K.C.S.E CHEMISTRY PAPER 233/1 2003

1. Some sodium chloride was found to be contaminated with copper (II) oxide. Describe how a sample of sodium chloride can be separated from the mixture (3 marks)

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

Ion	Electronic arrangement	Ionic radius
Na^+	2.8	0.095
K^+	2.8.8	0.133
Mg^{2+}	2.8	0.065

Explain why the ionic radius of:

a) K^+ is greater than that of Na^+

b) Mg^{2+} is smaller than that of Na^+

3. Use the following equations to determine the heat evolved when aluminium metal is reacted with iron (III) oxide. (3 marks)

$2Al_{(s)} + \frac{3}{2} O_{2(g)} \rightarrow Al_2O_{3(s)}; \Delta H_1 = -1673.6 kJmol^{-1}$

$2Fe_{(s)} + \frac{3}{2} O_{2(g)} \rightarrow Fe_2O_{3(s)}; \Delta H_2 = -836.8 kJmol^{-1}$

4. Sulphur exists in two crystalline forms

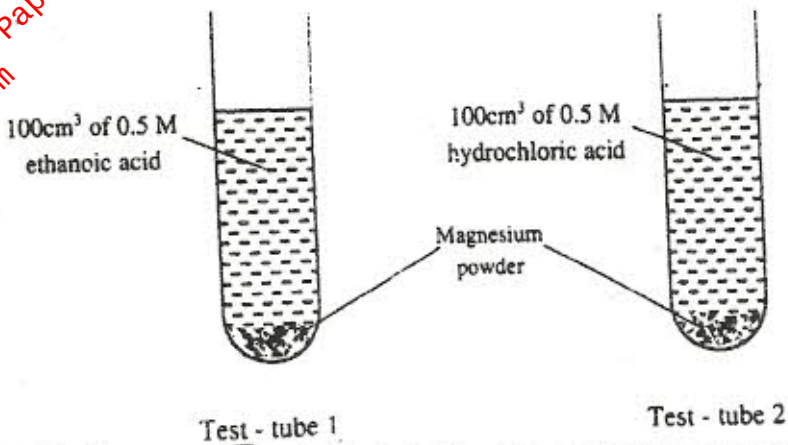
a) Name one crystalline form of sulphur (1 mark)

b) State two uses of sulphur (2 marks)

5. An atom of hydrogen can form two ions. Write two equations to show how a neutral atom of hydrogen can form the two ions. In each case show the sign of the energy change involved. (2 marks)

6. When excess dilute hydrochloric acid was added to sodium sulphite, $960cm^3$ of sulphur (IV) oxide gas was produced. Calculate the mass of sodium sulphite that was used. (Molar mass of sodium sulphite = 126g and molar gas volume = $24000cm^3$) (3 marks)

7. In an experiment, equal amounts of magnesium powder were placed into test-tube 1 and 2 as shown below.



Explain why the amount of hydrogen gas liberated in test-tube 2 is greater than in test-tube 1 before the reaction is complete (3 marks)

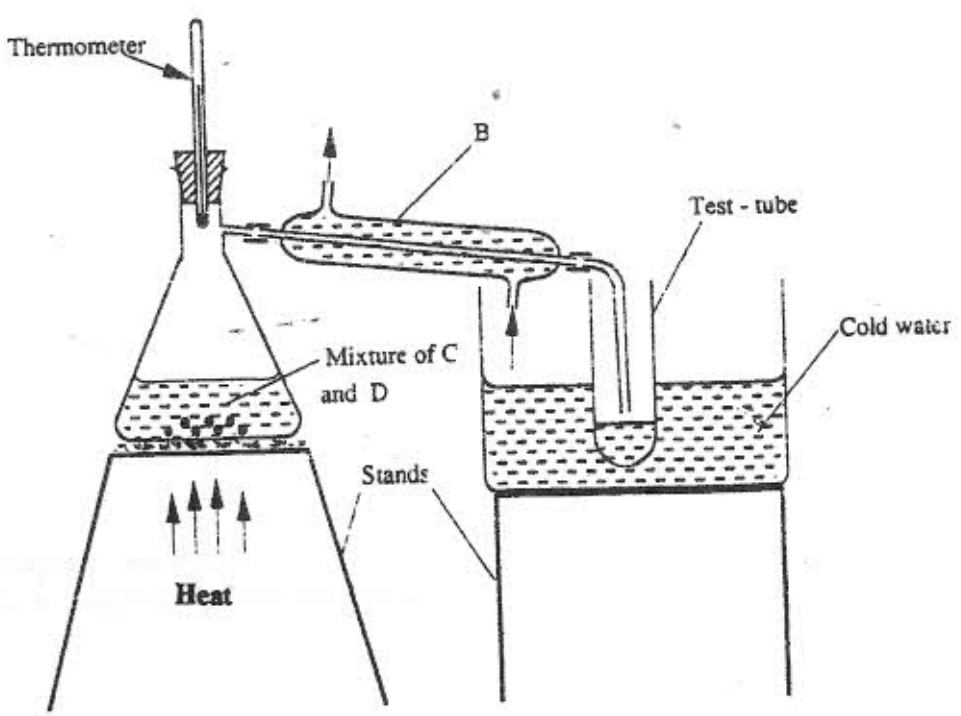
8. a) What is meant by heat of vaporisation? (1 mark)

_____

b) The boiling points of ethanol, propanol and butanol are 78°C, 97.2°C and 117°C. Explain this trend (1 mark)

_____

9. The set-up below represents the apparatus that may be used to separate mixture of two miscible liquids C and D whose boiling points are 80°C and 110°C.



a) Name B. (1 mark)

b) What is the purpose of the thermometer (1 mark)

c) Which liquid was collected in the test-tube (1 mark)

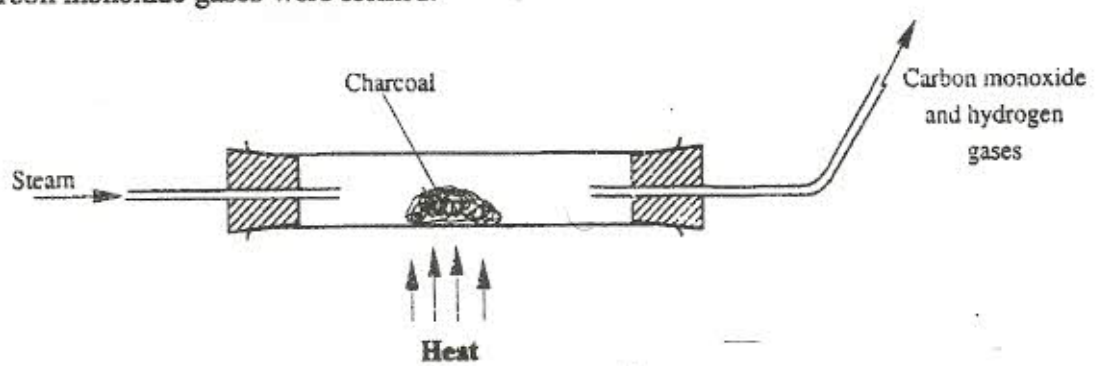
10. An oxide of element F has the formula F_2O_5

a) Determine the oxidation state of F (1 mark)

b) In which group of the periodic table is element F? (1 mark)

11. Yellow phosphorous reacts with chlorine gas to form a yellow liquid. The liquid fumes when exposed to air. Explain these observations (2 marks)

12. When steam was passed over heated charcoal as shown in the diagram below, hydrogen and carbon monoxide gases were formed.



a) Write the equation for the reaction which takes place (1 mark)

b) Name two uses of carbon monoxide gas which are also uses of hydrogen gas (2 marks)

13. Nitrogen (II) oxide and nitrogen (IV) oxide are some of the gases released from car exhaust pipes. State how these gases affect the environment. (2 marks)

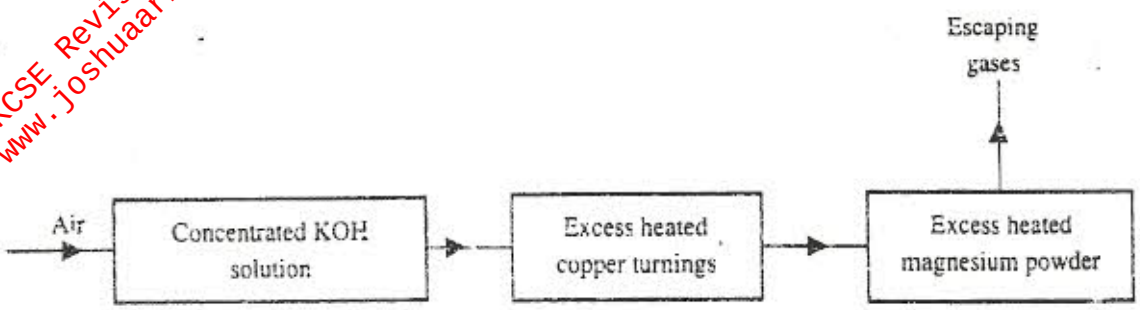
14. A few crystals of potassium permanganate were carefully placed into water in a beaker at one spot. The beaker was left undisturbed for two hours. State and explain the observation that was made (2 marks)

15. Oleum ($H_2S_2O_7$) is an intermediate product in the industrial manufacture of sulphuric acid.

a) How is oleum converted into sulphuric acid? (1 mark)

b) Give **one** use of sulphuric acid (1 mark)

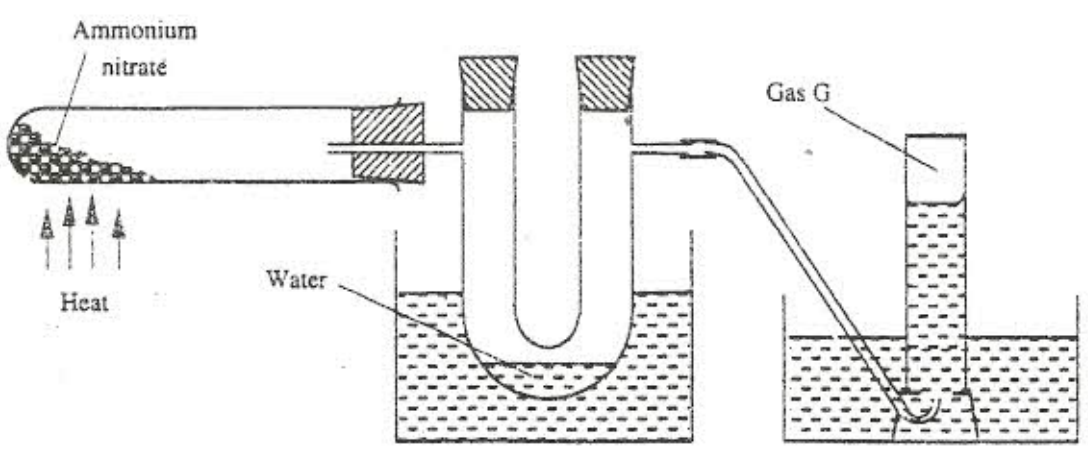
16. Air was passed through several reagents as shown in the flow chart below.



a) Write an equation for the reaction which takes place in the chamber with magnesium powder (1 mark)

b) Name **one** gas which escapes from the chamber containing magnesium powder. Give a reason for your answer (2 marks)

17. Ammonium nitrate was gently heated and the products collected as shown in the diagram below.



Describe one chemical and one physical method that can be used to identify gas G (3 marks)

18. The table below shows the tests carried out on a sample of water and the results obtained.

	Tests	Observations
I	Addition of sodium hydroxide solution dropwise until in excess	White precipitate which dissolves in excess
II	Addition of excess aqueous ammonia	Colourless solution obtained
III	Addition of dilute hydrochloric acid barium chloride	White precipitate

a) Identify the anion present in the water (1 mark)

_____

b) Write an ionic equation for the reaction in III (1 mark)

_____

c) Write the formula of the complex ion formed in II (1 mark)

_____

19. In the Haber process, the optimum yield of ammonia is obtained when a temperature of 450°C, a pressure of 200 atmospheres and an iron catalyst are use.

$N_{2(g)} + 3H_{2(g)} \rightleftharpoons 2NH_{3(g)}$; $\Delta H = -92kJ$

a) How would the yield of ammonia be affected if the temperature was raised to 600°C? (2 marks)

_____

_____

b) Give **one** use of ammonia (1 mark)

_____

20. Brass is an alloy of zinc and copper. Give **one** use of brass (1 mark)

_____

21. An organic compound with the formula $C_4H_{10}O$ reacts with potassium metal to give hydrogen gas and a white solid

a) Write the structural formula of the compound (1 mark)

_____

_____

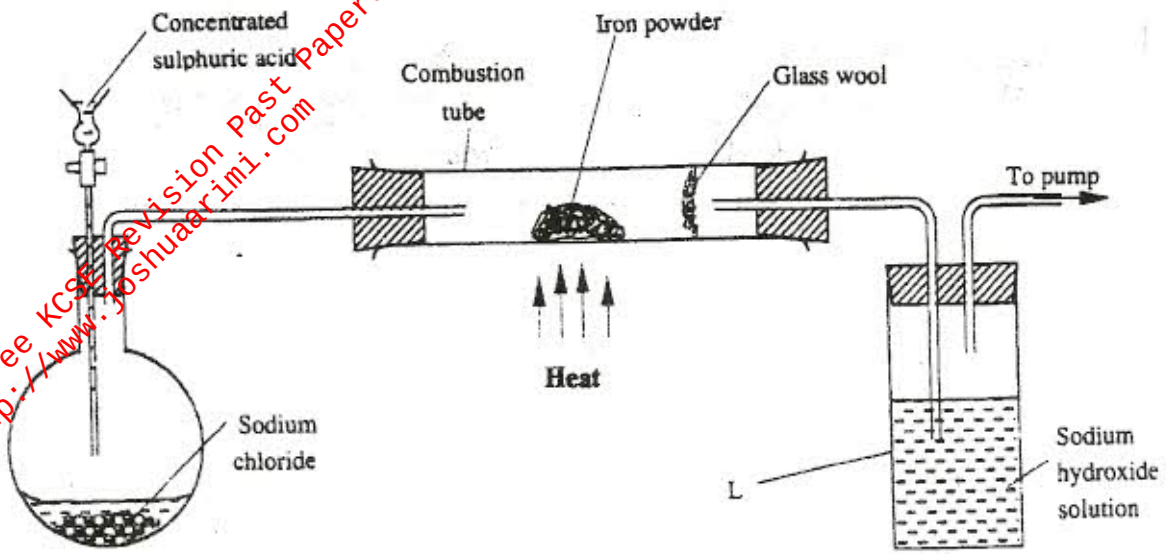
b) To which homologous series does the compound belong? (1 mark)

_____

c) Write the equation for the reaction between the compound and potassium metals (1 mark)

_____

22. The set-up below was used to prepare hydrogen chloride gas and react it with iron powder. Study it and answer the questions that follow.



At the end of the reaction, the iron powder turned into a light green solid.

a) Identify the light green solid (1 mark)

_____

b) At the beginning of the experiment, the pH of the solution in container L was about 14. At the end, the pH was found to be 2. Explain. (2 marks)

_____

23. a) State the observation made when excess pentene is reacted with bromine gas. (1 mark)

_____

b) Name the compound formed in (a) above (1 mark)

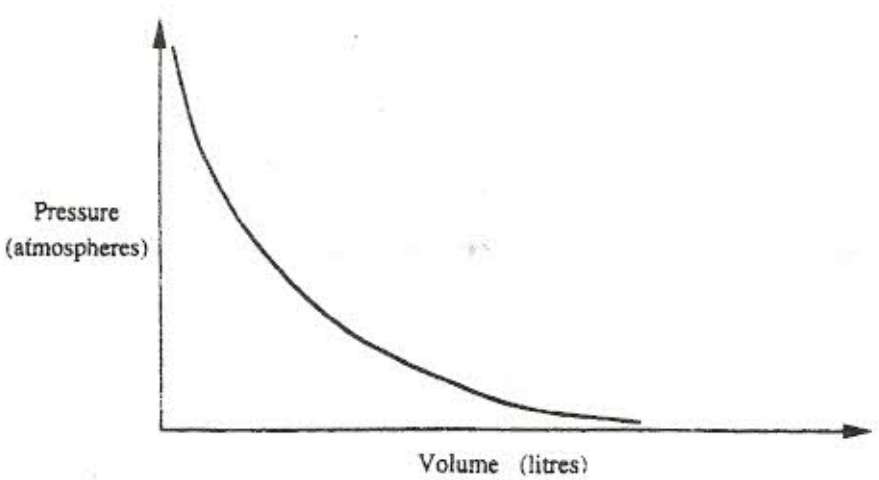
_____

24. Explain why the reactivity of group (VII) elements decreases down the group (3 marks)

_____

_____

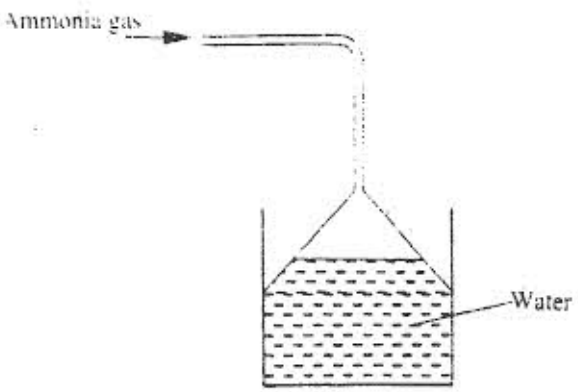
25. The graph below shows the behaviour of a fixed mass of a gas at constant temperature



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

b) 3 litres of oxygen gas at one atmosphere pressure were compressed to two atmospheres at constant pressure temperature. Calculate the volume occupied by the oxygen gas (2 marks)

26. Ammonia gas was passed into water as shown below



a) When a red litmus paper was dropped into the resulting solution, it turned blue. Give a reason for this observation (1 mark)

b) What is the function of the funnel (1 mark)

27. During purification of copper by electrolysis, 1.48g of copper were deposited when a current was passed through aqueous copper (II) sulphate for 2½ hours. Calculate the amount of current that was passed (Cu = 63.5, 1 Faraday = 96,500C) (3 marks)