

NAME DATE

INDEX NO. SIGNATURE

233/2

CHEMISTRY

PAPER 2

(THEORY)

FEB 2022

TIME: 2 HOURS.

FORM 3 EXAMINATION 2022

Kenya Certificate of Secondary Education.

233/2

CHEMISTRY

PAPER 2

(THEORY)

TIME: 2 HOURS.

INSTRUCTIONS TO CANDIDATES.

- Write your name and index number in the spaces provided above.
- Sign and write the date of exam in the spaces provided above.
- Answer **ALL** the questions in the spaces provided.
- Mathematical tables and silent electronic calculators may be used.
- All working **MUST** be clearly shown where necessary.
- This paper consists of 11 printed pages. Candidates should check to ensure that all pages are printed as indicated and no questions are missing

FOR EXAMINER'S USE ONLY.

Questions	Maximum score	Candidates score
1	12	
2	10	
3	13	
4	11	
5	11	
6	12	
7	11	
Total score	80	

1. (a) The grid below represents part of the periodic table. Study it and answer the questions that follow. The letters given do not represent the actual symbols of the elements.

						A		
	B		C		D		E	
F	G							
							H	

- (i) Select the element that can form an ion with a charge of -2. Explain your answer. (2 marks)

.....

- (ii) What type of structure would the oxide of C have? Explain your answer. (1 mark)

.....

- (iii) How does the reactivity of H compare with that of E? Explain your answer. (1 mark)

.....

- (iv) 2.6 g of B reacts completely when heated with 2.42 litres of chlorine gas (Cl_2) at s.t.p.

(1 mole of gas occupies 22.4 litres at s.t.p.)

- I. Write a balanced equation for the reaction between B and chlorine gas. (1 mark)

.....

- II. Determine the relative atomic mass of B. (2 marks)

.....

- (v) Explain how you would expect the atomic radii of F and G to compare. (2 Marks)

.....

(b) The table below shows physical properties of some substances .Use the information on the table to answer the questions that follow.

Substance	Melting point ($^{\circ}\text{C}$)	Boiling point($^{\circ}\text{C}$)	Electrical conductivity	
			Solid	Liquid
U	1083	2595	Good	Good
V	801	1413	Poor	Good
W	5.5	80.1	Poor	Poor
X	-114.8	-84.9	Poor	Poor
Y	3550	4827	Poor	Poor

(i) Which substance is likely to be (with a reason)

I. a metal.

(1 mark)

.....

II. a liquid at room temperature?

(1 mark)

.....

(ii) Which substance is likely to have the following structures.

I. Simple molecular

(1 mark)

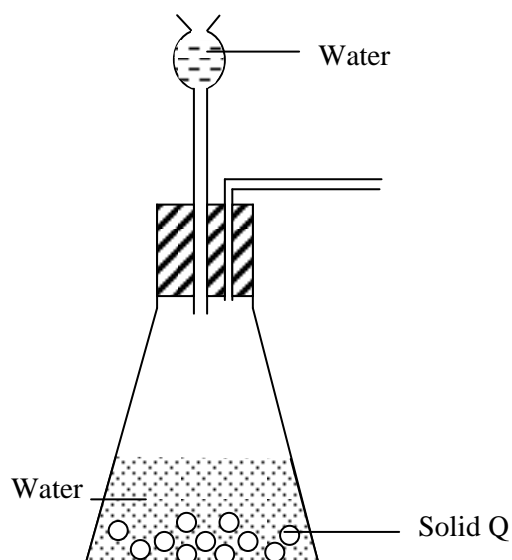
.....

II. Giant atomic

(1 Mark)

.....

2. The following diagram shows an incomplete set up that can be used to prepare and collect dry oxygen gas in the laboratory. Study it and answer the questions that follow



(i) Correct the mistakes in the set up (1 mark)

.....
.....

(ii) Complete the diagram to show how a dry sample of the gas may be collected. (2 marks)

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

(iii) Identify solid Q and give its formula (1 mark)

.....
.....

(iv) Write an equation that produces oxygen gas in this experiment. (1 mark)

.....
.....

(v) Name another pair of chemicals that can be used to produce oxygen in this set up.

.....
.....

(b) A small amount of burning sulphur was lowered in a gas jar of oxygen.

(i) State one observation made. (1 mark)

.....
.....

(ii) Write an equation for the reaction taking place. (1 mark)

.....
.....

(iii) State the approximate pH of the solution when the product in b(ii) above is dissolved in water. Explain. (2 marks)

.....
.....

3. (a) In an experiment 10.6g of a mixture of anhydrous Sodium Carbonate and Sodium chloride were dissolved in water to make 100cm³ of solution. 25cm³ of this solution required 20cm³ of 1M Hydrochloric acid solution for complete neutralization.

(i) Calculate the number of moles of Hydrochloric acid used (1 mark)

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

(ii) Which substance reacts with the Hydrochloric acid in this mixture? (1 Mark)

.....
.....

(iii) Write an equation for the reaction that occurs. (1 Mark)

.....
.....

(iv) Calculate the mass of Sodium Carbonate in 25 cm³ of this mixture. (1 Mark)

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

(v) Determine the moles of Sodium Carbonate in 100cm³ of the mixture. (1 Mark)

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

(vi) What is the mass of sodium carbonate in the mixture? (2 Marks)

.....
.....

(vii) Calculate the percentage of Sodium Chloride in the mixture. (2 Marks)

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

(b) A gaseous compound P contains 55% Carbon, 9.1 % Hydrogen and the rest is Oxygen.

(i) Determine the empirical formula of P. (C=12, H=1, O=16) (2 Marks)

.....
.....

(ii) Given that 0.262g of P occupies a volume of 67cm³ at s.t.p

I: Calculate the relative formula mass of P. (1 Mark)

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

II: Determine the molecular formula of P.

(Molar gas volume at s.t.p.=22.4 dm³)

.....

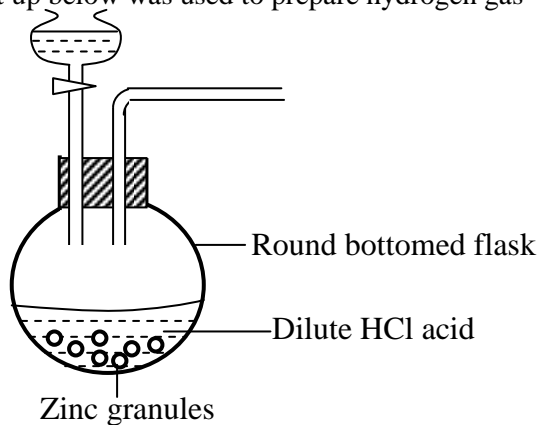
.....

.....

.....

.....

4. The set up below was used to prepare hydrogen gas



(a) Complete the diagram to show how dry sample of hydrogen can be collected. (2 Marks)

.....

.....

(b) Write an experiment for the reaction which takes place

(i) In the round bottomed flask. (1 Mark)

.....

.....

(ii) When hydrogen gas burns in air. (1 Mark)

.....

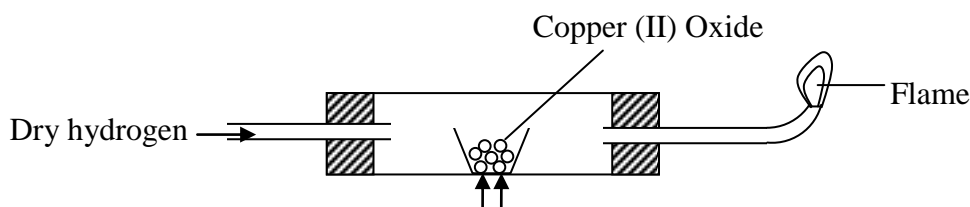
.....

(c) State two industrial uses of hydrogen gas. (2 Marks)

.....

.....

(d) Dry hydrogen gas passed over heated Copper (ii) oxide in the set up below.



(i) State two observations made in the experiment. (2 Marks)

.....

(ii) What property of Hydrogen was being investigated. (1 Mark)

.....

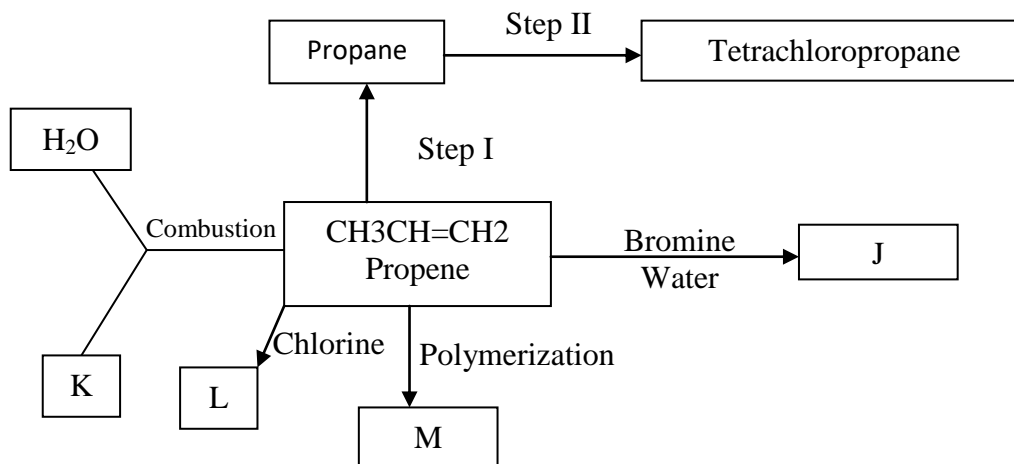
(iii) Write an equation for the reaction which proves the property in (ii). (1 Mark)

.....

(iv) Why should hydrogen be passed for sometime through the combustion tube before being lit. (1 Mark)

.....

5. The flow diagram below shows a reaction scheme starting from propene.



(a) Draw the structural formula of propene (1 Mark)

.....

(b) State the reagent and condition necessary for step1 to occur

Reagent: (1 Mark)

.....

Condition: (1 Mark)

.....

(c) Give the names of the following substances.

J-

.....

K -

.....

L-

.....

M-

(2 Marks)

.....

(d) Write the equation for the reaction that produces substance L.

(1 Mark)

.....

.....

(e) State the type of reaction that occurs in step I.

(1 Mark)

.....

.....

(f) Write the equation for complete combustion of propene.

(1 Mark)

.....

.....

(g) (i) Give one use of substances M.

(1 Mark)

.....

.....

(ii) State the environmental effects of the continued use of plastics to the environment .Explain. (2 Marks)

.....

.....

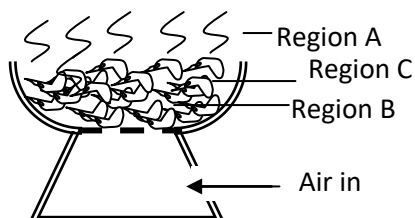
6. State one form of amorphous carbon other than charcoal and state its use.

(2 Marks)

.....

.....

(b)The diagram below represents a 'jiko' when in use .Study it and answer the questions that follow.



(i)Write equations for the reactions that occur in region

I: B

(1 mk)

.....

.....

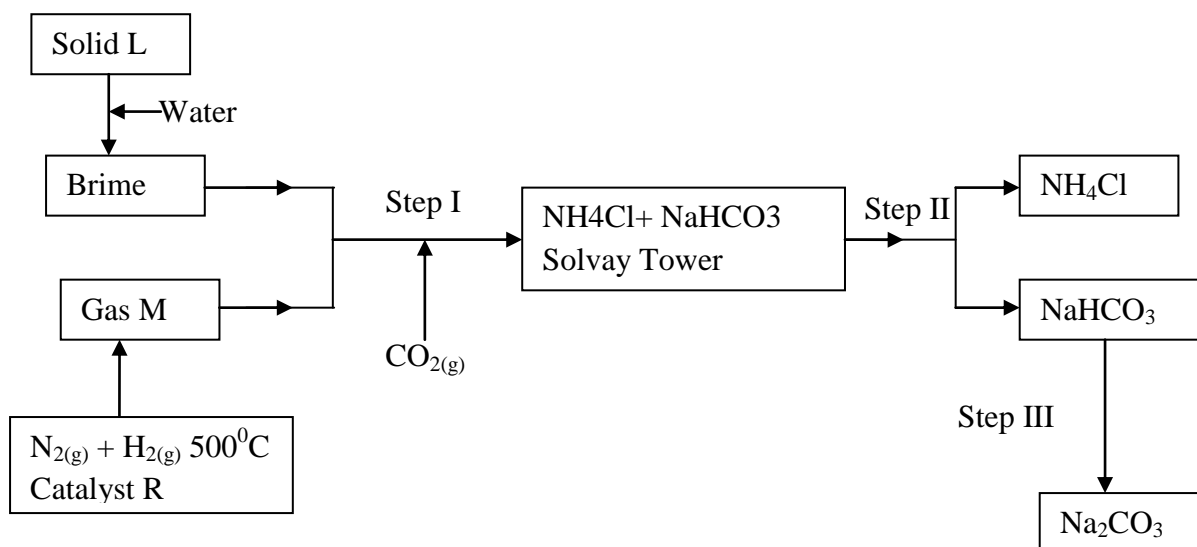
II: C

(1 mk)

(ii) Explain what happens in region A.

(1 mk)

(c) The following flow chart represents the Solvay process used in the manufacture of sodium carbonate. Study it and answer the questions that follow.



(i) Identify

I. Solid L

(½ mk)

II. Gas M

(½ mk)

(ii) Name the processes that take place in steps

II

(½ mk)

III

(½ mk)

(iii) Give the name of catalyst R.

(1 Mark)

(iv) Write an equation for the reaction that occur in steps

I (1 Mark)

.....

II (1 Mark)

.....

.....

(v) Describe how carbon (IV) oxide for this process is obtained. (1 mk)

.....

.....

(vi) State one commercial use of sodium carbonate (1 mk)

.....

.....

7. a) (i) Name two reagents to prepare Hydrogen chloride in the laboratory. (1 Mark)

.....

.....

(ii) State a suitable drying agent for hydrogen chloride gas (1 mk)

.....

.....

(iii) Write an equation for the reaction that produces Hydrogen Chloride using the reagents named in a (i) above. (1 Mark)

.....

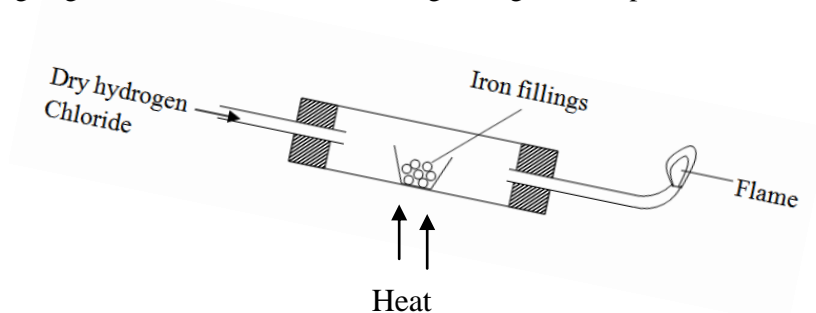
.....

(iv) Describe a test for Hydrogen Chloride gas. (1 mk)

.....

.....

(b) Dry hydrogen gas was reacted with iron fillings using the set up below:-



(i) Write occur in the combustion tube.

(1 mk)

.....
.....

(ii) Write an equation at the point of the flame.

(1 Mark)

.....
.....

(iii) 1.96 g of iron filling ,reacted completely with hydrogen chloride .Calculate the volume of Hydrogen gas produced.

(Molar gas volume at r.t.p. is 24 dm^3 , Fe=56.0)

(2 Marks)

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

(c) One of the industrial uses of chlorine gas is manufacture of Hydrochloric acid.

(i) Give one source of chlorine gas.

(1 Mark)

.....
.....

(ii) Name another major raw material for this process and state its source.

(2 Marks)

.....
.....