

1904/104

CHEMISTRY TECHNIQUES I

June/July 2019

Time: 3 hours



THE KENYA NATIONAL EXAMINATIONS COUNCIL

CRAFT CERTIFICATE IN SCIENCE LABORATORY TECHNOLOGY

MODULE I

CHEMISTRY TECHNIQUES I

3 hours

INSTRUCTIONS TO CANDIDATES

You should have the following for this examination:

Answer booklet;

Non-programmable scientific calculator (battery operated).

This paper consists of **TWO** sections; **A** and **B**.

Answer **ALL** the questions in section **A** and **any TWO** questions from section **B**.

Each question in section **A** carries **4** marks while each question in section **B** carries **20** marks.

Maximum marks for each part of a question are indicated.

Candidates should answer the questions in English.



This question paper consists of 6 printed pages.

Candidates must check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.

SECTION A (60 marks)

Answer ALL the questions in this section.

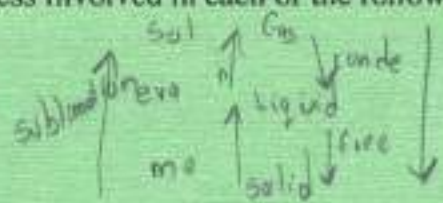


1. Define the following terms:

- (a) physical change; (1 mark)
- (b) chemical change; (1 mark)
- (c) solvent; *-> solid part of a chemical reaction.* (1 mark)
- (d) sublimation. *this is the* (1 mark)

2. Give the name of the process involved in each of the following transformations:

- (a) solid \rightarrow liquid; (1 mark)
- (b) liquid \rightarrow solid; (1 mark)
- (c) liquid \rightarrow gas (1 mark)
- (d) gas \rightarrow liquid (1 mark)



- 3. (a) Define an alkali. *also base alkaline* (1 mark)
- (b) List any three alkalis. (3 marks)

4. List four types of chemical bonding. (4 marks)

5. Write down the s, p, d, f electronic configuration of the following elements:

- (a) hydrogen; (4 marks)
- (b) lithium; (4 marks)
- (c) potassium; (4 marks)
- (d) sodium. (4 marks)

	Group	H										
Hydrogen	1	H										
Helium	2	He										
Lithium	1	Li										
Beryllium	2	Be										
Boron	13	B										
Carbon	14	C										
Nitrogen	15	N										
Oxygen	16	O										
Sodium	1	Na										
Potassium	1	K										

- 6. (a) Define the term "indicator". (1 mark)
- (b) Calculate the pH of a 0.01 M ethanoic acid solution. ($\alpha = 4.2 \times 10^{-2}$). (3 marks)

ethanoic acid C₂H₄O₂
C₂H₃O₂
47
C₂H₄O₂

6.16 g of iron completely reacted with 100 cm³ of 2.2 M hydrochloric acid. Calculate the relative atomic mass of iron. (4 marks)

8. 3.15 g of nitric acid was dissolved in water and diluted to 250 cm³. Calculate the molarity of the acid. (4 marks)

(H = 1, N = 14, O = 16)

9. State the names given to elements which belongs to the following groups in the periodic table:

- (a) Group I; (1 mark)
- (b) Group II; (1 mark)
- (c) Group VII; (1 mark)
- (d) Group VIII. (1 mark)

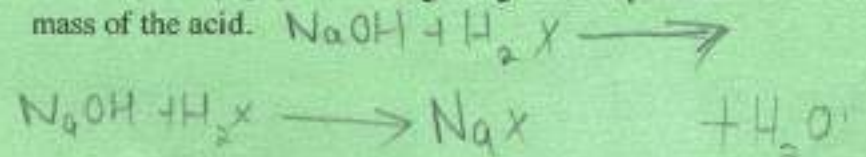
10. An element Y has electronic configuration 2,8,5.
- State the period to which the element belong. (1 mark)
 - Write a formula of the most stable anion of Y. (1 mark)
 - Write the electronic configuration of the ion of Y. (1 mark)
 - What is the difference between the atomic radius of element Y and its ionic radius? (1 mark)
11. (a) Define the term "salt". (1 mark)
- (b) Describe how a solid sample of zinc (II) carbonate can be prepared starting with zinc oxide. (3 marks)
12. A compound contains 69.42% carbon, 4.13% hydrogen and the rest is oxygen. Determine its empirical formulae. (C = 12, H = 1, O = 16). (4 marks)
13. (a) State the Le-Chatelier's principle. *when a system is at equilibrium, it will shift to try and undo the change.* (1 mark)
- (b) State **three** factors which affect the equilibrium constant. *Temperature, Catalyst, Pressure.* (3 marks)
14. Draw the structure of the following compounds:
- 3-methyl butan-1-ol; *1*
 - 2-methyl butan-1-ol.
 - Butan-2-ol.
 - Butan-1-ol.
- MA, G, Prop, But, Pent*
15. List any **four** applications of alkanols. *As a fuel, in brewing industry, as methylated spirit.* (4 marks)



SECTION B (40 marks)

Answer any **TWO** questions from this section.

16. (a) Define the following terms as used in volumetric analysis:
- standard solution; *is a solution of known concentration which occurs as either primary standard solution or secondary standard solution.* (1 mark)
 - molarity; *no. of moles in a litre per volume in litres of the solution.* (1 mark)
 - mole; *mass in grams per molar mass.* (1 mark)
 - titrant. *known ion delivered by burette.* (1 mark)
- (b) 25 cm³ of a 0.12 M sodium hydroxide were neutralised by 30 cm³ of a solution of a dibasic acid (H₂X) containing 6.3 grammes per litre. Calculate the relative molecular mass of the acid. (10 marks)



- (c) 10 cm³ solution containing chloride ions was treated with excess silver nitrate solution to precipitate 0.4368 g of silver chloride. Calculate the molarity of the chloride ions in the solution. (Ag = 108, Cl = 35.5) (6 marks)
17. (a) Calculate the amount of calcium carbonate required to produce 500 ppm calcium ions solution in a 500 ml volumetric flask. (Ca = 40, C = 12, O = 16). (6 marks)
- (b) List any **three** advantages of EDTA as a standard in complexometric titrations. (3 marks)
- (c) 10 g of an impure iron (II) salt was dissolved in water and made up to 250 ml in a volumetric flask. 20 cm³ of this solution required 25 cm³ of 0.04 M potassium permanganate for complete reaction in an acid media. Calculate the percentage of iron(II) in the original sample. (Fe = 56) (6 marks)
- (d) Table I below shows the mass number and atomic numbers of atoms T to Z.

Table I

Atom	Mass Number	Atomic Number
T	2	1
V	3	1
W	3	2
X	6	3
Y	9	4
Z	11	5

(i) State the number of:

- I. protons in Y;
- II. electrons in W;
- III. neutrons in Z.

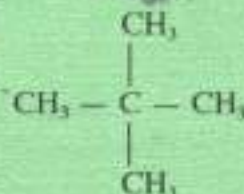
(ii) Which atoms are:

- I. isotopes of the same elements;
- II. noble gas.



18. (a) Give the IUPAC name of each of the following compounds:

(i)



(ii) $\text{CH}_3\text{C} \equiv \text{CCH}_2\text{CH}_3$.

(b) Use the flow chart in Figure 1, to answer the questions that follow:

one C_nH_{2n+2}
 one $C_nH_{2n} + C_2H_2$
 one C_nH_{2n-2}
 C_nH_{2n}

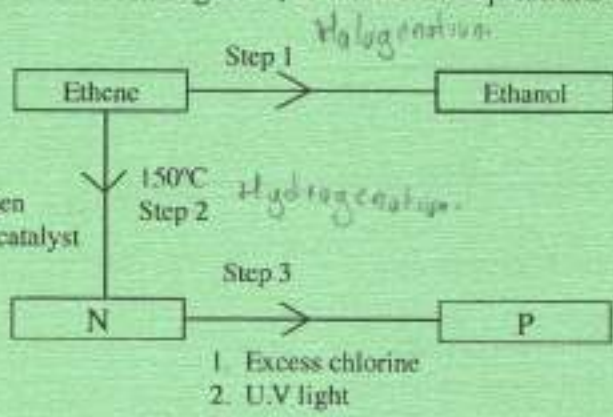


Fig. 1

(i) Identify:

- I. Compounds N and P; (2 marks)
- II. Reagents used in Step 1. (1 mark)

(ii) Give the names of the type of reaction that takes in steps 1, 2 and 3. (3 marks)

(iii) State a commercial application of the reaction that takes place in Step 2. (1 mark)

(c) (i) 5 cm³ of a saturated solution of sodium chloride weighing 5.35 g was diluted to a volume of 250 ml. 25 cm³ of the diluted solution completely reacted with 24.1 cm³ of 0.1 M silver nitrate solution. Calculate the number of moles of:

- I. Silver nitrate in 24.1 cm³ of solution. (2 marks)
- II. Sodium chloride in 25 cm³ of solution. (2 marks)
- III. Sodium chloride in 250 cm³ of solution. (3 marks)

(ii) Determine the mass of sodium chloride in the 5 cm³ saturated solution. (4 marks)

19. (a) Define the following terms:

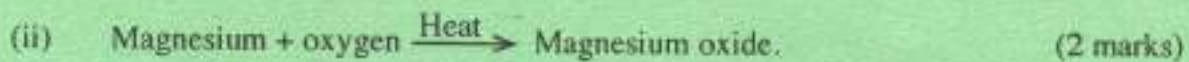
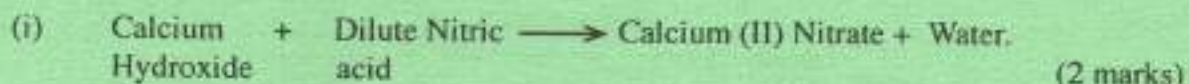
- (i) acid; (2 marks)
- (ii) base. (2 marks)

(b) State any two properties of:

- (i) acid; (2 marks)
- (ii) bases. (2 marks)



(c) Transform the following word equations into balanced chemical equations.



(d) List any **two** differences between:

(i) physical and chemical change; (4 marks)

(ii) electrovalent and covalent bonding. (4 marks)

*THIS IS THE LAST PRINTED PAGE.

