Name…………………………………………   **Index No………………/……….**

School……………………………………   Candidates Signature…………

                                         Date………………………………..

233/2
CHEMISTRY
Paper 2
(THEORY)
September 2021
TIME 2 HOURS

JOINT PREMOCK 1
*Kenya Certificate of Secondary Education (K.C.S.E)*

INSTRUCTIONS TO CANDIDATES

- Write your name, school and index number in the spaces provided above.
- Sign and write date of examination in the spaces provided above.
- Answer **ALL** questions in the spaces provided.
- Mathematical tables and silent electronic calculators may be used.
- All workings **MUST** be clearly shown where necessary.

Questions	Maximum Score	Candidate's Score
1	14	
2	14	
3	11	
4	14	
5	16	
6	11	
TOTAL	80	

This paper consists of 11 printed pages
Candidates should check the question paper to ensure that all the
Papers are printed as indicated and no questions are missing

1. The scheme below shows a series of reactions and compounds. Study it and use it to answer the questions that follow.
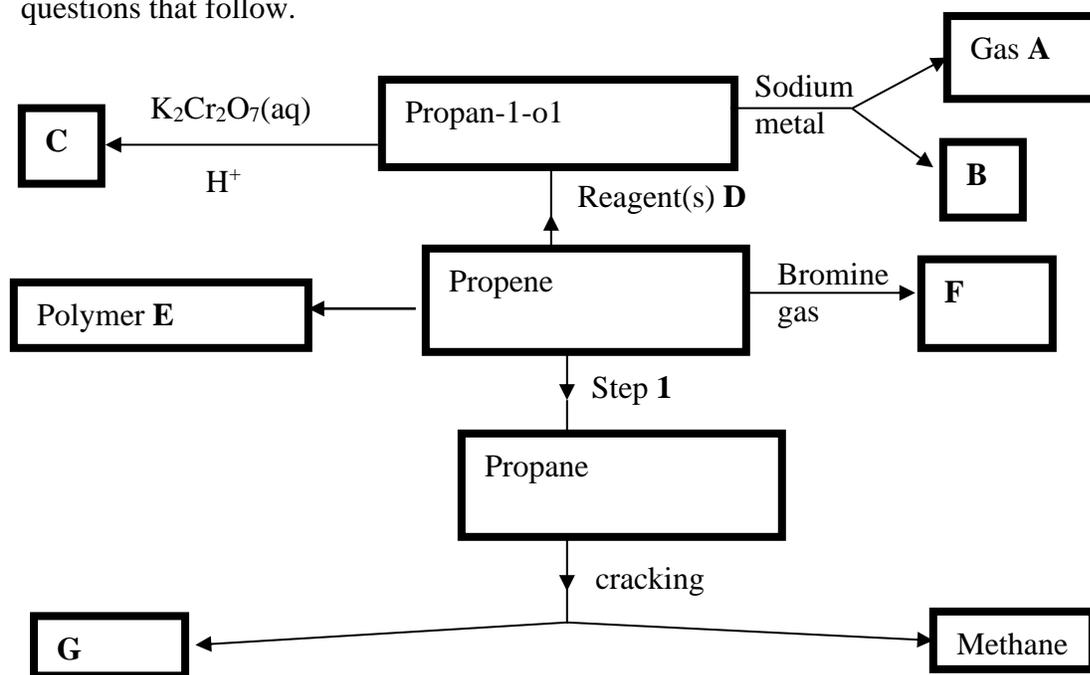
(a) Identify the following compounds and products   (6marks)

A………………………………………………………………………………………

B………………………………………………………………………………………

C………………………………………………………………………………………..

E…………………………………………………………………………………………..

F…………………………………………………………………………………………..

G…………………………………………………………………………………………..

(b) State 2 conditions for **step 1** to occur.   (1 mark)

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…………………………………………………………………………………………….

(c) Write an equation for the formation compound **F.**   (1 mark)

……………………………………………………………………………………………

……………………………………………………………………………………………

(d) Identify reagent(s) **D.**   (1 mark)

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(e) State one industrial use of methane. (1 mark)

…………………………………………………………………………………………………

…………………………………………………………………………………………………..

(f) Name the following organic compounds. (3 marks)

(i) C_3H_4

…………………………………………………………………………………………………

(ii) $CH_3CH_2\ CH_2\ CH\ CH_2\ CH_3$
$|$
OH

…………………………………………………………………………………………………

(iii) $CH_2 = C – CH_3$
$|$
CH_3

…………………………………………………………………………………………………..

(g) Draw the structure of a section of polymer E showing three repeat units. (1 mark).

2. The table below shows the elements in period 3 of the periodic table. Study it and answer the questions that follow.

Element	Na	Mg	Al	Si	P	S	Cl	Ar

(a) Write the formulae of two oxides for each of the following: (2 marks)

   (i)   Sodium: Oxide I ……………………………………. Oxide II …………………………..

   (ii) Sulphur: Oxide I ……………………………………. Oxide II …………………………..

(b) The products of the reaction between phosphorus and chlorine depend on the conditions used.

   Write the equation for the reaction when phosphorus reacts with limited phosphorus. (1 mark)

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(c) Identify the most electronegative element. Give a reason. (2 marks)

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(d) State and explain the differences in the boiling points of:

    (i)   Magnesium oxide and sulphur (IV) oxide.   (2 marks)

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………
………

    (ii)   Sulphur and phosphorus.   (2 marks)

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………
………

(e) The diagram below shows the electrolysis of the chloride of sodium.

molten sodium chloride
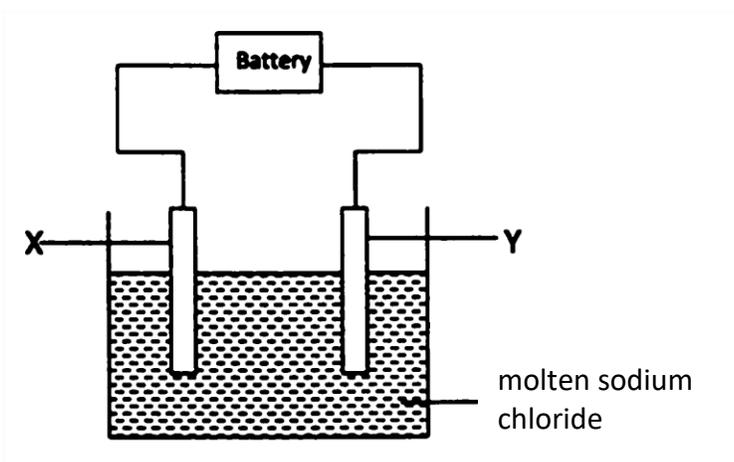
(a) On the diagram, indicate the missing condition.   (1 mark)

(b) During the electrolysis, chlorine gas was formed at electrode Y. Identify the:

    (i)   Anode…………………………………………………………………….   (1 mark)

    (ii)   Cathode…………………………………………………………………..   (1 mark)

(c) Write the half equation for the reaction taking place at the:

    (i)   Anode.   (1 mark)

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………

(ii)   Cathode.   (1 mark)

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3. A student set up the apparatus shown below to prepare and collect dry carbon (IV) oxide gas.

Dilute H_2SO_4 acid

Water

Calcium carbonate   Concentrated sulphuric (VI) acid
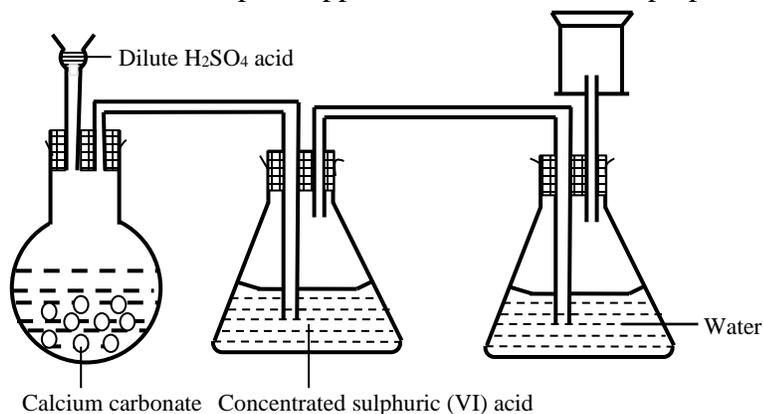
(a) State a correction for three mistakes in the set up above   (3 marks)

(i)   ………………………………………………………………………………………………………

      ………………………………………………………………………………………………………

(ii) ………………………………………………………………………………………………………

      ………………………………………………………………………………………………………

(iii) ………………………………………………………………………………………………………

      ………………………………………………………………………………………………………

(b) Give two reasons why carbon (IV) oxide is used as a fire extinguisher   (1 mark)

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(c) The flow chart below is for the manufacture of sodium carbonate by the Solvay process. Use it to answer the questions that follow.
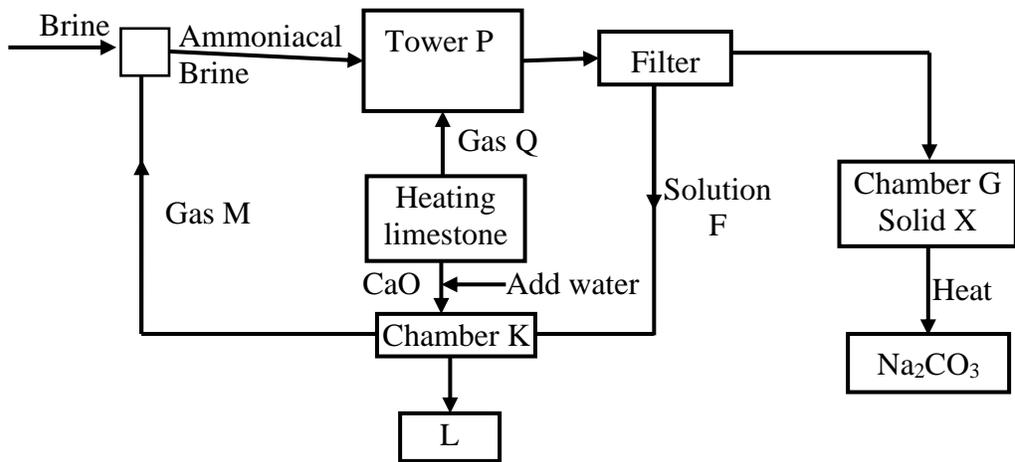
(i)   Name:

Gas M ………………………………………… Gas Q ………………………….………………… (1 mark)

Solution F …………………………………… Solid X ……………………….……………….. (1 mark)

(ii)   Name the product L formed and give one of its uses.   (2 marks)

Name: ………………………………………………………………………………………………

Use: …………………………………………………………………………………………………

(iii)   Write equations of the reactions in: (2 marks)

Tower P (Overall equation)

……………………………………………………………………………………..……………..

Chamber K

……………………………………………………………………………………………………

(v) Name the two raw materials required in the manufacture of sodium carbonate   (1 mark)

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4. Study the flow chart below and answer the questions that follow.
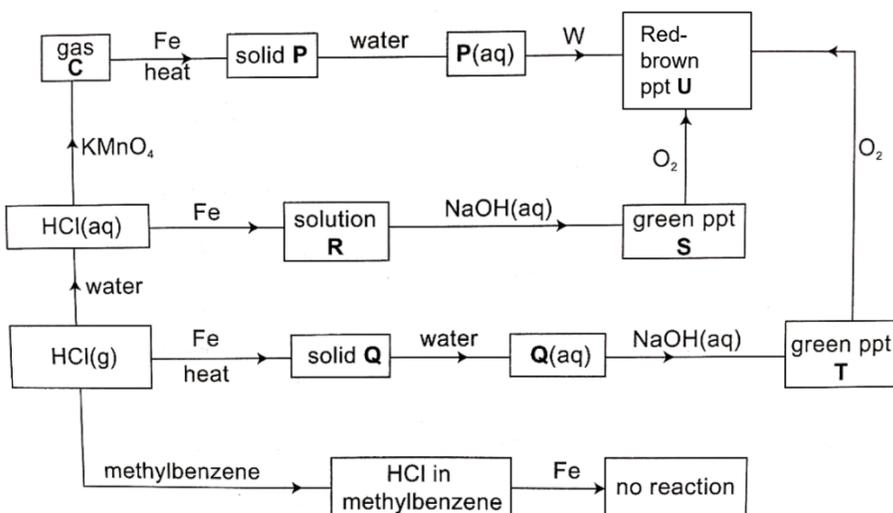
(a) Identify:

(i)   Gas C …………………………………………………………………………… (½ mark)

(ii)   Solid Q ………………………………………………………………………….. (½ mark)

(iii)   Solid P …………………………………………………………………………… (½ mark)

(b) From the flow chart, give two solutions that contain the same metallic ions. (1 mark)

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(c) Give two precipitates in the flow chart that are the same and name them. (3 marks)

Precipitates: …………………………………………………………………………………………………….

Name: ……..

(d) Explain the difference between HCl (g) in water and in methylbenzene as shown in the flow chart.

(2 marks)

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(e) Name reagent W. (½ mark)

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(f) Write the equations for:

    (i)   The formation of solid P. (1 mark)

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    (ii)   The formation of solid Q. (1 mark)

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(g) In the preparation of a bleaching agent (sodium hypochlorite), excess chlorine gas was bubbled into 15 litres of cold 2M sodium hydroxide.

(i) Write the equation for the reaction between chlorine gas and cold dilute sodium hydroxide.

(1 mark)

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(ii) Calculate the mass in **kilograms** of sodium hypochlorite produced. (Na = 23.0, Cl = 35.5, O = 16.0)

(3 marks)

5. Study the flow chart below and answer the questions that follow.
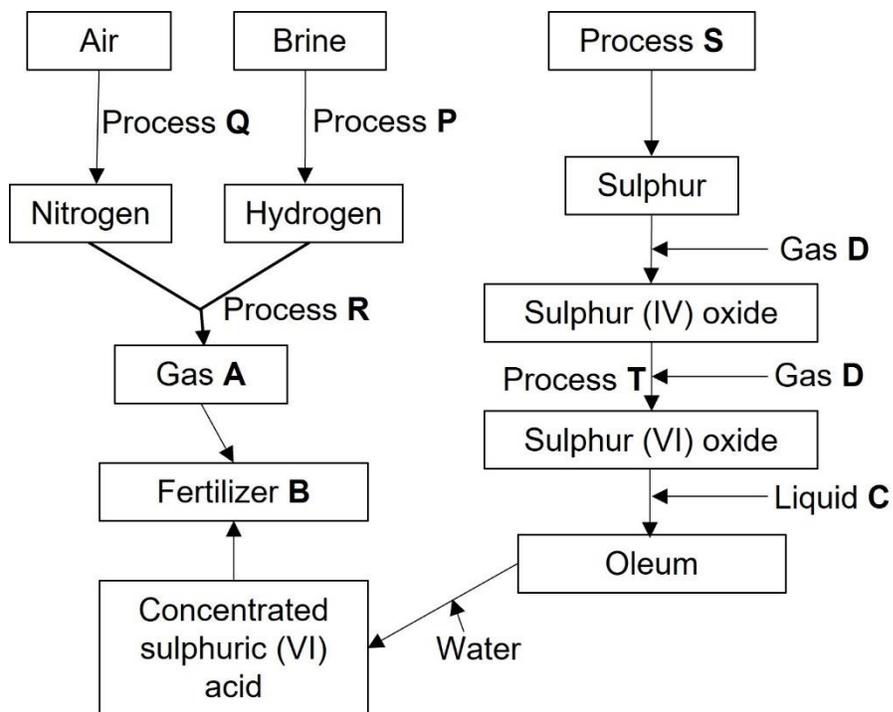
(a) Name the following: (3 marks)

   (i)   Process **Q** ……………………………………………………………………………………….

   (ii) Process **R** …………………………………………………………………………………..

   (iii) Process **S** …………………………………………………………………………………..

   (iv) Process **T** …………………………………………………………………………………..

   (v) Gas **A** …………………………………………………………………………………………

   (vi)Fertilizer **B** …………………………………………………………………………………

(b) Why is liquid C used instead of water? (1 mark)

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(c) Write the formula of oleum. (1 mark)

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(d) Write the equation for the formation of:

   (i)   fertilizer **B**. (1 mark)

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(ii)   gas **A**.   (1 mark)

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(e) Name the **catalyst** and give the **conditions** for:

(i) Process **R**.   (3 marks)

Catalyst ……………………………………………………………………………………………………

Conditions …………………………………………………………………………………………………

(ii) Process **T**.   (3 marks)

Catalyst ……………………………………………………………………………………………………

Conditions …………………………………………………………………………………………………

(h) Explain how nitrogen is obtained from air using process **Q**.   (3 marks)

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6. The following is a procedure that was used to obtain the solubility of a salt **Q** in water at 25^0C. Study it and answer the questions that follow.

Salt **Q** was dissolved in warm distilled water until no more could dissolve. The mixture was then cooled to 25^0C and allowed to settle. A dry evaporating dish and dry watch glass were weighed. Some of the solution was decanted into the dish, covered with the watch glass, and then weighed.

The solution was evaporated to dryness over a small flame. This residue, the dish and the watch glass were weighed. The residue was then heated repeatedly until a constant mass was obtained. The results below were obtained.

Mass of dish + Watch glass = 50.60g
Mass of solution + dish + watch glass = 80.6g
Mass of residue + dish + watch glass = 62.60g

(a) Use the data to answer the questions that follow.

(i) What is the purpose of the watch glass in such an experiment? (1 mark)

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(ii) Why should the heating be continued until a constant mass is obtained? (1 mark)

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(iii) Calculate the mass of the solution. (1 mark)
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(iv) Calculate the mass of the residue. (1 mark)

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(v) Calculate the mass of the water. (1 mark)

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(vi) Calculate the solubility of salt **Q** in g per 100g of water at 25^0C. (2 marks)

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(b) Hard water has both advantages and disadvantages. Give one advantage and one
   disadvantage of using hard water. (2 marks)

Advantage

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Disadvantage

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(c) Using an equation, explain how addition of sodium carbonate is used to remove water
   hardness. (2 marks)

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