

NAME:.....CLASS:.....ADM NO:.....

TEACHER.CO.KE

CHEMISTRY PAPER 2 MARKING SCHEME

OPENER TERM 1 EXAM

FORM 4

TERM 1 – 2022

TIME:

**INSTRUCTION.****Answer all questions in the spaces provided.**

1. The table below shows some elements in the periodic table. Use it to answer the question that follow. (The letter are not the actual symbols of the elements)

				T		M		U
P			Q				V	
S								R

- a) Identify the elements in the same group. (2mks)

- *P & S*
- *U and R*

- b) Give the name of the family to which elements P and S belong. (1mk)

- *Alkali metals*

- c) Write the electron configuration of ions of elements; (2mks)

i. V  
 $V^{-} 2.8.8$

ii. Q  
 $Q^{3+} 2.8$

- d) Given that isotopes of element S are as follows  $^{39}\text{S}(93.1\%)$ ,  $^x\text{S}(0.01\%)$  and  $^{41}\text{S}(6.89\%)$ , calculate x given that the relative atomic mass of element S is 39.1349. (3mks)

$$= \frac{(93.1 \times 39) + (0.01Xx) + (6.89 \times 41)}{100}$$

$$= 39.1379$$

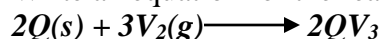
$$= \frac{3630.9 + 0.01x + 282.49}{100} = 39.1379$$

$$= 3913.39 + 0.01x = 3913.79$$

$$= 0.01x = \frac{0.40}{0.01} = 40$$

$$x = 40$$

- e) Elements Q and V react to form a compound. (1mk)
- i. Write an equation for the reaction.



- ii. What is the nature of the compound formed in (i) above. Explain. (2mks)
- **Acidic;  $QV_3/AlCl_3$  hydrolyses in water to form  $H^+$  ions, hence the acidic nature of the chloride.**
- f) Element T forms covalent bond with element V. Using dot (.) and cross (x) diagram show bonding in the compound formed. (2mks)

2. A. The following set up was carried out by students in form two in the open air in the presence of sunlight to investigate a certain property of the halogen. Study it answer the questions.



- a) Which property of the halogen was being investigated? (1mk)
- **Solubility in water.**
- b) Name the gas which was colourless. (1mk)
- **Oxygen**
- c) Chlorine water is yellow in colour. However, in the presence of light it is decolourised. Explain. (2mks)

- *The yellow colour is due to presence of chloric (I) acid; in the presence of light the chloric (I) acid decompose to form hydrochloric acid, hence the solution turn colourless.*

d) Comment on the effect of chlorine water on red and blue litmus paper. (2mks)

- *Blue litmus paper turns red then both litmus papers are bleached to white; chlorine water is acidic and has bleaching properties due to presence of chloric (I) acid/ hypochlorous acid.*

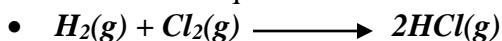
B) The following diagram represents a section of the plant for the large scale manufacture of hydrochloric acid.



- a) Name gases A and B. (2mks)
- *A – Hydrogen*
  - *B – Chlorine*
- b) State the role of glass beads in the plant. (1mk)
- *To increase the surface area over which the gas dissolves in water.*
- c) Explain why gas A is introduced into the reaction chamber through a jet. (1mk)

- *To prevent an explosion since the mixture of chlorine and hydrogen react explosively.*

d) Write the chemical equation for the reaction between gas A and B. (1mk)



e) Determine the volume of hydrochloric acid gas formed when  $3600\text{cm}^3$  of gas B react with gas A at stp (MGV at stp =  $22.4\text{dm}^3$ ) (2mks)

$$\text{Moles of B} = \frac{\text{Vol}}{\text{MGV}}$$

$$= \frac{3600}{22400}$$

$$= 0.1607 \text{ moles}$$

$$\text{Moles of HCl produced} = (0.1607 \times 2)$$

$$= 0.3214 \text{ moles}$$

$$\text{Volume of HCl gas} = \text{moles} \times \text{MGV}$$

$$= 0.3214 \times 22400$$

$$= 7200\text{cm}^3$$

f) CFC'S and DDT are chlorine compounds with long life span and so affects both plants and animal life. Write their full names. (2mks)

CFC - *chlorofluorocarbons*

DDT - *Dichlorodiphenyltrichloroethane*

3. A. Butane and bromine react according to the equation below.



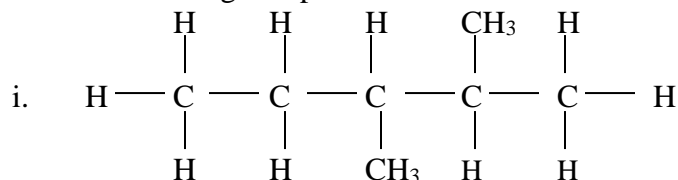
a) Name the type of reaction taking place in the equation above. (1mk)

- *Substitution*

b) State the condition under which the above reaction takes place. Explain. (2mks)

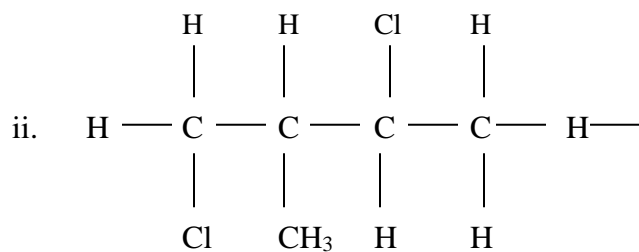
- *U.V light/ sunlight; presence of sunlight splits the halogen (bromine) molecules into free atoms which are very reactive hence they replace the hydrogen atoms in an alkane.*

c) Name the following compounds:



(1mk)

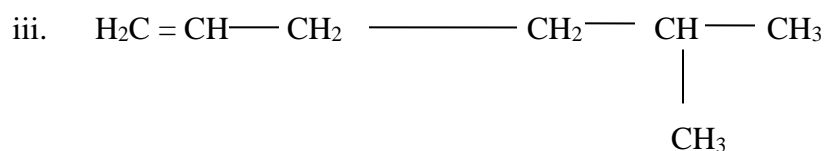
- *Name 2,3 - dimethylpentane*



(1mk)

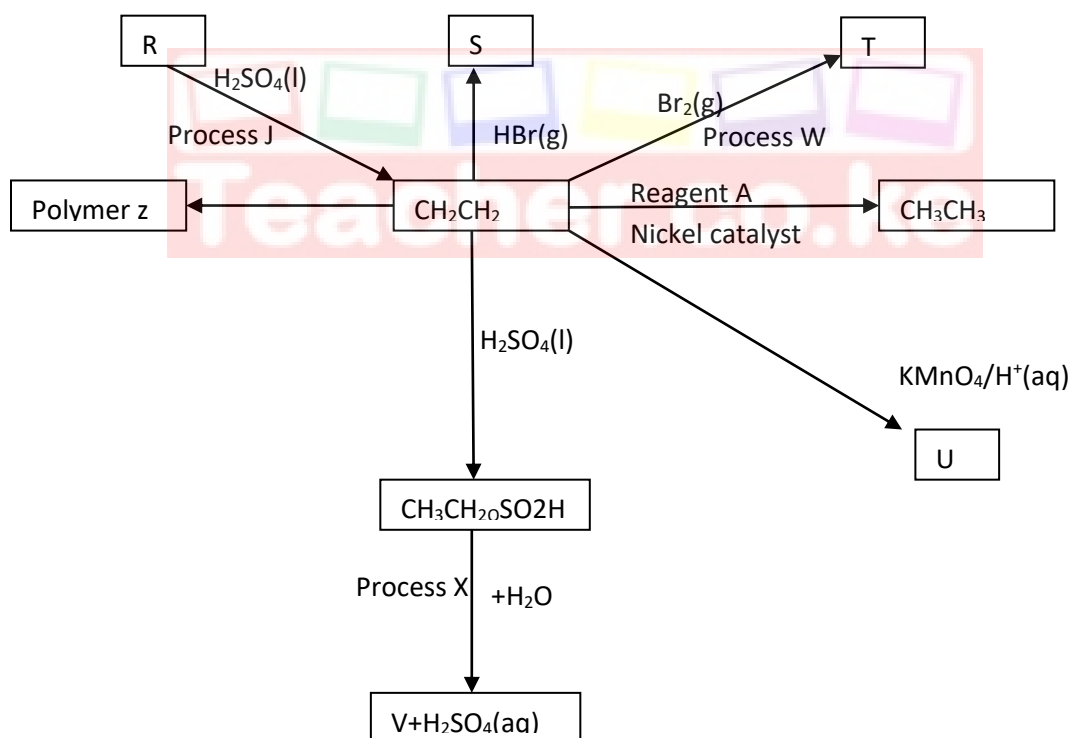
• Name 1,3 - dichloro - 2 - methylbutane

(1mk)



• Name: 5 - methylhex-1-ene

B. Study the reaction scheme shown and answer the questions that follow.



a) Identify reagent A. (1mk)

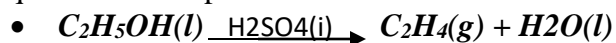
• **Hydrogen**

b) Name process; (1mk)

i. X - **Hydrolysis** (1mk)

ii. W - **Halogenation** (1mk)

c) Write the equation for the process J. (1mk)



d) Name products: (3mks)

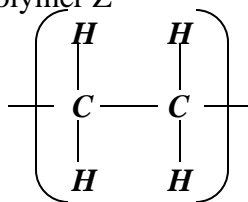
*S - Bromoethane*

*T - 1, 2 - dibromoethane*

*V - Ethanol*

e) Draw and name the structure of:

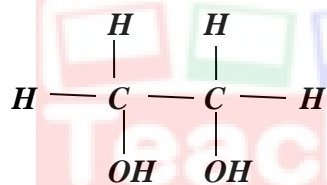
i. Polymer Z



*Polyethene*

(1 ½ mks)

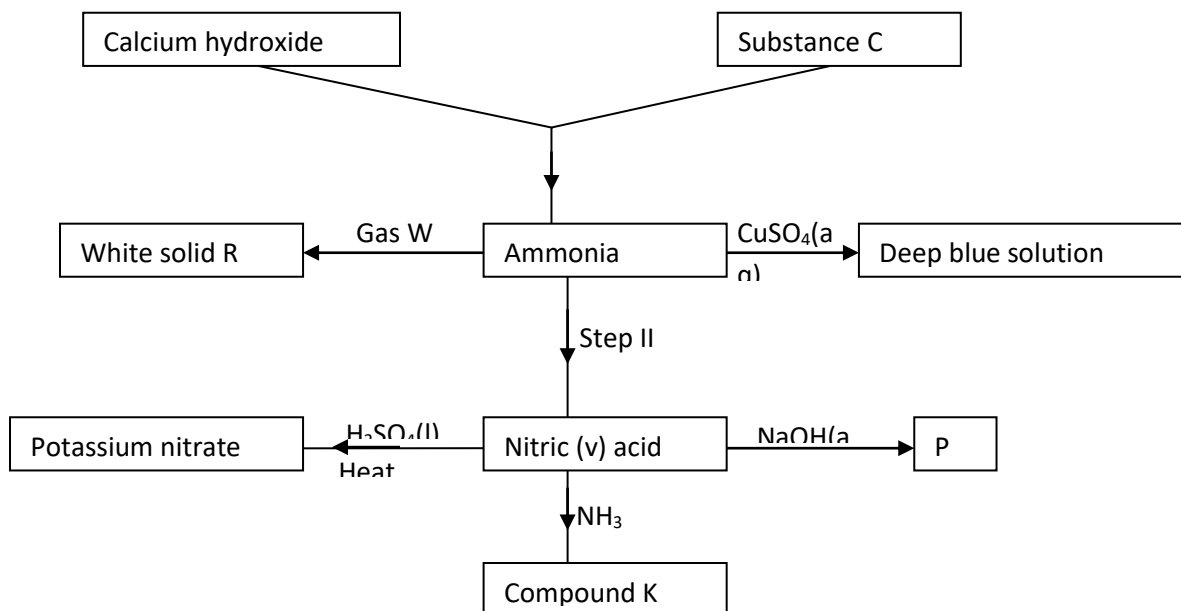
ii. Product U



*Ethan - 1, 2 - diol*

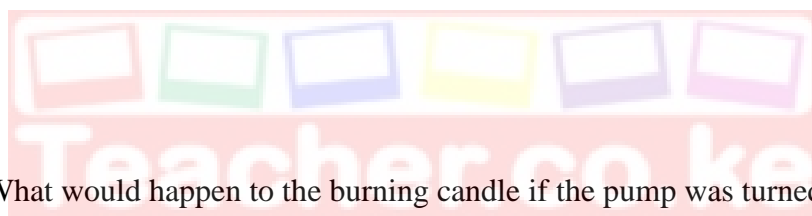
(1 ½ mks)

4. A. Use the flow chart drawn to answer the questions that follow:



- a) Identify:
- Compound C (1mk)
    - Ammonia chloride**
  - Compound K (1mk)
    - Ammonium nitrate**
- b) Write the equation for the following:
- Calcium hydroxide and substance C. (1mk)
    - $\text{Ca(OH)}_2(\text{s}) + 2\text{NH}_4\text{Cl}(\text{s}) \longrightarrow \text{CaCl}_2(\text{aq}) + 2\text{NH}_3(\text{g}) + 2\text{H}_2\text{O}(\text{l})$
  - Gas W and ammonia. (1mk)
    - $\text{NH}_3(\text{g}) + \text{HCl}(\text{g}) \longrightarrow \text{NH}_4\text{Cl}(\text{s})$
- c) Identify the catalyst in step II. (1mk)
  - Platinum rhodium**
- d) Write the formula of the deep blue solution and compound K. (2mks)
- $[\text{Cu}(\text{NH}_3)_4]^{2+}$
  - $\text{NH}_4\text{NO}_3$
- e) State the type of reaction that produces P. (1mk)
  - Neutralization**
- f) State one use of compound K. (1mk)
  - As a fertilizer**
  - In preparation of nitrogen (I) oxide**
- B) When compound N is heated, a red-brown gas is evolved and a yellow residue is left on cooling.
- a) Name:
- The red-brown gas. (1mk)
    - Nitrogen (IV) oxide**
  - The ions present in the residue. (1mk)
    - $\text{Pb}^{2+}$  and  $\text{NO}_3^-$  ions**
  - Write equation for decomposition of solid N. (1mk)
    - $2\text{Pb}(\text{NO}_3)_2(\text{s}) \xrightarrow{\text{Heat}} 2\text{PbO}(\text{s}) + 4\text{NO}_2(\text{g}) + \text{O}_2(\text{g})$
5. a. Candle wax is mainly a compound consisting of two elements. Name the two elements. (2mks)
- Hydrogen**
  - Carbon**

b) The set – up below was used to investigate the burning of a candle. Study it and answer the questions that follow.

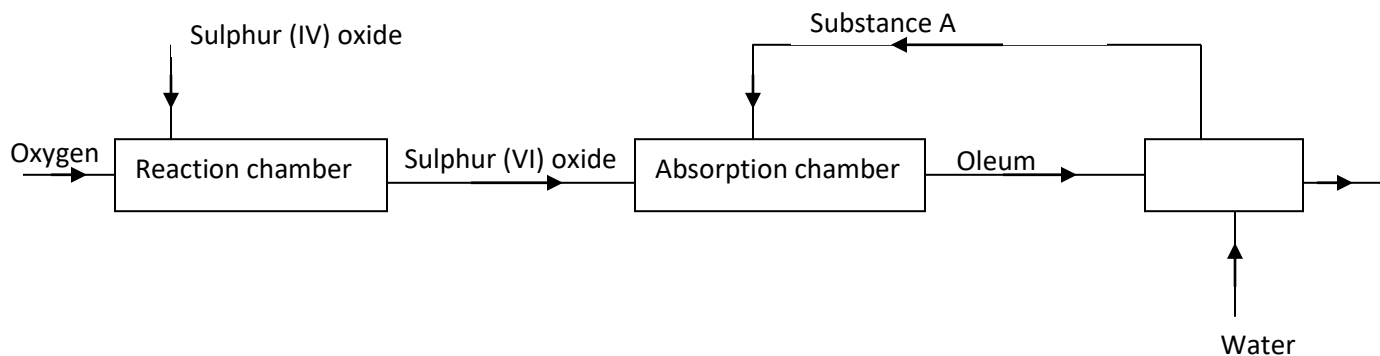


- i. What would happen to the burning candle if the pump was turned off? Give reasons. (3mks)
- *It extinguishes because carbon (IV) oxide will accumulate around it putting it off.*
- ii. State and explain the changes in mass that are likely to occur in tube N by the end of the experiment. (3mks)
- *Mass increase since water vapour reacts with calcium oxide, Cao, and forms calcium hydroxide, which then reacts with carbon (IV) oxide to produce calcium carbonate.*
- iii. Name two gases that come out through tube M. (2mks)
- *Nitrogen, Helium, Neon, Argon*
- iv. What is the purpose of calcium chloride in tube L? (1mk)
- *It absorbs moisture which is produced from burning candle.*
- v. Name another substance that could be used in the place of calcium oxide in tube N. (1mk)



- *Sodium hydroxide*

6. The flow chart below shows some of the processes involved in large scale production of sulphuric (VI) acid. Use it to answer the questions that follow.



- a) Describe how oxygen is obtained from air on a large scale. (3mks)
- *Air is first passed through concentrated sodium hydroxide to remove carbon (IV) oxide. It is then cooled to  $-25^{\circ}\text{C}$  to remove water; through repeated expansion and compression, air is cooled to liquid at  $-200^{\circ}\text{C}$  through fractional distillation, nitrogen and oxygen are then separated*
- b) i. Name substance A. (1mk)
- *Con. Sulphuric (VI) acid*
- ii. Write an equation for the process that takes place in the absorption chamber. (1mk)
- $\text{H}_2\text{SO}_4(l) + \text{SO}_3(g) \longrightarrow \text{H}_2\text{S}_2\text{O}_7(l)$
- c) Vanadium (V) oxide is a commonly used catalyst in the contact process.
- i. Name another catalyst which can be used for this process. (1mk)
- *Platinised asbestos.*
- ii. Give two reasons why vanadium (V) oxide is the commonly used catalyst. (2mks)
- *Not highly/ easily poisoned by impurities*
  - *It is cheap*
- d) State and explain the observations made when concentrated sulphuric (VI) acid is added to crystals of copper (II) sulphate in a beaker. (1mk)
- *Crystals turn from blue to white; concentrated sulphuric (VI) acid removes water of crystallization from hydrated copper (II) sulphate.*

e) The reaction of concentrated sulphuric (VI) acid with sodium chloride produces hydrogen chloride gas. State the property of concentrated sulphuric (VI) acid illustrate in this reaction. (1mk)

- ***Concentrated sulphuric (VI) acid is less volatile hence displaces more volatile acids from their salts.***

f) Name four uses of sulphuric (VI) acid. (2mks)

