

KAHURO/MURANG'A EAST JOINT EXAMINATION – 2016

233/1

CHEMISTRY

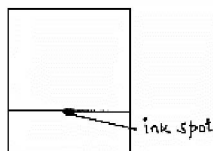
PAPER 1

(THEORY)

JULY/AUGUST, 2016

TIME: 2 HOURS

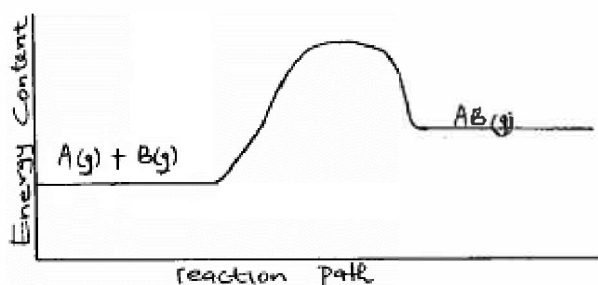
1. A given sample of ink is a mixture of red dye, blue dye and orange dye. The blue dye is least absorbed than the rest and the red dye is most sticky.
- (a) Complete the paper chromatogram below showing their separation. (1½mks)



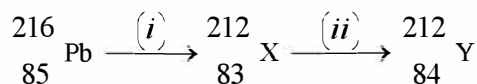
- (b) The above dyes are soluble in water. Describe how a pure sample of blue dye can be obtained. (1mk)
- (c) Name the solvent used in paper chromatography. (½mk)
2. Excess iron was allowed to rust in 2dm³ of moist air and the volume of air remaining was measured at 1 atmospheric pressure each day. The results were as follows.

Day	0	1	3	4	5	6	7	8
Volume (cm ³)	2000	1900	1720	1660	1620	1600	1600	1600

- (i) Write an equation for the formation of rust. (1mk)
- (ii) On which day was the reaction complete. Explain. (1mk)
- (iii) What is the percentage volume of oxygen in air. Show your working. (1mk)
3. State **two** properties of copper that make it suitable for making ornaments. (2mks)
4. Give the IUPAC name of the following: (1mk)
- (i) CH₃CH₂COOCH₂CH₃
- (ii) Give the name of the homologous series to which the compound belongs. (1mk)
- (iii) Name and draw the alcohol that formed the compound in 4(i) above. (1mk)
5. Consider the following equation.

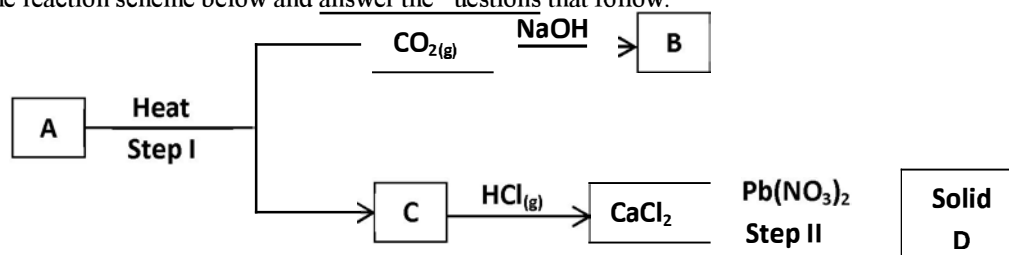


- On the same axis, sketch the graph when a catalyst is added and label all the essential parts. (2mks)
6. A radioactive isotopes of lead undergoes radioactive decay in two stages are shown below.

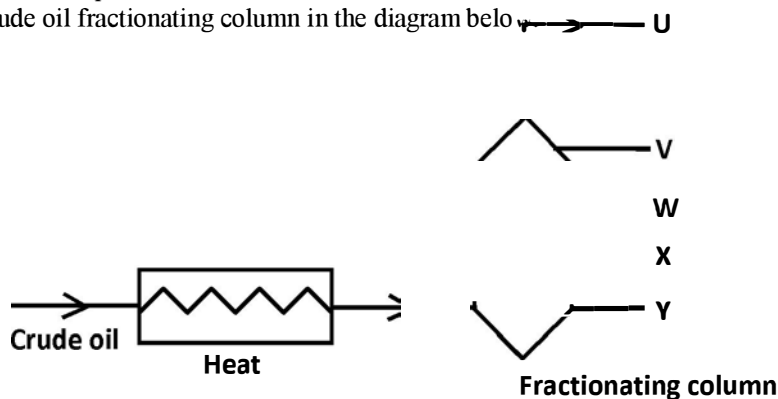


- (a) Identify the particle emitted at each stage. (2mks)
- (b) State **one** use of radioactive isotopes. (1mk)
7. Aluminium chloride solution changes blue litmus paper red. Explain this observations. (2mks)
8. Nitric (V) acid may be prepared in the laboratory by the action of concentrated sulphuric (VI) acid on a suitable nitrate and distilling OFF the nitric (V) acid.
- (a) Why is the apparatus consisting of glass desirable? (1mk)
- (b) Pure nitric (V) acid is colourless but the products in the laboratory preparation is usually yellow. Explain. (2mks)
9. Describe how a solid sample of barium sulphate can be prepared starting with copper (II) oxide. (3mks)
10. The results of an experiment to determine the solubility of potassium chlorate in water at 30°C were as follows.
- Mass of dish = 15.86g.
- Mass of dish + saturated solution at 30°C = 26.8g.
- Mass of dish + solid potassium chlorate after evaporation to dryness = 16.86g.
- Calculate the mass of saturated solution containing 60g of water at 30°C. (3mks)
11. The melting point of phosphorous trichloride is -91°C while that of sodium chloride is 801°C. In terms of structure and bonding explain the difference in the melting point. (3mks)

12. Study the reaction scheme below and answer the questions that follow.

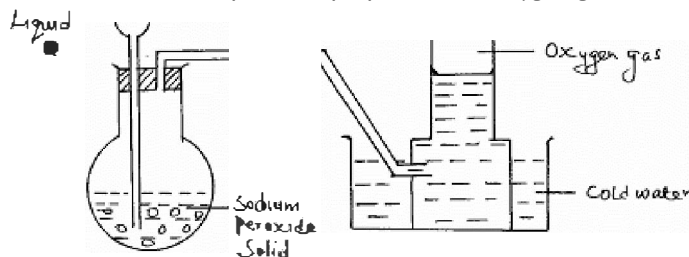


- (i) Identify substances A, B, C, D (2mks)
 (ii) Write chemical equation for the reaction taking place in Step (II). (1mk)
13. (i) Explain why the ability of temporary hard water to conduct electricity falls when water is boiled, but it does not fall when temporary hardness is removed by addition of washing soda. (2mks)
 (ii) Name the ions that causes water hardness. (1mk)
14. (i) State the Gay-Lussac's Law. (1mk)
 (ii) 15cm^3 of a gaseous hydrocarbon reacted completely with 45cm^3 of oxygen. 30cm^3 of carbon (IV) oxide were formed. Determine the formula of the hydrocarbon given that all volumes of gases were measured under the same conditions of temperature and pressure. (2mks)
15. (i) State the observation made when hydrogen sulphide gas is bubbled through aqueous lead (II) nitrate solution. (1mk)
 (ii) Write an ionic equation for the reaction above. (1mk)
16. Study the crude oil fractionating column in the diagram below.

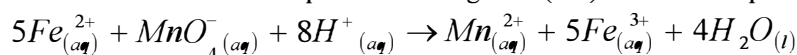


- (i) How would you expect the temperature to vary from U to Y? (½mk)
 (ii) For each fraction given below, state at what position U, V, W, Z and Y it will be collected. (2½mks)
- | Compound with | Position collected |
|---|--------------------|
| $\text{C}_{15} \rightarrow \text{C}_{25}$ atoms | |
| $\text{C}_4 \rightarrow \text{C}_{15}$ atoms | |
| $\text{C}_{20} \rightarrow$ Upwards | |
| $\text{C}_8 \rightarrow \text{C}_{16}$ atoms | |
| $\text{C}_1 \rightarrow \text{C}_4$ atoms | |

17. The apparatus below is set up for the preparation of oxygen gas in the laboratory.



- (a) Name liquid Q. (1mk)
 (b) Write a balanced chemical equation for the reaction that takes place in the reaction flask. (1mk)
 (c) Give a reason why it is preferred to use warm water to cold water when collecting oxygen gas. (1mk)
18. 25cm^3 of a solution of ammonium iron (II) sulphate $(\text{NH}_4)_2\text{SO}_4 \cdot \text{FeSO}_4 \cdot n\text{H}_2\text{O}$ with concentration of 19.6g/l was titrated with 12.5cm^3 of 0.02M acidified potassium manganate (VII). Given the equation.

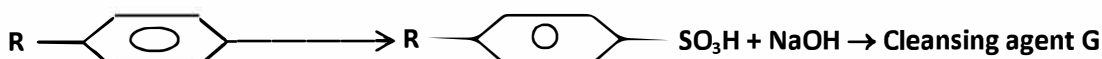


Determine the value of n in the salt.

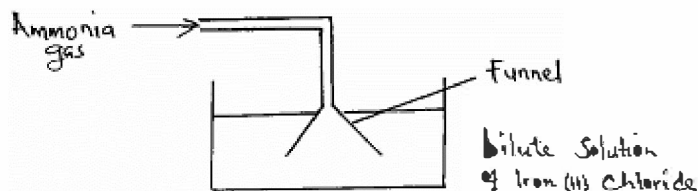
(3mks)

19. Sulphur (IV) oxide and nitrogen (IV) oxide reacts as shown in the equation below.
 $\text{SO}_2 + \text{NO}_2 \rightarrow \text{SO}_3(\text{g}) + \text{NO}(\text{g})$
 (a) Using oxidation numbers show that this is a redox reaction. (2mks)
 (b) Identify the reducing agent. (1mk)
20. Zinc can be extracted through reduction then purified by electrolytic process.
 (i) Name **two** ores from which zinc can be extracted. (1mk)
 (ii) Name a substance that can be used as reducing agent in the furnace during extraction of zinc by reduction. (1mk)
21. A student was provided with 1.5g of XCO_3 . He reacted it with 50cm^3 of 1M HCl which was excess. Determine the volume of CO_2 produced at S.T.P.
 (R.F.M of $\text{XCO}_3 = 100$) molar gas volume at S.T.P = 22400cm^3 . (2mks)

22. Explain how a catalyst affects the following in a chemical reaction.
 (i) The enthalpy change. (1mk)
 (ii) The activation energy. (1mk)
 (iii) Chemical equilibrium. (1mk)
23. The scheme below represents the manufacture of a cleansing agent G.



- (i) Draw the structure of G and state the type of cleansing agent in which G belongs. (2mks)
 (ii) State **one** advantage of using G as a cleansing agent. (1mk)
24. The equation below represents an equilibrium reaction between chromate ions and dichromate ions.
- $$2\text{CrO}_4^{2-} + 2\text{H}^+ \rightleftharpoons \text{Cr}_2\text{O}_7^{2-} + \text{H}_2\text{O}$$
- (Yellow) (Orange)
- (a) What is meant by the term dynamic equilibrium? (1mk)
 (b) State and explain the observation made if dilute sulphuric (VI) acid is added to the equilibrium mixture. (2mks)
25. Below is a set up of apparatus used to react ammonia gas with iron (II) chloride?

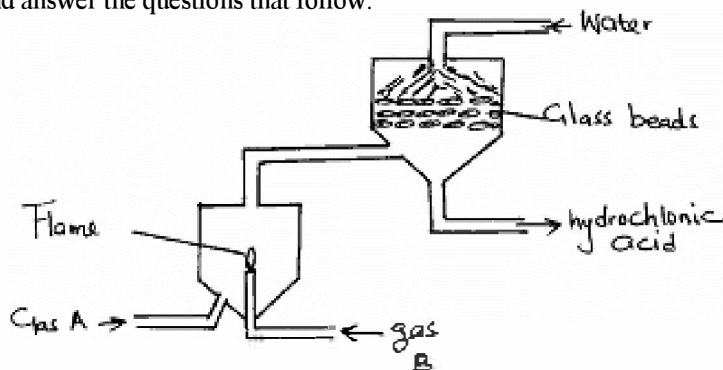


- (a) State observation made in the beaker. (1mk)
 (b) Give a reason for using a funnel to deliver the ammonia into the beaker. (2mks)
26. Your lab technician noted that the reagent bottles of sodium carbonate, sodium chloride and sugar have lost their labels. Your chemistry teacher requested you to prepare and test aqueous solutions of each sample as shown below.

Bottle	PH	Electrical conductivity
1	7	Conducts
2	7	Does not conduct
3	10	Conducts

Complete the table by filling the correct label for each bottle. (3mks)

27. The diagram below represents large scale manufacture of hydrochloric acid. Study it and answer the questions that follow.



- (a) Identify. (1mk)
- (i) Gas **A**
- (ii) Gas **B**
- (b) Write the chemical equation for the reaction between gas **A** and **B**. (1mk)
- (c) State the role of glass beads in the process. (1mk)
28. (a) Using electrons in the outermost energy level, draw (•) and cross (x) diagram for H_3O^+ and C_2H_4 (H = 1, C = 6, O = 16)
- (i) C_2H_4 (1mk)
- (ii) H_3O^+ (1mk)
- (b) What would be the effect of dipping lit mus paper in aqueous solution of H_3O^+ ? (1mk)