

ADM.....NAME.....CLASS.....

GATITU SECONDARY SCHOOL P.O BOX 327- 01030 GATUNDU

FORM FOUR CHEMISTRY PAPER 1 END TERM I EXAM

TERM I 2015

TIME 2HRS

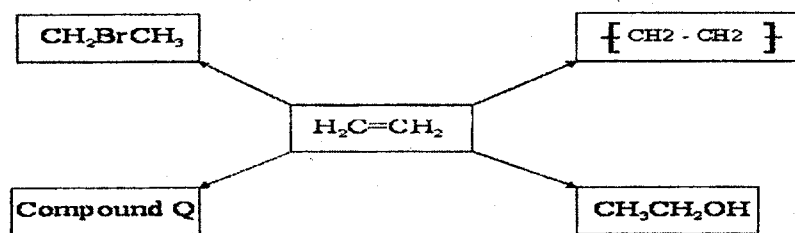
Instructions

- Write your name admission number and class in the spaces provided above
- Answer all the questions in the spaces provided in the question paper.
- Mathematical tables and electronic calculators may be used.
- All working must be shown clearly.

1. (a) Write the electronic configuration of Calcium (atomic number 20) and magnesium (atomic number 12). (1mark)

(b) Why is calcium more reactive than magnesium? (2 marks)

2. Study the scheme below and answer the questions that follow.



Name:

(i) The reagents used in process R. (1 mark)

(ii) Process S (1 mark)

(iii) Compound Q. (1 mark)

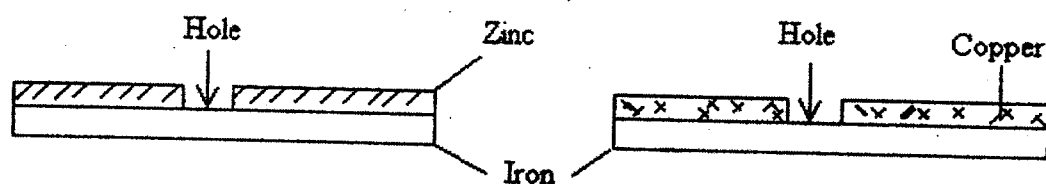
3. A weighed sample of crystalline Sodium carbonate ($\text{Na}_2\text{CO}_3 \cdot n\text{H}_2\text{O}$) was heated in a crucible until there was no further change in mass. The mass of the sample reduced by 14.5%. Calculate the number of moles (n) of the water of crystallisation. (Na = 23, O = 16, C = 12, H = 1) (3 marks)

4. (a) Give the name and formula of one chief ore of aluminium metal. (1 mark)

(b) Aluminium metal is extracted through electrolysis process. Write the equation of the reaction at the cathode during the process. (1 mark)

(c) Why is it not advisable to store Sodium hydroxide solution in an aluminium container. (1 mark)

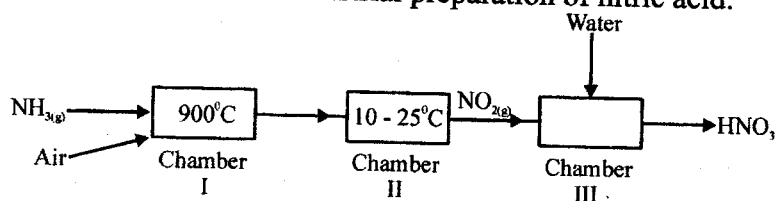
5. Below are cross - sections of two pieces coated with zinc and copper respectively.



Which piece would rust when the holes were filled with water and left for sometimes? Explain. (2 marks)

(2 marks)

6. The scheme below show the industrial preparation of nitric acid.



(a) What is the oxidation state of nitrogen in;

(i) NH_3 _____ (1 marks)

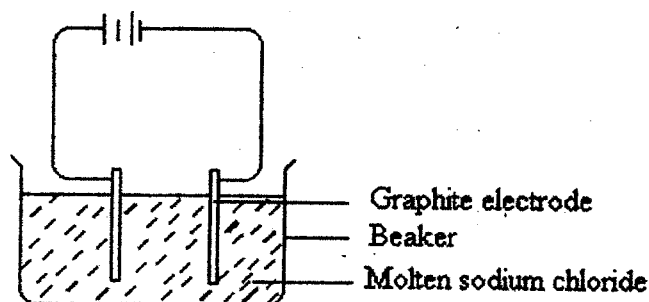
(ii) HNO_3 _____ (1 marks)

(b) Write a balanced chemical equation for the reaction taking place in.

(i) Chamber I _____ (1 mark)

(ii) Chamber II _____ (1 mark)

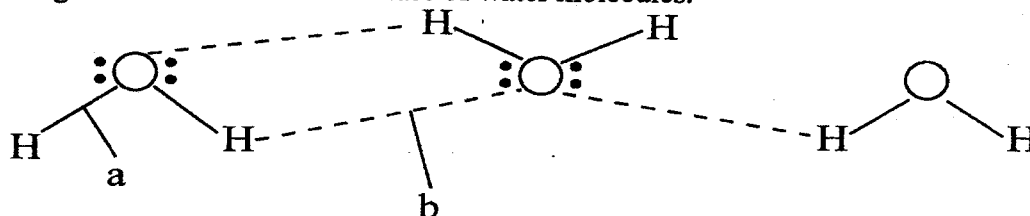
8. The diagram below represents an experiment which was carried out by a student to investigate the effect of passing an electric current on molten sodium chloride.



- (i) Molten Sodium chloride is a binary electrolyte. State the meaning of the term binary electrolyte. (1 mark)
- (ii) State the observations made at the anode. (1 mark)
- (iii) Write an equation to show what happens at the cathode. (1 mark)
9. Briefly explain how you would obtain a pure sample of lead chloride from a mixture of lead chloride and silver chloride. (3 marks)

10. A given volume of Ozone (O_3) diffused from a certain apparatus in 96 seconds. Calculate the time taken by an equal volume of carbon (IV) Oxide (CO_2) to diffuse under the same conditions. ($O = 16, C = 12$) (3 marks)

11. The diagram below shows a structure of water molecules.



- (i) Name the bonds labelled a and b. (1 mark)

- (ii) Using dots (.) and cross (x) diagram, show the bonding in the compound phosphonium ion PH_4^+ . (H = 1, P = 15) (2 marks)

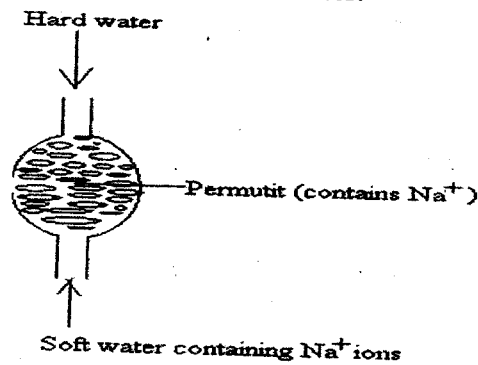
12. Study the information in the table below and answer the questions that follow. (The letters do not represent the actual symbols of the elements).

SUBSTANCE	MELTING POINT ($^{\circ}\text{C}$)	BOILING POINT ($^{\circ}\text{C}$)	SOLUBILITY IN WATER	SOLUBILITY IN WATER
H	-117	78.5	VERY SOLUBLE	0.8
J	-78	-33	VERY SOLUBLE	0.77×10^{-3}
K	-23	77	INSOLUBLE	1.6
L	-219	-183	SLIGHTLY SOLUBLE	1.33×10^{-3}

- (i) Which substance would dissolve in water and would be separated from the solution by fractional distillation? Give a reason. (1 mark)
- (ii) Which substance is a liquid at room temperature and when mixed with water, two layers would be formed. (1 mark)
- (iii) Which letter represents a substance that is a gas at room temperature and which can be collected over water. Explain (1 mark)

13. 3.4g of an element X on complete combustion produced heat which raised the temperature of 120cm^3 of water from 22°C to 62°C . Determine the molar heat of combustion of X. (Atomic mass of X = 34. Density of water = 1g/cm^3 (specific heat capacity of water = 4.2J/gk^{-1}) (3 marks)

14. (a) The column below was used to soften hard water.



(i) Explain how the hard water was softened as it passed through the column. (1 mark)

(ii) After sometimes, the material in the column is not able to soften hard water. How can the material be re - activated. (1 mark)

(b) Give one advantage of using hard water for domestic purposes. (1 mark)

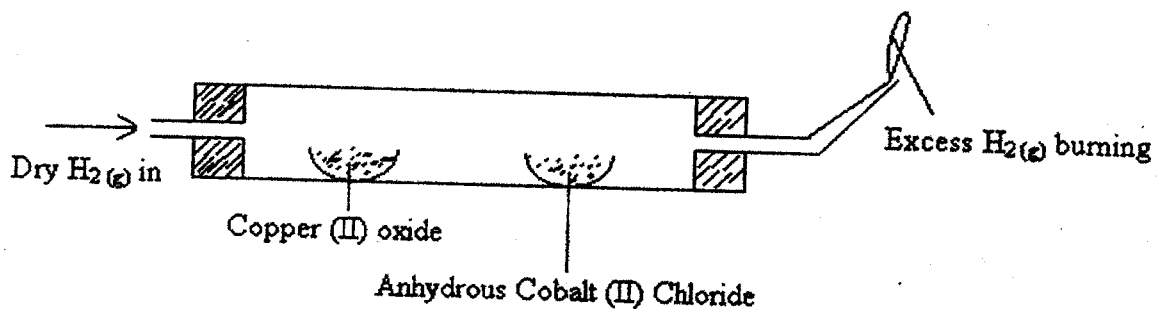
15. In an experiment, the quantity of electricity passed to deposit 1.2 grammes of metal Q from its salt was 3860 Coulombs. (RAM of Q = 120, 1 Faraday = 96500 Coulombs)

(a) How many Faradays of electricity are required to deposit? 1 mole of Q?

(2marks)

(b) One of the ions present in the solutions of salt Q has the formula QY^+ . What is the numerical value of Y? (1 mark)

16. The set - up below was used to investigate the effect of dry hydrogen gas on hot Copper (II) Oxide powder.



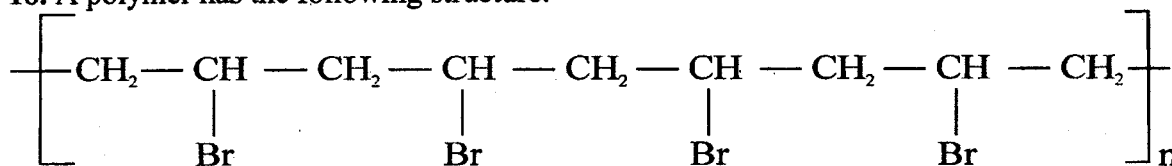
Explain what is observed in the combustion tube during the experiment. (3 marks)

17. The table below gives the energy required to remove the outermost electrons for some group I elements.

ELEMENT	A	B	C	D
ENERGY KJ MOL ⁻¹	494	418	519	376

Arrange the elements in the order of their reactivity starting with least reactive. (2 marks)

18. A polymer has the following structure.



(a) Draw the structural formula of the monomer.

(1 mark)

(b) Determine the number of monomers in the polymer. (C = 12, H = 1, Br = 80) (2 marks)

19. The following data gives PH values of solutions P, Q and R.

SOLUTION	PH
P	13.6
Q	6.9
R	1.3

(i) Which solution will produce Carbon (IV) Oxide when reacted with marble chips. (1 mark)

(ii) What would be the colour of solution P after adding a few drops of phenolphthalein.

(1 mark)

20. The table below shows the solubility of a salt at various temperatures.

TEMPERATURE	SOLUBILITY (G/100G WATER)
0	39
40	33
80	27
110	22

What would happen if a sample of saturated solution of the salt at 40°C is heated to 80°C ?

(2 marks)

21. Sulphuric (VI) acid is manufactured in large scale by the contact process. The basic reaction in the contact process is the catalytic oxidation of Sulphur (IV) Oxide.

(a) Name the catalyst used

(1 mark)

(b) Write the equation for the reaction.

(1 mark)

(c) State one large scale use of sulphuric (VI) acid.

(1 mark)

22. The following two tests were carried out on chlorine water contained in two test tubes.

(a) A piece of blue flower was dropped into the first test tube. Explain why the flower was bleached.

(2 marks)

(b) The second test tube was corked and exposed to sunlight. After a few days, it was found to contain a gas that rekindled a glowing splint. Write an equation for the reaction which produced the gas.

(1 mark)

23. Describe how a solid sample of lead (II) chloride can be prepared using the following reagents. Dilute nitric acid, dilute hydrochloric acid and lead carbonate. (3 mark)

24. 20.0cm^3 of a solution containing 4g per litre of sodium hydroxide was neutralised by 8.0cm^3 of dilute sulphuric acid. Calculate the concentration of sulphuric acid in moles per litre. (Na = 23, O = 16, H = 1) (3 marks)

25. The grid below represents part of the periodic table. The letters do not represent the actual elements.

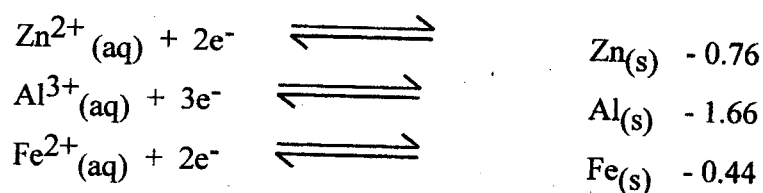
L								O
P								S
U	V							

(a) Write the electronic arrangement for the ions formed by elements Q and S. (1 mark)

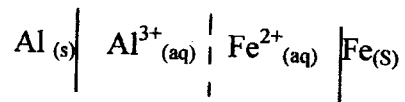
(b) Compare the melting points of P and U. Explain. (1 mark)

(c) Select the most reactive non - metal. Give a reason for your answer. (1 mark)

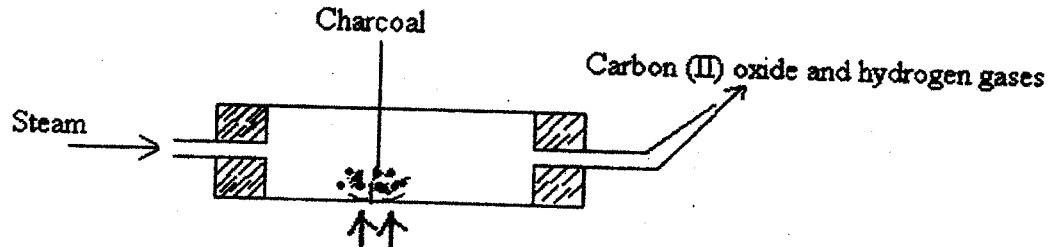
26. Use the information below to answer the questions that follow.
Volts



Calculate the E^θ value for the electrochemical cell represented below. (1 mark)

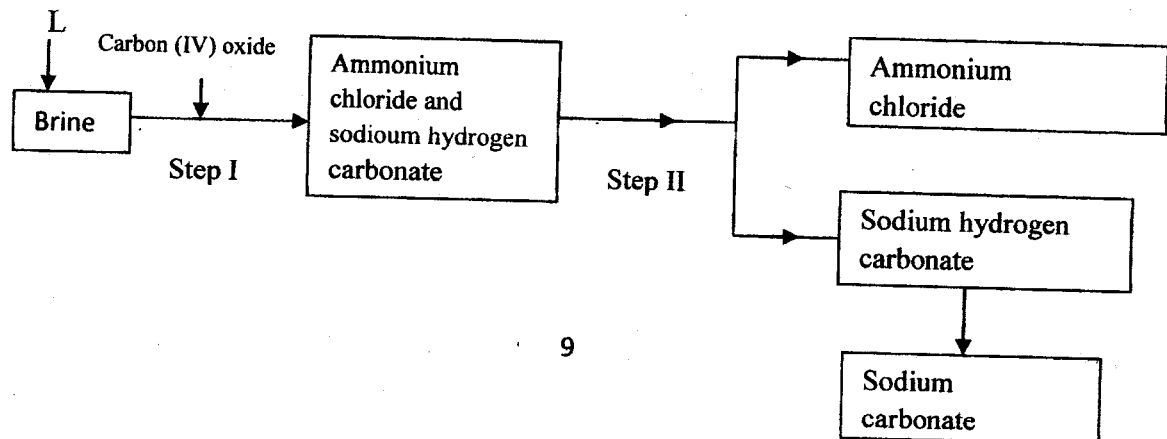


27. When steam was passed over heated charcoal as shown in the diagram below, hydrogen and carbon (II) oxide gases were formed.



- (a) Write the equation for the reaction which takes place. (1 mark)
- (b) Name one use of carbon (II) oxide which is also a use of hydrogen gas. (1 mark)

28. The simplified flow chart below shows some of the steps in the manufacture of sodium carbonate by the Solvay process.



Step III

(a) Identify substance L.

(1 marks)

(b) Name the process taking place to step II.

(1 marks)

(c) Write an equation for the process which takes place in step III.

(1 mark)

29. a) A compound Q is a solid with a giant ionic structure. In what form would the compound conduct an electric current. (1mark)

a) With reference to iodine distinguish between covalent bonds and van-der-waals forces.

(2marks)

30. Some reactions of metals P, Q, R and S are given below.

Metal	Reaction with cold water	Reaction with dilute hydrochloric acid
P	bubbles form slowly in water	Vigorous reaction. Gas is given off
Q	Vigorous reaction, metal melts, gas given off.	Explosive reaction. Should not be attempted.
R	No reaction	No reaction
S	Does not react with cold water. Hot metal reacts with steam.	Steady fizzing.

(a) Arrange the metals in order of the reactivity starting with the least reactive. (1mark)

(b) Write a chemical equation for the reaction between metal Q and water.

(1mark)

(c) Which of the metals could be:

(i) Copper

(1 mark)

(ii) Magnesium

(1 mark)