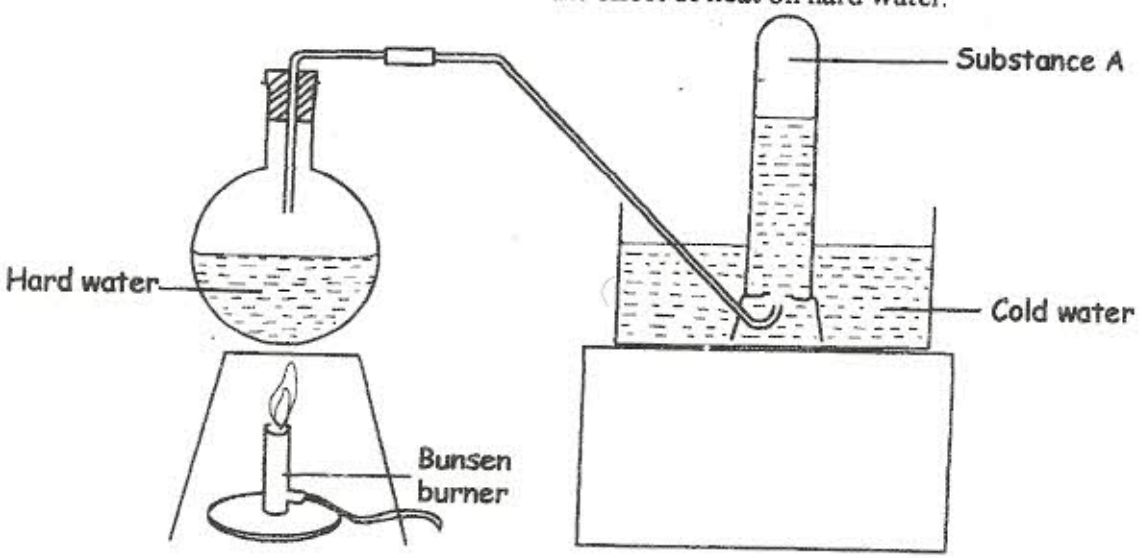
K.C.S.E CHEMISTRY PAPER 1
233/1 2005
1½ hours

1. State one use of sodium hydrogen carbonate. (1 mark)

2. Calcium oxide can be used to dry ammonia gas.
   (a) Explain why calcium is not used to dry hydrogen chloride gas. (2 marks)

   (b) Name one drying agent for hydrogen gas. (1 mark)

3. The set-up below was used to demonstrate the effect of heat on hard water.



   (a) Name substance A. (1 mark)

   (b) Explain why the heating is hard water produced substance A. (2 marks)

4. Using dots (.) and crosses (x) to represent electrons, show bonding in the compounds formed when the following elements react: (Si=14. Na=11 and Cl=17.
   a) Sodium and chlorine (1 mark)

   b) Silicon and chlorine. (1 mark)

5. Zinc oxide reacts with acids and alkalis

(a) Write the equation for the reaction between zinc oxide and:

(i) dilute sulphuric acid. (1 mark)

(ii) sodium hydroxide solution.

(b) What property of zinc oxide is shown by the reaction in (a) above? (1 mark)

6. 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	B	C	D	E	F
Atomic number	18	5	5	5	20
Mass number	10	10	7	11	40

(a) Which two letters represent the same element. Give a reason. (2 marks)

(b) Give the number of neutrons in an atom element D (1 mark)

7. Give the name and draw the structural formula of the compound formed when one mole of ethyne reacts with one mole of chlorine gas. (2 marks)

8. Determine the oxidation state of sulphur in the following compound. (2 marks)

(a) H_2S

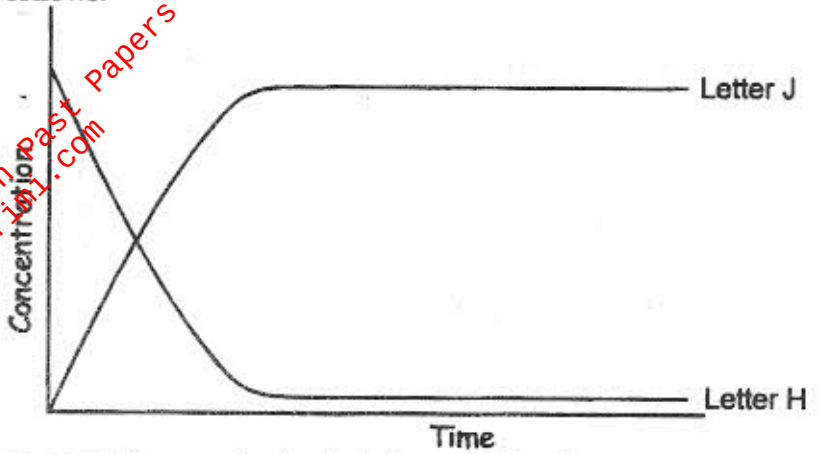
(b) $Na_2S_2O_2$

9. A certain carbonate. GCO_3 reacts with dilute hydrochloric acid according to the equation given below:

$GCO_3 + 2HCl_{(aq)} + CO_{2(g)} + H_2O_{(g)}$

If 1 of the carbonate reacts completely with 20cm^3 of 1 m hydrochloric acid. Calculate the relative atomic mass of (i). (3 marks)

10. The sketch below shows the rate at which substance H is converted into J. study it and answer question that follows.



Why do the two curves become horizontal after sometime? (1 mark)

_____

11. The reaction between hot concentrated sodium hydroxide and chlorine produces sodium chloride (V). sodium chloride and water.

(a) Write the equation for the reaction. (1 mark)

_____

_____

(b) Give one use of sodium chlorate (V). (1 mark)

_____

12. In the industrial extraction of lead metal, the ore is first roasted in a furnace. The solid mixture obtained is then fed into another furnace together with coke, limestone and scrap iron. State the function of each of the following in this process. (3 marks)

(a) Coke

_____

(b) Scrap iron

_____

13. Methane reacts with oxygen according to the equation given below

$CH_{4(g)} + 20_{2(g)} + AH = 890Hmol$

Calculate the volume of methane which would produce 111.25H when completed burnt. (Molar volume of a gas = 24 litres) (2 marks)

_____

_____

_____

14. 100g of a radioactive substance was reduced to 12.5 gm 15.6 years. Calculate the half-life of the substance. (2 marks)

_____

_____

15. In terms of structure and bonding, explain whey graphite is used as a lubricant. (2 marks)

16. The table below gives some information about elements. **I. II. III** and **IV** which are in the same group of periodic table. Use the information to answer the questions that follows.

Element	First ionization energy (kJmole)	Atomic radius (mm)
I	520	0.15
II	500	0.79
III	420	0.23
IV	400	0.25

State and explain the relationship between the variations in the first ionization energies and the atomic radii. (3 marks)

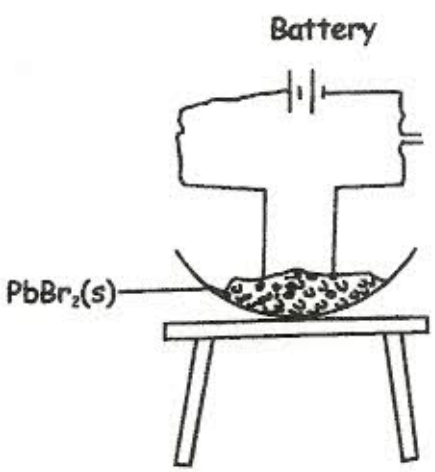
17. (a) What conditions is necessary for an equilibrium to be established (1 mark)

(b) When calcium carbonate is heated, the equilibrium shown below is established.

$$C_aC_{3(s)} \rightleftharpoons C_a0_{(s)} + C0_{2(g)}$$

How would the position of the equilibrium be affected if a small amount of dilute potassium hydroxide is added to the equilibrium mixture? Explain

18. In an experiment to investigate the conductivity of substances, a student used the set-up shown below.



The student noted that the bulb did not light.

(a) What had been omitted on the set-up? (1 mark)

_____

(b) Explain why the bulb lights when the omission is corrected. (2 marks)

_____

19. The scheme below shows the energy changes that are involved between water and steam. Study it and answer the questions that follow.

$$H_2O_{(s)} \underset{\Delta H_4}{\overset{\Delta H_1}{\rightleftharpoons}} H_2O_{(l)} \underset{\Delta H_3}{\overset{\Delta H_2}{\rightleftharpoons}} H_2O_{(g)}$$

(a) What name is given to the energy change ΔH_4? (1 mark)

_____

(b) What is the sign of "H_3? Give a reason. (2 marks)

_____

20. Equal volumes of **IM** monobasic acids **I** and **M** were each reacted with excess magnesium turnings. The table below shows the volumes of the gas produced after one minute.

Acid	Volume of gas (cm^3)
I	40
M	100

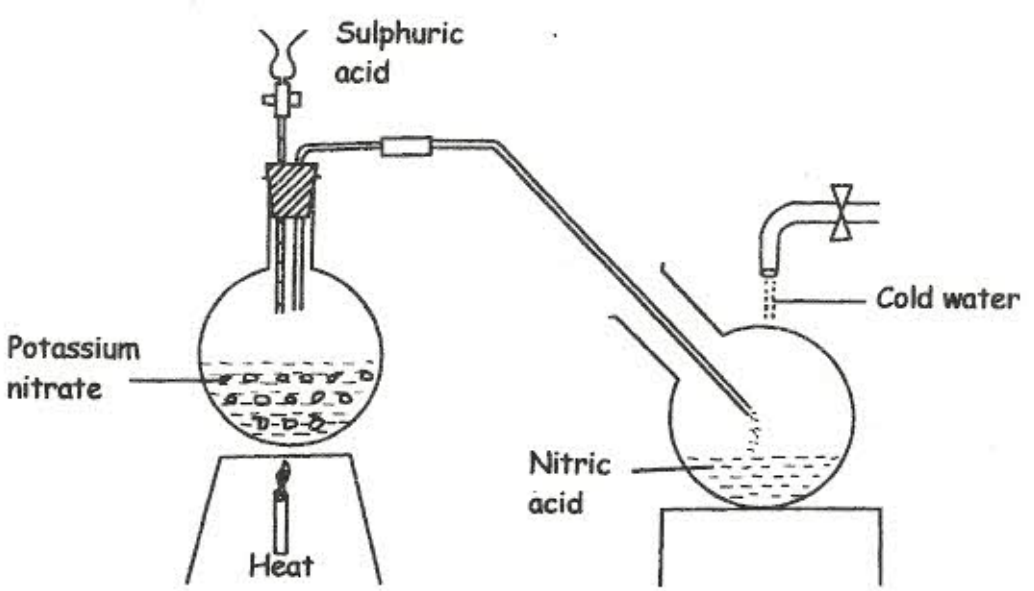
Explain the difference in the volumes of the gas produced. (2 marks)

_____

_____

_____

21. The diagram below shows a set-up that was used to prepare and collect a sample of nitric acid.



(a) Give a reason why it is possible to separate nitric acid from sculptures acid in the set-up. (1 mark)

_____

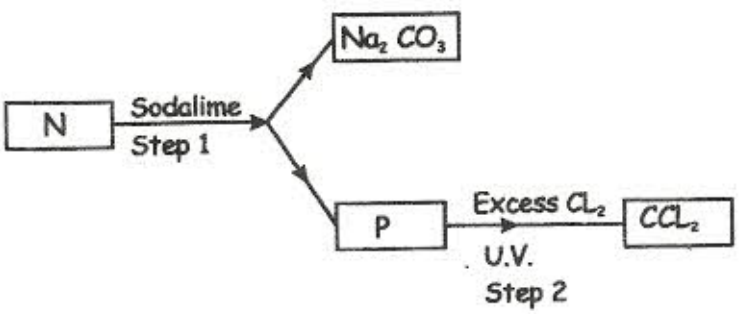
(b) Name another substance that can be used instead of potassium nitrate (1mark)

_____

(c) Give one use of nitric acid. (1 mark)

_____

22. Study the flow chart below and answer the questions that follow.



(a) Identify N and P (2 marks)

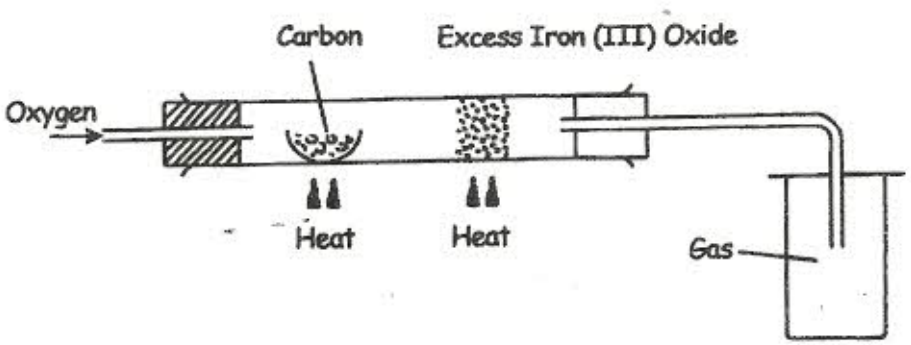
N _____

P _____

(b) What name is given to the type of halogenaton chlorination reaction in step 2? (1 mark)

_____

23. The set-up below was used to obtain a sample of iron. (1 mark)



Write two equations for the reactions which occur in the combustion tube. (2 marks)

_____

_____

_____

24. In an experiment, a gas jar containing moles sulphur dioxide was inverted over another gas jar containing hydrogen sulphide gas.
(a) State and explain the observation that was made (2 marks)

(b) State the precaution that should be taken when carrying out this experiment. (1 mark)

25. When a few drops of aqueous ammonia were added to copper (II) nitrate solution, a light blue precipitate was formed. On addition of more aqueous ammonia, a deep blue solution was formed.
Identify the substance responsible for the
(a) Light blue precipitate. (2 mark)

(b) Deep blue solution. (1 mark)

26. When a current of 0.82A was passed for 5 hours through an aqueous solution of metal Z. 2.65g of the metal were deposited. Determine the charge on the ions of metal Z. (A Faraday = 96.5000 Coulombs: Relative atomic mass of Z = 52).

27. Dry carbon monoxide gas reacts with heated lead (II) oxide as shown in the equation below.

$$PbO_{(s)} + CO_{(g)} \rightarrow Pb_{(s)} + CO_{2(g)}$$

(a) Name the process undergone by the lead (II) oxide. (1 mark)

(b) Give a reason for your answer in (a) above. (1 mark)

(c) Name another gas that can be used to perform the same function as carbon monoxide gas in the above reaction. (1 mark)

28. When a hydrocarbon was completely burnt in oxygen, 4.2g carbon dioxide and 1.71g of water were formed. Determine the empirical formula of the hydrocarbon.
(H = 1.0 : C = 12.0 : O = 16.0) (3 marks)