxide concentration
D Decreasing pressure
E Adding a catalyst.

- (viii) When a burning fuel produces blue colour it means there is
 A adequate supply of oxygen with production of soot.
 B inadequate supply of oxygen without production of soot.
 C inadequate supply of oxygen with production of soot.
 D adequate supply of oxygen with production of less heat.
 E adequate supply of oxygen with production of more heat.
- (ix) Which equation represents the combustion of methane with the products collected at 120°C?
 A $\text{CH}_{4(l)} + 2\text{O}_{2(g)} \rightarrow \text{CO}_{2(g)} + 2\text{H}_2\text{O}_{(l)}$
 B $\text{CH}_{4(g)} + 2\text{O}_{2(l)} \rightarrow \text{CO}_{2(g)} + 2\text{H}_2\text{O}_{(l)}$
 C $\text{CH}_{4(g)} + 2\text{O}_{2(g)} \rightarrow \text{CO}_{2(g)} + 2\text{H}_2\text{O}_{(g)}$
 D $\text{CH}_{4(l)} + 2\text{O}_{2(l)} \rightarrow \text{CO}_{2(l)} + 2\text{H}_2\text{O}_{(g)}$
 E $\text{CH}_{4(l)} + 2\text{O}_{2(g)} \rightarrow \text{CO}_{2(g)} + 2\text{H}_2\text{O}_{(g)}$
- (x) Which substance can be reduced when heated with carbon?
 A Aluminium
 B Calcium carbonate
 C Iron (III) oxide
 D Magnesium oxide
 E Sodium oxide.

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 booklet provided.

LIST A	LIST B
(i) An element which is extracted by Frasch process.	A Carbon dioxide
(ii) A gas with pungent choking smell and forms misty.	B Carboxylic acids
(iii) A substance used for sterilization of drinking water.	C Iron (III) oxide
(iv) An alkaline gas.	D Nitrogen
(v) A compound used in domestic water-softening.	E Diamond
(vi) A compound prepared by fermentation of carbohydrates.	F Sodium carbonate
(vii) The compounds with a general formula of $\text{C}_n\text{H}_{2n+1}\text{COOH}$.	G Hydrogen chloride
(viii) The hardest allotrope of carbon.	H Sulphur
(ix) A gas which turns lime-water milky.	I Graphite
(x) A substance which is amorphous form of carbon.	J Ethanol
	K Chlorine
	L Calcium
	M Ammonia gas
	N Plastic sulphur
	O Coke

SECTION B (54 Marks)

Answer **all** questions in this section.

3. (a) Define the following terms:
- Neutralization.
 - Unsaturated solution.
 - Thermal decomposition.
- (b) (i) List two advantages of liming.
(ii) State two roles of climate in soil formation.
4. (a) Copper obtained from copper pyrites (CuFeS_2) is impure for electrical wiring and has to be purified by electrolysis.
- Name the electrolyte and the electrodes used during electrolysis.
 - Write the observations that can be made during the electrolysis.
- (b) The following flow diagram shows the stages in the contact process.
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graph LR; A[Element A] -- "Stage 1
Burned in air" --> B[Sulphur dioxide]; B -- "Stage 2
Heated over Catalyst B at 450C" --> C[Sulphur trioxide]; C -- "Dissolved in concentrated sulphuric acid and then diluted" --> D[Acid C]
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- Give the names of element A, catalyst B and an acid C.
  - Write a balanced chemical equation for the formation of sulphur trioxide in stage 2.
5. (a) Suggest one method of separating each of the following:
- Green solution from leaves.
  - Alcohol from water.
- (b) Elements K, L, M and N have atomic numbers 6, 8, 9 and 20 respectively. Classify each element into its respective period and group.
6. (a) Give one example in each of the following:
- Alkali earth metals.
  - Noble gases.
  - Transition elements.
- (b) Write the names of the following processes of changing matter from one state to another.
- Gas to liquid.
  - Gas to solid.
  - Solid to gas.
7. (a) Define the following:
- Mole.
  - Molar mass.

- (b) 112 dm<sup>3</sup> of oxygen gas was collected at s.t.p. When a sample of lead nitrate was completely decomposed by heat. Calculate the volume of nitrogen dioxide gas produced.
8. (a) Distinguish manures from fertilizers. Give an example in each case.
- (b) The following equation shows the reaction between hydrogen and iodine gas to form hydrogen iodide gas,  $\text{H}_{2(\text{g})} + \text{I}_{2(\text{g})} \rightleftharpoons 2\text{HI}_{(\text{g})}$ ;  $\Delta\text{H} = -800\text{kJ/mol}$ . Giving a reason, explain what would happen to the position of equilibrium if
- temperature is lowered.
  - hydrogen iodide gas is pumped into the system.
9. (a) (i) Name the products formed when hydrogen sulphide reacts with chlorine gas.  
(ii) Mention two uses of hydrochloric acid.
- (b) (i) Name the compound which causes temporary hardness of water and the compound which causes permanent hardness of water.  
(ii) Write one balanced chemical equation in each case to show how to remove temporary and permanent hardness of water.
10. (a) (i) Define isomerism.  
(ii) Draw and name two structural formulae of the isomers of C<sub>4</sub>H<sub>8</sub>.
- (b) Carbon dioxide can be prepared by adding an acid to calcium carbonate.  
(i) Using a named acid, write a balanced chemical equation for the reaction.  
(ii) Name all the products formed in (b) (i).
11. (a) With the aid of a chemical equation, describe how you would prepare pure solid sodium chloride by the action of an acid and a base.
- (b) (i) Why petroleum and coal are non-renewable sources of energy?  
(ii) Give three alternatives to non-renewable sources of energy.

### SECTION C (26 Marks)

Answer **all** questions from this section.

12. Three moles of nitrogen gas combined with five moles of hydrogen gas to form ammonium gas by the Haber process
- Which reactant is present in smaller amount?
  - Calculate the grams of the reactant left in the container.
  - How many moles of NH<sub>3</sub> are produced?
  - How many litres of NH<sub>3</sub> are produced at STP?
13. In Tanzania, soil conservation is very important for Industrial Materials production. Explain six methods that are used to manage loss of plant nutrients from the soil.