

MARANDA HIGH SCHOOL

Kenya Certificate of Secondary Education 2021

CHEMISTRY PAPER 1

(THEORY)

JANUARY 2021

TIME: 2 HOURS.

MARANDA HIGH SCHOOL POST MOCK

Name: _____ Index Number: _____

Candidates Signature: _____ Date: _____

Instructions to Candidates

1. Write your name and index number in the spaces provided above.
2. Sign and write the date of examination in the spaces provided above.
3. Answer **ALL** the questions in the spaces provided in the question paper.
4. Mathematical tables and silent electronic calculators may be used.
5. All working **MUST** be clearly shown where necessary.
6. **This paper consists of 14 printed pages.**
7. **Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.**

For Examiners use only

Questions	Maximum Score	Candidates Score
1 - 27	80	

- **This paper consists of 14 printed pages.**
- **Candidates should check the question paper to ensure that all pages are pointed as indicated and no questions are missing.**

1. State the process that takes place when;

(3marks)

a. Natural fats or oil are hydrolysed using alkalis

.....

.....

.....

b. Sulphur is added to natural rubber and heated to form cross links

.....

.....

.....

c. A heavy nuclide is broken down by a fast-moving neutron.

.....

.....

.....

2. a. Define the term homologous series as used in the study of organic chemistry

(1mark)

.....

.....

b. Draw the structural formula of the third member of alkyne homologous series and name it. (2marks)

.....

.....

.....

.....

.....

.....

3. The element has isotopic species **A** and **B** each with a mass number 39 and 40 respectively. The percentage of **A** is 60% and in **B** is 40% for an isotopic element X. Calculate the relative atomic mass of X. (2marks)

.....

.....

.....

.....

.....

.....

4. a. Define the term solubility

(1mark)

.....

.....

.....

b. 70 g of salt **W** were added to 80 cm³ of water at 25°C. After stirring 10g of crystals of salt **W** were filtered out. Determine the solubility of salt **W** at 25° C

(2marks)

.....

.....

.....

.....

.....

.....

5. a. Define molar heat of solution

(1mark)

.....

.....

.....

b. The lattice energy of sodium bromide and hydration energies of sodium and bromide ions are 733, 406 and 335KJmol⁻¹ respectively

i) Determine the heat of solution of Sodium Bromide

(2marks)

.....

.....

.....

.....

.....

.....

ii) Sketch an energy level diagram of the process

(2marks)

6. The table below gives some experimental results on four samples of water. Use the information to answer the questions that follow.

Sample of water (50 cm ³)	Drops of soap needed for form lather	
	Before boiling	After boiling
A	25	15
B	8	8
C	18	8
D	25	25

a. Which samples contain permanent hardness? Explain

(1½marks)

.....

.....

.....

.....

b. Which samples are likely to contain calcium hydrogen carbonate? Explain

(1½marks)

.....

.....

.....

.....

7. Describe how you could prepare dry sample of Lead (II) Chloride starting with Lead (II) Carbonate.
(3marks)

.....

.....

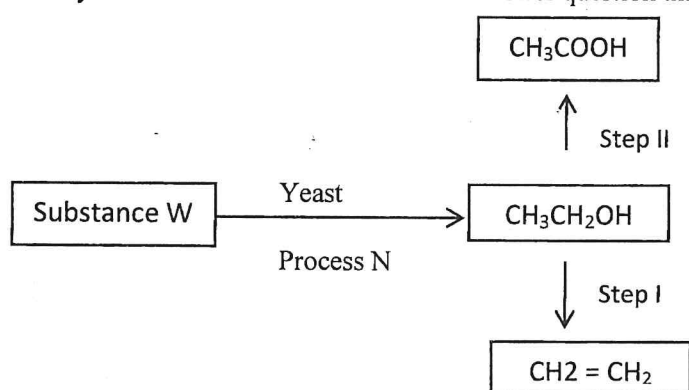
.....

.....

.....

.....

8. Study the flow chart below and use it to answer question that follow.



a. Name the process N (1mark)

.....

.....

.....

b. Suggest a suitable reagent for use in step II (1mark)

.....

.....

.....

c. Describe how step I is carried out. (1mark)

.....

.....

.....

9. Sodium hydroxide solution and graphite are both capable of conducting an electric current. What is the major difference between the two substances in their electrical conductivity? (1mark)

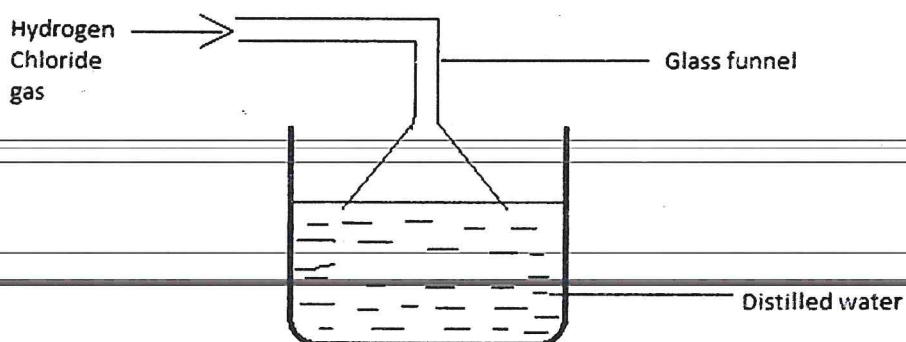
.....

.....

.....

.....

10. An aqueous solution of hydrogen chloride can be prepared as shown in the diagram below.



a. Give two reasons for using an inverted funnel (1mark)

.....

.....

.....

.....

.....

b. Four drops of Lead (II) Nitrate solution were added to 4cm³ of the solution obtained above followed by excess aqueous ammonia. Explain the observation (2marks)

.....

.....

.....

.....

.....

.....

11. Nitrogen reacts with oxygen according to the equation.

$\text{N}_2(\text{g}) + \text{O}_2(\text{g}) \rightleftharpoons 2\text{NO}(\text{g}), \Delta H = +197\text{kJmol}^{-1}$. What is the effect of increase of the following on the position of the equilibrium? Explain.

i. Pressure

(1½marks)

.....
.....
.....
.....

ii. Temperature

(1½marks)

.....
.....
.....
.....
.....

12. The standard reduction potentials of two half cells are



a. Draw a well labelled diagram of an electrochemical cell that can be constructed using the two half cells.

(2marks)

.....
.....
.....
.....
.....
.....
.....

b. Determine the e.m.f of the above cell

(1mark)

.....
.....
.....
.....
.....

13. A white solid L changes to yellow solid R when strongly heated but on cooling becomes white again when L is reacted with dilute nitric(v)acid effervescence occurs.

i. Identify L

(1mark)

.....

.....

.....

ii. Write the equation for the reaction of L and Nitric (v) acid.

(1mark)

.....

.....

.....

iii. Name and write the formula of the salt formed when solid R dissolves in Sodium Hydroxide solution.

(1mark)

.....

.....

.....

14. The table below shows the PH values of J to N

Solution	J	K	L	M	N
PH	5	13	2	10	7

a. Which solution

i. Contains the largest concentration of hydroxide ions? Explain

(1mark)

.....

.....

.....

ii. Is likely to be a solution of ethanoic acid? Explain

(1 mark)

.....

.....

.....

15. a. Using dots (o) and crosses (x), show the bonding in;

(2marks)

i. Water

.....
.....
.....
.....

ii. Carbon(IV)Oxide

.....
.....
.....
.....

b. Why is water a liquid at room temperature while Carbon (IV) Oxide is a gas as room temperature

(1mark)

.....
.....
.....

16. A gaseous compound consists of 86% carbon and 14% hydrogen by mass. At s.t.p, 3.2 dm³ of the compound has a mass 6g. (C=12; H=1, Molar gas volume at s.t.p=22.4dm³)

a. Calculate its empirical formula

(1mark)

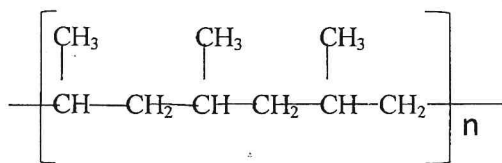
.....
.....
.....
.....

b. Calculate its molecular formula

(2marks)

.....
.....
.....
.....
.....

17. The structure below represents a segment of a polymer. Use it to answer the questions that follow.



a. Draw the structure of the monomer

(1mark)

.....

.....

.....

.....

b. Given that the molecular mass of the polymer is 2,000 find the value of **n**

(2marks)

.....

.....

.....

.....

18. The chief are aluminum bauxite which mainly contains $\text{Al}_2\text{O}_3 \cdot 2\text{H}_2\text{O}$. The ore is initially purified before aluminum is extracted electronically.

a. Identify the main impurities associated with this ore.

(1mark)

.....

.....

b. Sodium hydroxide solution is used in the purification process. State its role.

(1mark)

.....

.....

.....

.....

- c. Give an equation for the reaction that forms aluminum oxide (Alumina) from Aluminum hydroxide. (1mark)

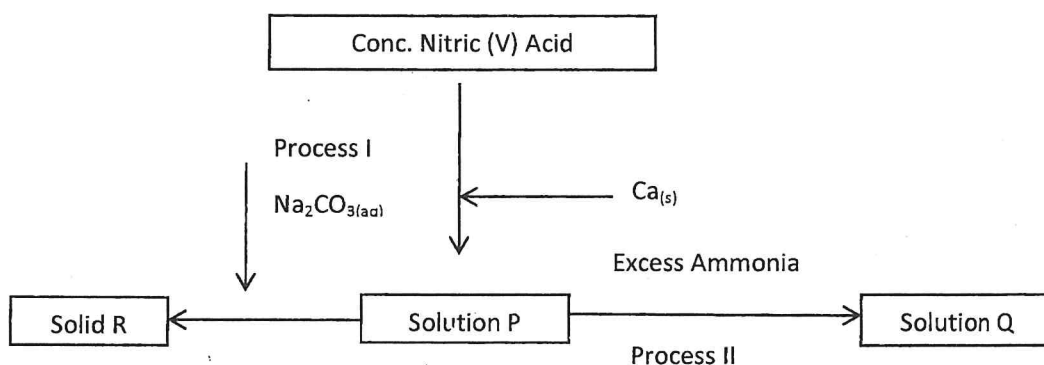
.....19.

When a current of 0.5 amperes was passed for 32 minutes and 10 seconds through chloride of metal P. 0.44g of P was deposited. Determine the charge of the ion of metal P. (1f=96500c, p=88)

(3marks)

.....

20. Study the flow chart below and answer the questions that follow.



- i. Identify the solution P (1mark)

.....

- ii. Write the chemical equation to show how solid R is formed. (1mark)

.....

- iii. State the observation made in process II (1mark)

.....

21. If 25.0 cm³ of 0.1M H₂SO₄ solution neutralized a solution containing 1.06g of sodium carbonate in 250 cm³ of solution. Calculate,

a. The Molarity of sodium carbonate solution. (Na=23, O=16, C=12) (1½marks)

.....

.....

.....

b. Volume of Sodium Carbonate solution used. (1½marks)

.....

.....

.....

.....

22. The following elements belong to the same group of periodic table. (Letters do not represent the actual symbols)

Element	Atomic radius (nm)	Ionic radius (nm)	1 st Ionization Energy (kJmol ⁻¹)
P	0.137	0.066	736
Q	0.089	0.031	900
R	0.174	0.099	590

i. State whether the elements are metals or non-metals. Explain your answer. (2marks)

.....

.....

.....

ii. Which element is the most reactive? Explain (2marks)

.....

.....

.....

23. Given the following substances: wood ash, lemon, juice and sodium chloride

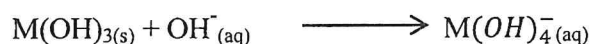
- a. Name one commercial indicator that can be used to show whether wood ash, lemon juice and sodium chloride are acidic, basic and neutral (1mark)

.....

- b. Classify the substances in 23(a) above as acid, base and neutral (2marks)

Acid	Base	Neutral

24. A compound whose general formula is $M(OH)_3$ reacts as shown by the equation.



- a. What name is given to compounds which behave like $M(OH)_3$ in the two reactions.

.....
 (1mark)

- b. Name two elements whose hydroxides behave like that of M. (2marks)

.....

25. In an experiment on rates of reaction, Potassium Carbonate was reacted with dilute Sulphuric(VI) acid.

- a) What would be the effect of an increase in the concentration of the acid on the rate of reaction? (1mark)

.....

b) Explain why the rate of reaction is found to increase with temperature (2marks)

.....

.....

.....

26. a. State Boyles law. (1mark)

.....

.....

.....

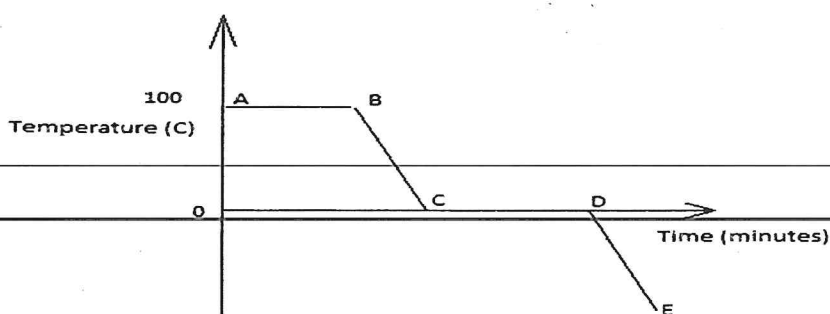
b. A gas occupies 500cm³ at 27°C and 100,000Pa. What will be its volume at 0°C and 101325Pa? (2marks)

.....

.....

.....

27. The graph below is a cooling curve for water. Study it and answer the questions that follow.



a. Explain what happens to the molecules of water in the region BC in terms of Kinetic theory. (2marks)

.....

.....

.....

b. In what state is the water in the region DE? (1mark)

.....