

| | | |
|---|---------------------------|--|
| To the third portion, 3cm ³ of aqueous sodium carbonate was added, the mixture filtered and 1cm ³ of soap solution added to the filtrate. | Lather formed immediately | |
|---|---------------------------|--|

Complete the table by filling in the inferences.

(3 marks)

26. A water trough, aqueous sodium hydroxide, burning candle, watch class and a graduated gas jar were used in an experimental set up to determine the percentage of active part of air. Draw a labeled diagram of the set up at the end of the experiment.

(3 marks)

27. The atomic numbers of phosphorus, sulphur and potassium are 15, 16 and 19 respectively. The formulae of their ions are P³⁻, S²⁻ and K⁺. These ions have the same number of electrons.

- a) Write the electron arrangement for the ions.

(1 mark)

- b) Arrange the ions in the order of increasing ionic radius starting with the smallest. Give a reason for the order.

(2 marks)

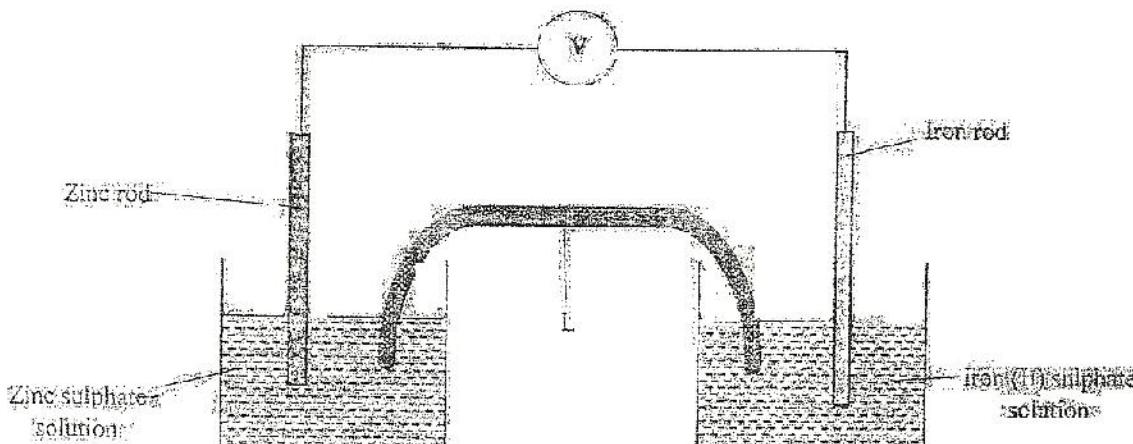
**K.C.S.E YEAR 2010
PAPER 2**

1.

- a) Which one of the following compounds; urea, ammonia, sugar and copper (II) chloride will conduct an electric current when dissolved in water? Give reasons.

(2 marks)

- b) The diagram below shows an electrochemical cell. Study it and answer the questions that follows.



Given the following



- i) Show on the diagram using an arrow, the direction of flow of electrons
(1 mark)

- ii) Name **two** substances that are used to fill the part labeled L
(2 marks)

- c) In an experiment to electroplate iron with silver, a current of 0.5 amperes was passed through a solution of silver nitrate for an hour

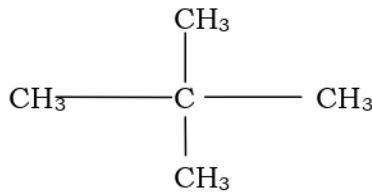
- i) Give **two** reasons why it is necessary to electroplate iron with silver
(2 marks)

- ii) Calculate the mass of silver that was deposited on iron ($\text{Ag} = 108$, 1 Faraday = 96,500 coulombs) (3mks)

2.

- i. Give the name of the following compounds:

- i)

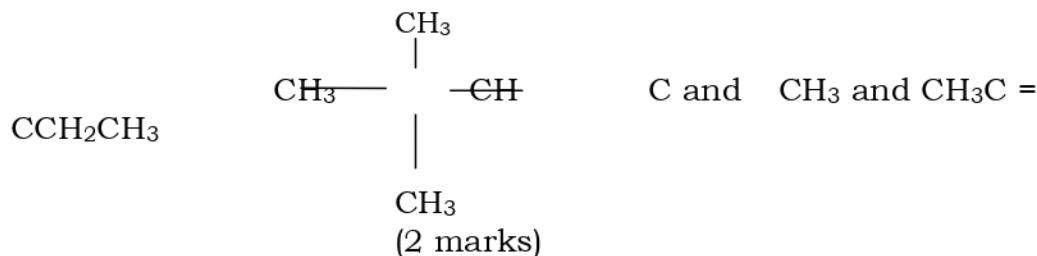


(2 marks)

- ii) $\text{CH}_3\text{C} = \text{CCH}_2\text{CH}_3$

(1 mark)

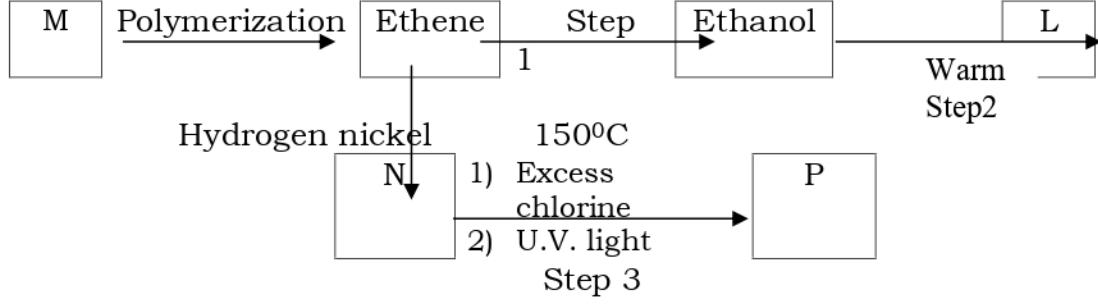
- ii. Describe a chemical test that can be carried out in order to distinguish between



- iii. Study the flow chart below and answer the questions that follows

- a. Ethanoic acid
- b. Concentrated Sulphuric acid

ric(v
i)
acid



- i) Name the compounds:
(2 marks)

2. L
3. N

- ii) Draw the structural formula of compound M showing two repeat units
(1 mark)

- iii) Give the reagent and the conditions used in step I
(1 mark)

- iv) State the type of reaction that take place in:
(2 marks)

- a. Step 2
b. Step 3

2. The molecular formula of compound P is $C_2H_2Cl_4$. Draw the two structural formulae of compound P(2 marks)

3. Use the information in the table below to answer the questions that follow.
The letters do not represent the actual symbols of the elements.

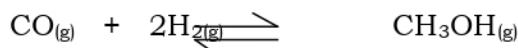
| Element | Atomic number | Melting point ($^{\circ}C$) |
|---------|---------------|-------------------------------|
| R | 11 | 97.8 |
| S | 12 | 650.0 |
| T | 15 | 44.0 |
| U | 17 | -102 |
| V | 18 | -189 |
| W | 19 | 64.0 |

- a) Give the reasons why the melting point of:

- i) S is higher than that of R
 (1 mark)
- ii) V is lower than that of U
 (2 marks)
- b) How does the reactivity of W with chlorine compare with that of R with chlorine?
 Explain,
 (2 marks)
- c) Write an equation for the reaction between T and excess oxygen
 (1 mark)
- d) When 1.15g of R were reacted with water, 600cm³ of gass was produced.
 Determine the relative atomic mass of R. (Molar gas volume = 24000cm³)
 (3 marks)
- e) Give one use of element V
 (1 mark)
- 4.
- a. 50cm³ of 1M copper (II)sulphate solution was placed in a 100cm³ plastic beaker. The temperature of the solution was measured. Excess metal A powder was added to the solution, the mixture stirred and the maximum temperature was repeated using powder of metals **B** and **C**. The results obtained are given in the table below:

| A | B | C |
|--------------------------|----------|----------|
| Maximum temperature (°C) | 26.3 | 31.7 |
| Initial temperature (°C) | 22.0 | 22.0 |

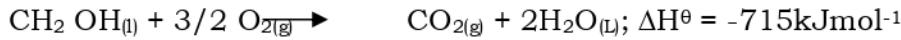
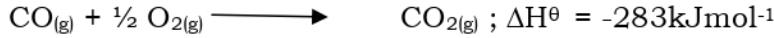
- Arrange the metal **A**, **B**, **C** and copper in order of reactivity starting with the least reactive. Give reasons for the order.
 (3 marks)
- Other than temperature change, state one other observation that was made when the most reactive metal was added to the copper(II) sulphate solution.
 (1 mark)
- The standard enthalpy change of formation of methanol is -239 kJmol⁻¹.
 - Write the thermol chemical equation for the standard enthalpy change of formation of methanol. (1 mark)
 - Methanol is manufactured by reacting carbon(II)oxide with hydrogen at 300°C and a pressure of 250 atmospheres.
 The equation for the reaction is:



- How would the yield of methanol be affected if the manufacturing process above is carried out at 300°C and a pressure of 400

atmosphere? Explain (2 marks)

2. Use the following data to calculate the enthalpy change for the manufacture of methanol from carbon(II)oxide and hydrogen (3 marks)

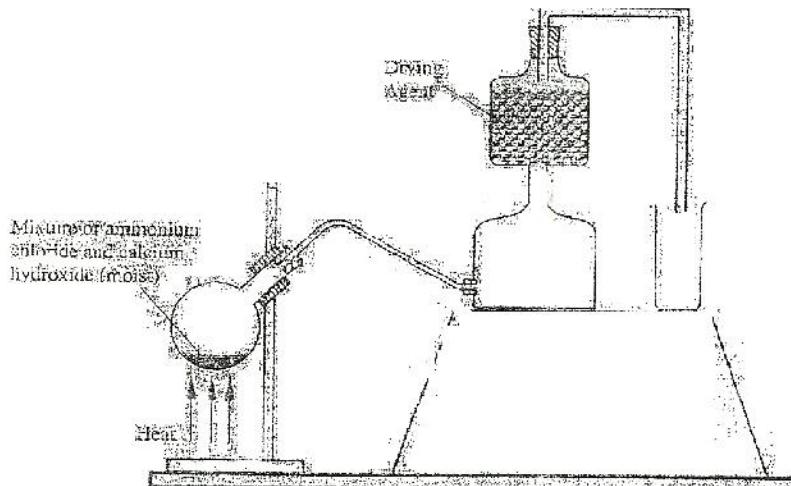


- iii) The calculate enthalpy change in part B(ii) (II) above differ from the standard enthalpy change of formation of methanol. Give a reason.

(1 mark)

5.

- a) A student set up the apparatus as shown in the diagram below to prepare and collect dry ammonia gas.



- i) Identify **two** mistakes in the set up and give a reason for each mistake. (3 marks)

1. Mistake

Reason

2. Mistake

Reason

- ii) Name a suitable drying agent for ammonia

(1 mark)

- iii) Write an equation for the reaction that occurred when a mixture of ammonium chloride and calcium hydrogen was heated.

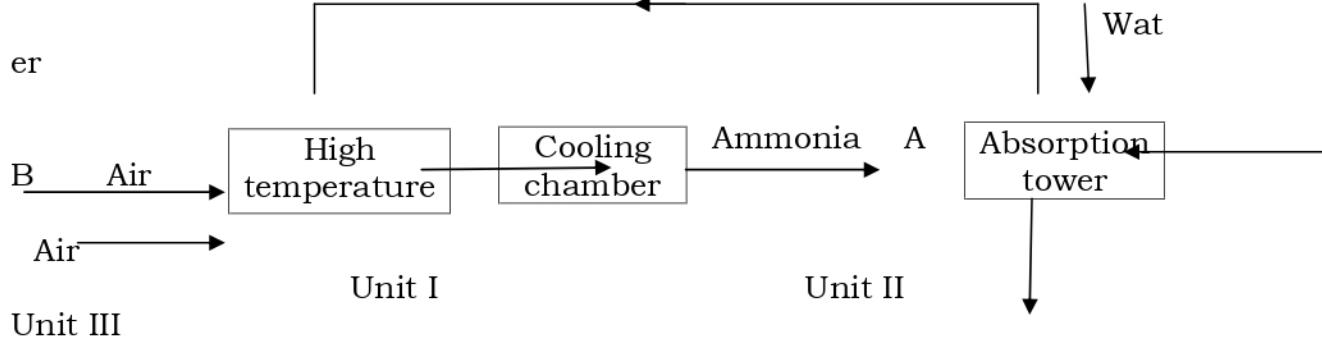
(1 mark)

- iv) Describe **one** chemical test for ammonia gas

(1 mark)

- d) Ammonia gas is used to manufacture nitric (V) acid, as shown below.

Gases



Water(v)acid

- i) This process require the use of a catalyst. In which unit is the catalyst used? (1 mark)
 - ii) Identify compound **A** and **B** (1 mark)
 - iii) Using oxidation number, explain why the conversion of ammonia to nitric(V) acid is called catalytic oxidation of ammonia (2 marks)
 - iv) Ammonia and nitric(V) acid are used in the manufacture of ammonium nitrate fertilizer. Calculate the amount of nitric (V) acid required to manufacture 1000kg ammonium nitrate using excess ammonia. (3 marks)
6. The melting and boiling points of zinc are 419°C and 907°C respectively. One of the ores of zinc blende. To extract zinc, the ore is first roasted in air before feeding it into a furnace.

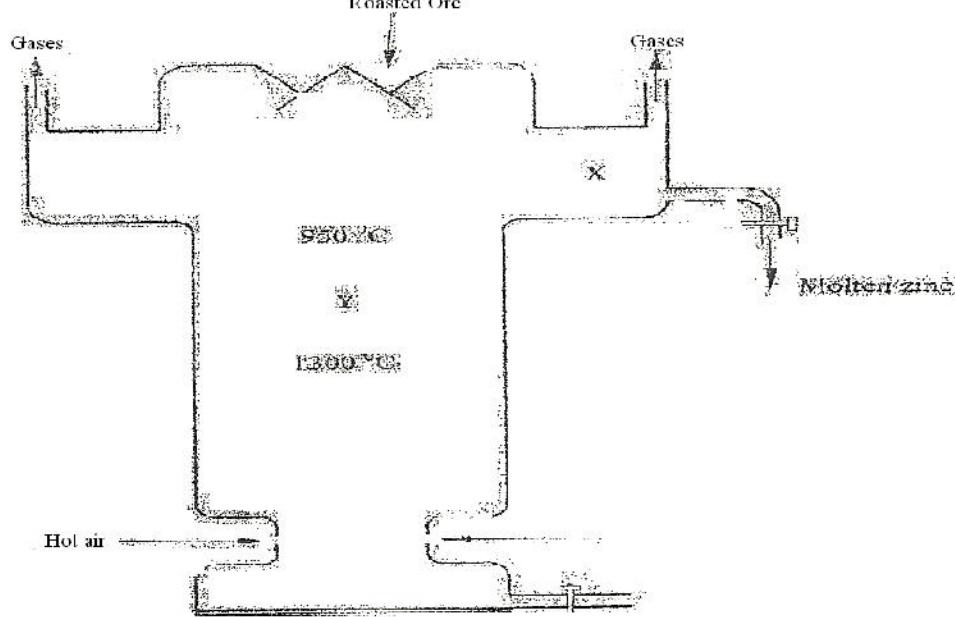
a.

- i) Write the formula of the main zinc compound in zinc blende. (1 mark)
- ii) Explain using an equation why it is necessary to roast the ore in air before introducing it into the furnace

(
2

m
a
r
k
s
)

- b. The diagram below shows a simplified furnace used in the extraction of zinc. Study it and answer the questions that follows:



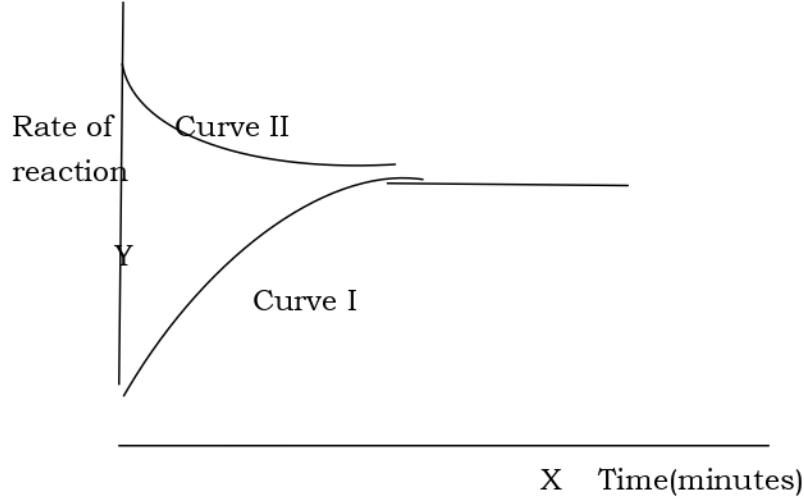
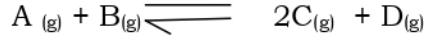
- i) Name **two** other substance that are also introduced into the furnace together with roasted ore. (1 mark)
- ii) The main reducing agent in the furnace is carbon(II) oxide. Write **two** equations showing how it is formed.

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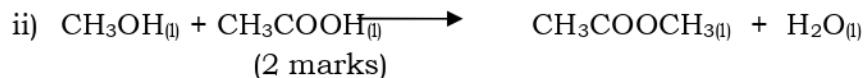
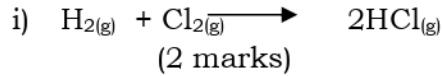
m
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)

- iii) In which physical state is zinc at point **Y** in the furnace? Give a reason (1 mark)
- iv) Suggest a value for the temperature at point **X** in the furnace. Give a reason. (1 mark)
- v) State and explain **one** environmental effect that may arise from the extraction of zinc from zinc blende (2 mks)
- vi) Give **two** industrial uses of zinc.
(1 mark)

7. The figure below shows how the rate of the following reaction varies with the time.



- i) Which of the two curves represent the rate of the reverse reaction? Give a reason (2 marks)
- ii) What is the significance of point **X** and **Y** on the figure? (2 marks)
- b) State and explain the effect of an increase in pressure on the rates of the following reactions.



- c) In an experiment to study the rate of reaction between barium carbonate and dilute hydrochloric acid; 1.97g of barium carbonate were reacted with excess 2M hydrochloric acid. The equation for the reaction is



The data in the table was obtained

| | | | | | | | | | |
|-----------------|---|----|----|----|-----|-----|-----|-----|-----|
| Time in seconds | 0 | 30 | 60 | 90 | 120 | 150 | 180 | 210 | 240 |
|-----------------|---|----|----|----|-----|-----|-----|-----|-----|

| | | | | | | | | | |
|-------------------------------------|---|----|-----|-----|-----|-----|-----|-----|-----|
| Volume of gas (cm ³) | 0 | 80 | 135 | 175 | 210 | 230 | 240 | 240 | 240 |
|-------------------------------------|---|----|-----|-----|-----|-----|-----|-----|-----|

- i) On a grid plot a graph of volume of gas produced (vertical axis) against time (3 marks)
- ii) From the graph, determine the rate of the reaction at:
 - (I) 15 seconds (1 mark)
 - (II) 120 seconds (1 mark)
 - (III) Give a reason for the difference between the two values. (1 mark)