

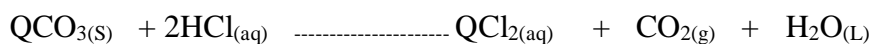
## FORM 4 TERM 1 2021 CHEMISTRY

1. The diagram below represents part of the periodic table. Use it to answer the questions that follow.

N					W				
M	T				V				

- a. Write the electronic arrangement for the suitable ion formed by V (1mk)
  
- b. Write an equation for the reaction between T and W. (1mk)
  
- c. How do the ionisation energies of the elements N and M compare? Explain. (1mk)

2. A certain carbonate,  $\text{QCO}_3$  reacts with dilute hydrochloric acid according to the equation given below .



If 1g of the carbonate reacts completely with  $20\text{cm}^3$  of 1M Hydrochloric acid. Calculate the relative atomic mass of Q. (C = 12.0, O=16.0) (3mks)

3. (a) Using dots (.) and crosses (x) to represent electrons draw diagrams to represent the bonding in (2mks)

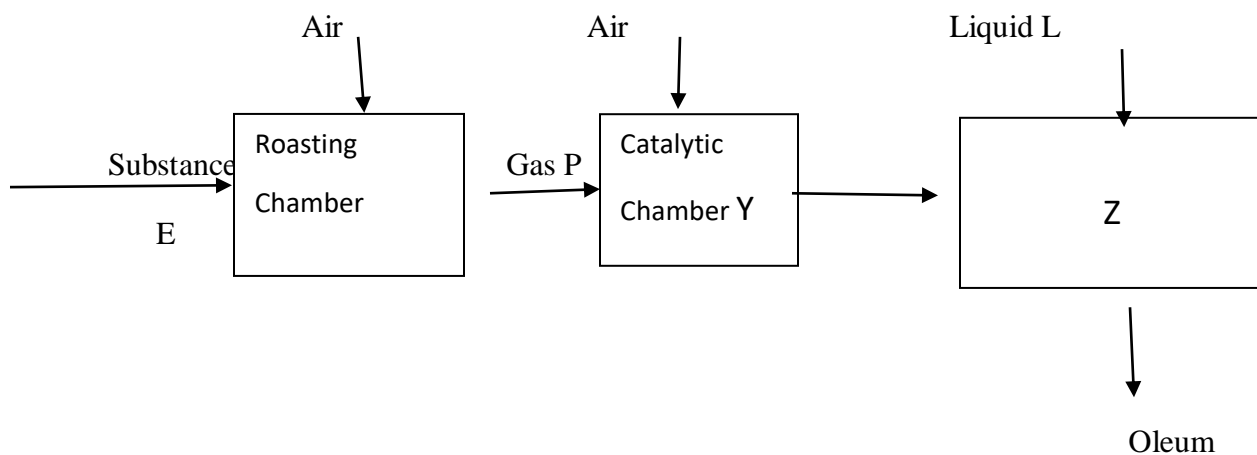
(i)  $\text{PH}_3$

(ii)  $\text{PH}_4^+$

(a) State why a phosphine molecule ( $\text{PH}_3$ ) can combine with  $\text{H}^+$  to form  $\text{PH}_4^+$  (P =15, H=1)

(1mk)

4. Below is a flow diagram that summarizes the manufacture of sulphuric (VI) acid.



a. Identify

i) Substance E

(1mk)

ii) Liquid L

(1mk)

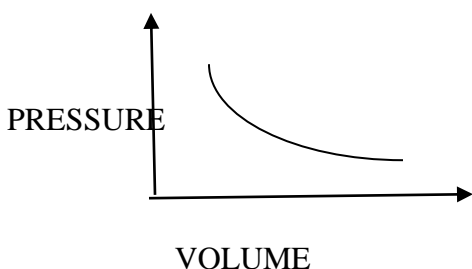
b) Write a chemical equation to show the reaction at Z.

(1mk)

C) Name the commonly used catalyst in the catalytic chamber. (1mk)

5. Describe how a pure solid sample of Zinc (II) carbonate can be prepared starting with Zinc powder . (3mks)

6. The graph below show the behavior of a fixed mass of a gas at constant temperature.



a) What is the relationship between the volume and pressure of the gas? (1mk)

b) A fixed mass of a gas at 750mmHg pressure and  $-23^{\circ}\text{C}$  temperature occupies a volume of  $600\text{cm}^3$ . What volume will it occupy at  $33^{\circ}\text{C}$  and 900 mmHg? (2mks)

7 .a) When ammonia gas is passed through water, the solution formed changes red litmus paper to blue. Name the ion responsible for the colour change of the litmus paper. (1mk)

b) Study the effect of heat on the following metal nitrates.

<i>Metal</i>	<i>Products</i>
A	Metal oxide, Nitrogen(IV) Oxide and Oxygen
B	Metal nitrite and oxygen
C	Metal, nitrogen(IV) oxide and oxygen

i) Arrange the metals in order of their reactivity starting with the most reactive (1mk)

ii) To which group of the periodic table does metal B belong? (1mk)

8. Metals **J**, **K**, **L** and **M** and their respective oxides were reacted. Metal **M** reduced the oxides of **K** and **L**. Metal **L** reduced the oxide of **K** and metal **J** reduced the oxide of **M**.

a. Arrange the metals in order of reactivity starting with the least reactive. (2mks)

b. Which of the above metals can be a sacrificial metal in electroplating of metal **M**. (1mk)

9. The table below shows result obtained from experiment carried out in a suspected salt M.

Experiment	Results
a. A few drops of Barium nitrate added to solution M.	No white precipitate
b. A few drops of Lead (II) nitrate added to solution M.	White precipitate
c. Ammonia solution added drop wise until in excess	White precipitate which dissolves forming colorless solution

a. Identify the anions present in solution M. (1mk)

b) Write an ionic equation for the formation of the white precipitate in experiment II. (1mk)

c) Write the formula of the complex ion responsible for the colorless solution in experiment III.

(1mk)

10 .a) Give the names of the following compounds.

i)  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$

(1mk)

II)  $\text{CH}_3\text{CHCHCH}_2\text{CH}_3$

(1mk)

B) Study the information in the table below and answer the questions that follow.

<i>No. of carbon atoms per molecule</i>	<i>Relative molecular mass of hydrogen</i>
2	28
3	42
4	56

i) Write the general formula of the hydrocarbons in the table.

(1mk)

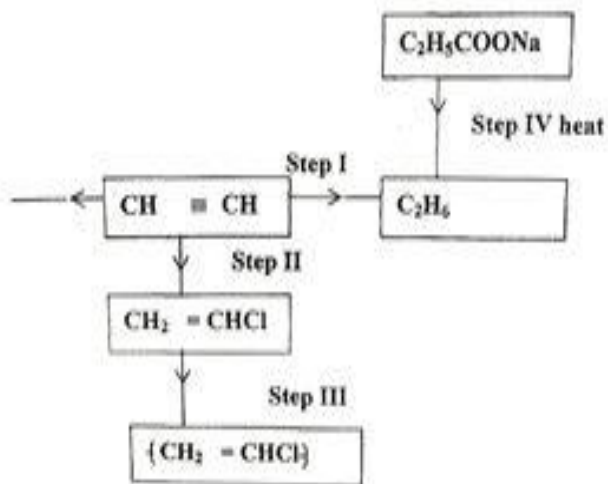
ii) Predict the relative molecular mass of the hydrocarbon with 5 carbon atoms.

(1mk)

iii) Determine the molecular formula of the hydrocarbon in (II) and draw its structural formula.

(2mks)

c. Study the scheme given and answer questions that follow



I). Name the reagent used in

Step I (1mk)

Step II (1mk)

Step III (1mk)

II) Write an equation for complete combustion of  $\text{CH} = \text{CH}$  (1mk)

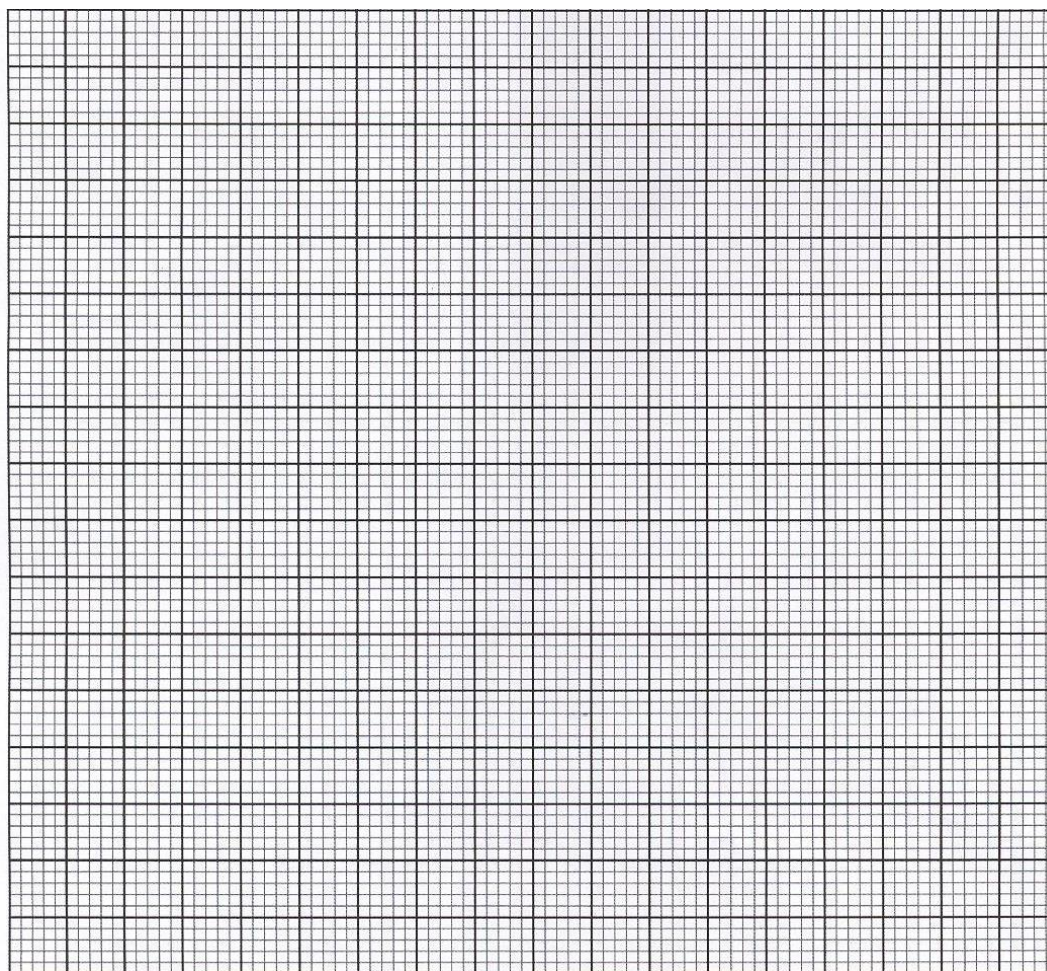
III) Explain one disadvantages of the continued use of items in step III. (1mk)

11. Solubilities of potassium and copper II sulphate were determined at different temperature. The following data was obtained

Temperature (OC)		0	20	40	60	80	100
------------------	--	---	----	----	----	----	-----

Solubility of 100g of water	KNO <sub>3</sub>	12	30	75	125	185	250
	CuSO <sub>4</sub>	15	20	35	45	65	80

i. On the graph paper provided; plot solubility curves for both salts, where solubility (vertical axis) is plotted against temperature. (4mks)



ii. Determine from the graph against the solubility of each salt at 50°C (1mk)

KNO<sub>3</sub>

CuSO<sub>4</sub>

(1mk)

III) At what temperature was the solubility of both salts equal? (1mk)

iv) Saturated solution of potassium nitrate at 70°C was cooled to 20°C. What mass of the crystals will be deposited? (1mk)

b. i) What is permanent hardness of water? (1mk)

ii) State two chemical substances that can be used to remove permanent hardness. (1mk)

c. Explain why aluminium chloride solution is acidic. (1mk)