NAME……..…… INDEX NO…….....……..……

SCHOOL…… CANDIDATE'S SIGNATURE……

DATE……..……..……..

**233/1**
**CHEMISTRY**
**PAPER 1**
**(THEORY)**
**JULY/AUGUST 2013**
**TIME: 2 HOURS**

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# KIHARU/KAHURO DISTRICT JOINT EXAMINATION - 2013

**Kenya Certificate of Secondary Education.**
**CHEMISTRY**
**PAPER 1**
**(THEORY)**
**TIME: 2 HOURS**

**INSTRUCTIONS TO CANDIDATES:**

- Write your **Name** and **Index number** and **School** in the spaces provided **above**.
- **Sign** and write the **date** of examination in the spaces provided **above**.
- Answer **ALL** the questions in the spaces provided in the question paper.
- All working **must be** shown clearly where necessary.
- Mathematical tables and silent electronic calculators **may be** used.

**For Examiner's Use Only**

| Questions | Maximum Score | Candidate's Score |
|---|---|---|
| 1 – 27 | 80 | |

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1. Two papers **A** and **B** were placed at different levels of a non-luminous flame. Paper **A** was placed at the lowest part of the flame while **B** was placed at the tip.

(a) Indicate **below** the observations made on each paper. (2 marks)

Paper **A**

Paper **B**

(b) Explain the observations made on paper **A**. (1 mark)

_____

_____

_____

2. The diagram **below** shows a set-up used by a student to separate two liquids **C** and **D**.

(a) Name the apparatus drawn. (1 mark)

_____

(b) Explain why it is possible to separate **C** and **D** using the apparatus shown. (2 marks)

_____

_____

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_____

3. The pH values of some solutions labeled **E** to I are given in the table **below**. Use the information to answer the questions that follow.

| pH | 14.0 | 1.0 | 8.0 | 6.5 | 7.0 |
|---|---|---|---|---|---|
| Solution | E | F | G | H | I |

(a) Identify the solution with the highest concentration of hydroxide ions. Give a reason for your answer. (2 marks)

_____

_____

_____

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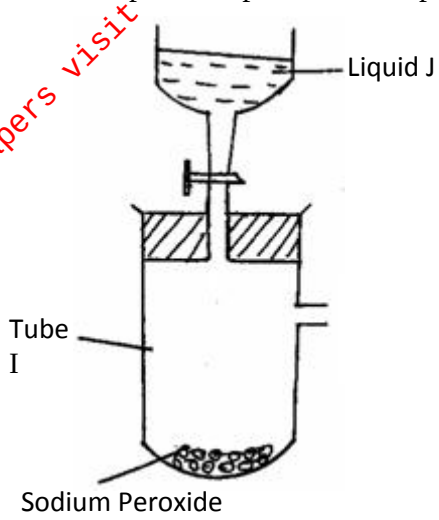
(b) Which solution can be used as a remedy for acid indigestion in the stomach? (1 mark)

_____

(c) Which solution would react most vigorously with magnesium metal? (1 mark)

_____

4. The diagram **below** represents part of a set-up for preparing and collecting a dry sample of oxygen gas.




(a) Complete the diagram. (2 marks)

(b) Write the equation for the reaction in tube I. (1 mark)

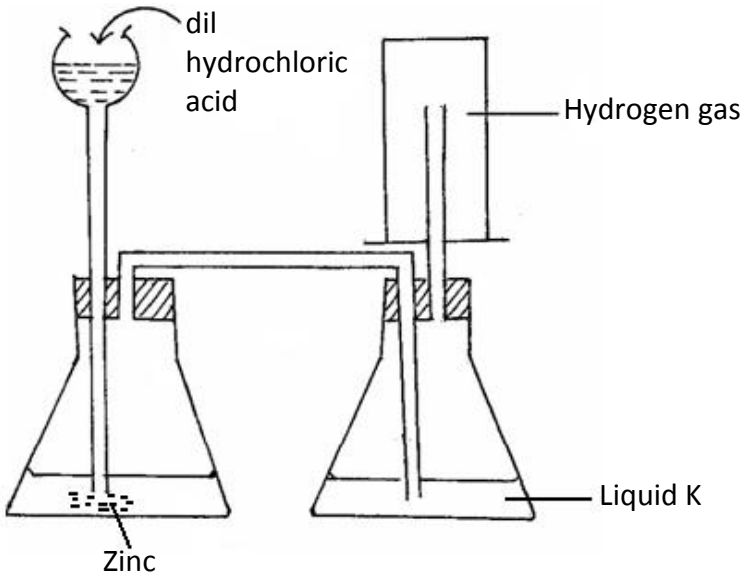
(c) State **one** commercial use of oxygen gas. (1 mark)

_____

_____

_____

5. The diagram **below** represents an arrangement for preparing and collecting dry hydrogen. Study it and answer the questions that follow.



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(a) Write the equation for the reaction that produces hydrogen gas. (1 mark)

(b) Name a suitable substance that liquid K is likely to be. (1 mark)

(c) Explain why it is not advisable to use nitric (V) acid as an alternative to hydrochloric acid in this preparation experiment. (1 mark)

6. Study the table and answer the questions that follow. The letters are not actual symbols of the elements or ion.

| Particle | Number of | | |
|---|---|---|---|
| | Protons | Electrons | Neutrons |
| L | 18 | 18 | 12 |
| M | 17 | 18 | 18 |
| N | 19 | 19 | 20 |
| O | 9 | 8 | 10 |
| P | 19 | 19 | 22 |

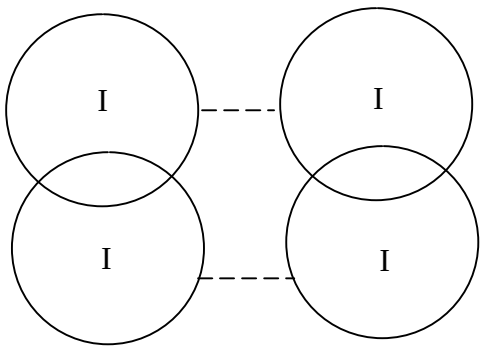
With reasons, choose the letters that represent

(a) A cation. (1 mark)

(b) An anion. (1 mark)

(c) A pair of isotopes. (1 mark)

7. (a) The diagram **below** shows the structure of solid iodine.



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(i) Name the types of bond(s) in the solid. (1 mark)

(ii) Explain why iodine has a very low melting point. (1 mark)

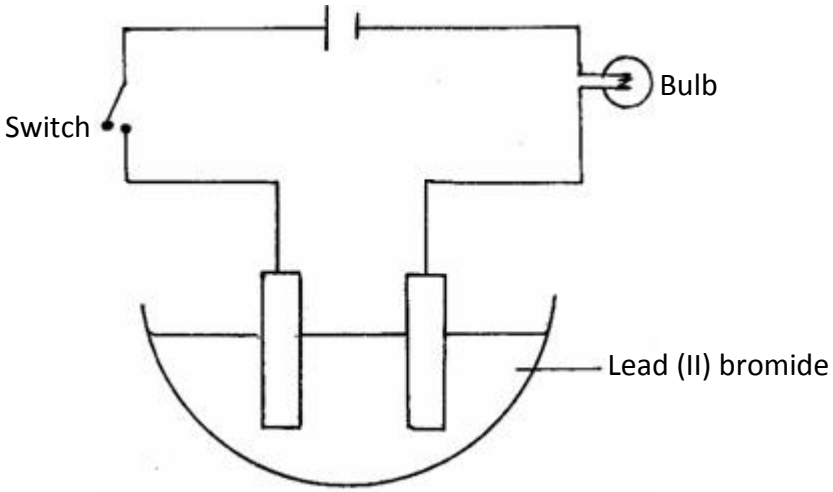
(b) Explain why graphite is a better lubricant than oil. (1 mark)

8. Explain the following observations.

(a) A beaker with lime water, when left exposed develops a layer of a white solid on the surface. (1 mark)

(b) Calcium chloride powder, when left exposed gradually turn into a colourless solution. (1 mark)

9. The diagram **below** shows a set-up intended for the electrolysis of molten lead (II) bromide.




(a) Label on the diagram: (i) anode (½ mark)
(ii) cathode (½ mark)

(b) Indicate on the diagram the direction of flow of electrons. (1 mark)

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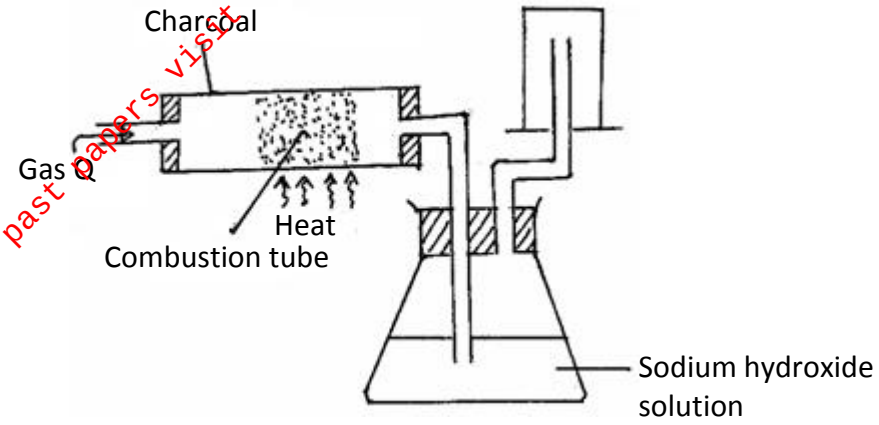
(c) State the observations made at the

(i) anode _____ (½ mark)

(ii) cathode _____ (½ mark)

10. The diagram **below** shows an experimental set-up for preparing carbon (II) oxide. Study it and answer the questions that follow.




(a) State the role of sodium hydroxide solution in the set-up. (1 mark)

_____

_____

_____

(b) State the reason why carbon (II) oxide is collected in the manner indicated. (1 mark)

_____

_____

_____

(c) Describe a simple test that can be used to distinguish between carbon (II) oxide and carbon (IV) oxide. (1 mark)

_____

_____

_____

11. When 3.1g of a metal carbonate RCO3 were heated, a constant mass of 2.0g of the metal oxide were formed. On reduction with coke the same oxide yielded 1.6g of pure metal. Calculate the relative atomic mass of metal R (O = 16.0). (3 marks)

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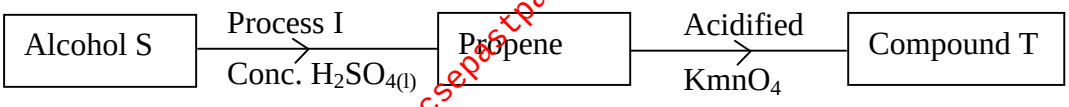
12. Study the flow chart **below**.

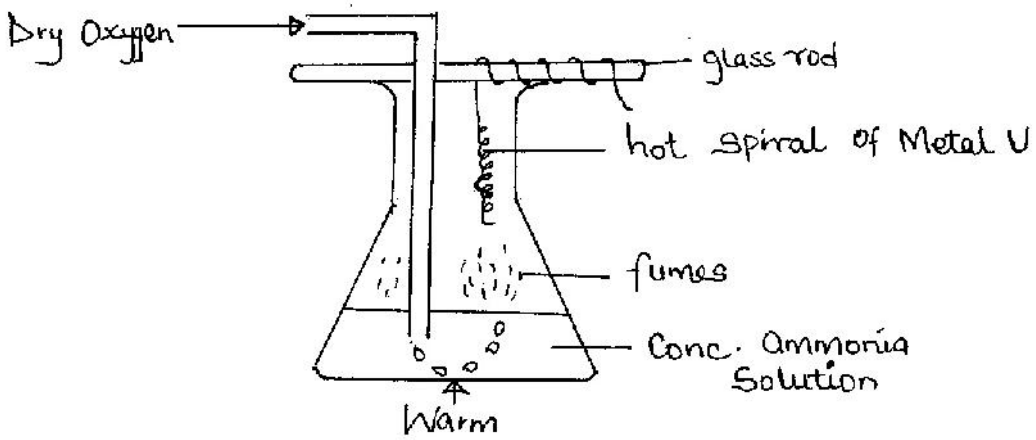



(a) Write the structural formula of alcohol **S**. (1 mark)

(b) Name (i) compound **T** _____ (1 mark)

(ii) process **I** _____ (1 mark)

13. Study the diagram **below**:




(a) Give the most likely identity of metal **U**. (1 mark)

_____

(b) State **two** observations made in the conical flask. (2 marks)

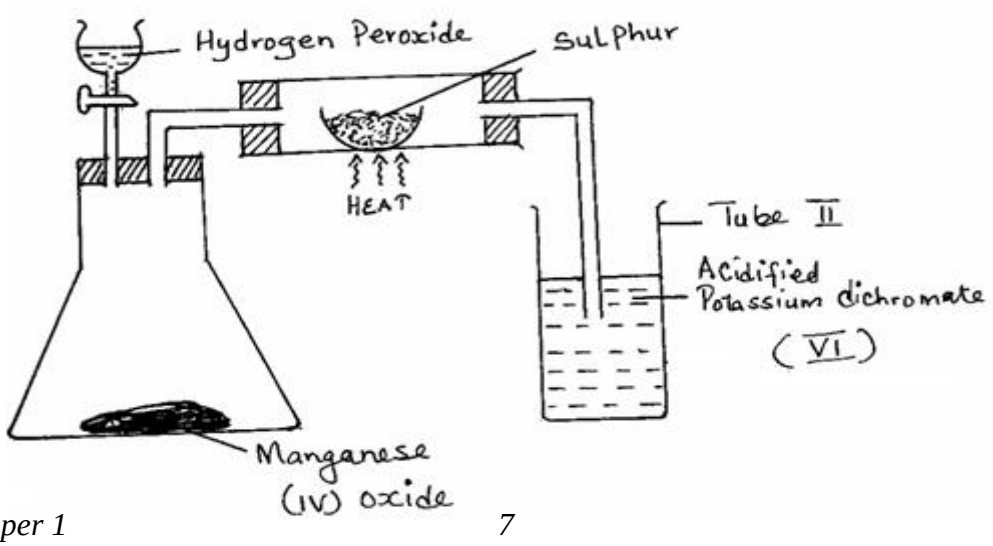
_____

_____

_____

_____

14. Study the diagram **below**.



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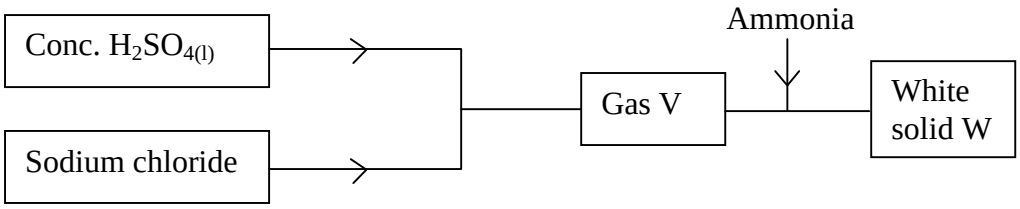
(a) State the role of manganese (IV) oxide in the set-up shown above. (1 mark)

(b) State and explain the observation made in tube **II**. (2 marks)

15. Study the flow chart **below** and answer the questions that follow.




(a) Name (i) gas **V** _____ (1 mark)

(ii) Solid **W** _____ (1 mark)

16. In an experiment, soap solution was added to three separate samples of water. The table **below** shows the volumes of soap solution added in order to form lather with 1000cm³ of each samples before and after boiling.

| | Sample I | Sample II | Sample III |
|---|---|---|---|
| Volume of soap added to unboiled sample (cm³) | 27.0 | 3.0 | 10.6 |
| Volume of soap added after boiling sample (cm³) | 27.0 | 3.0 | 3.0 |

(a) Identify the sample that was likely to be soft water. Explain. (1 mark)

(b) Explain the change in the volume of soap solution in sample III. (1 mark)

(c) Give **one** disadvantage of hard water. (1 mark)

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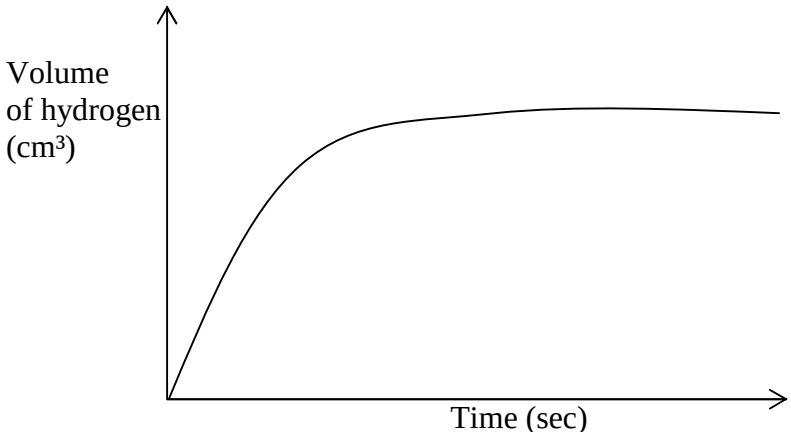
17. (a) When 8.0g of ammonium nitrate was dissolved in 100cm³ at the temperature of the solution was 14ºC. Given that the temperature of the water was initially 20ºC, calculate the molar enthalpy of solution of ammonium nitrate. (N = 14.0, H = 1.0, O = 16.0) C = 4.2$Jg^{-1}K^{-1}$. (2 marks)

(b) Draw an energy level diagram for this process. (1 mark)

18. In an experiment to monitor the rate of reaction of magnesium and hydrochloric acid a student recorded the volume of hydrogen produced at regular time intervals and obtained the graph shown **below**.




(a) On the same set of axes sketch the curve expected if the experiment is repeated with a few crystals of copper (II) sulphate added to the reactants. (1 mark)

(b) Explain the shape of your curve. (1 mark)

_____

_____

_____

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19. A current of 4A was passed through dilute sulphuric (VI) acid for 13h 24min and 10sec. Calculate the volume of oxygen gas produced at the anode. (IF = 96500C, molar gas volume = 24.0c/m³). (3 marks)

20. (a) Write the formula of the chief ore (bauxite) from which aluminium is extracted. (1 mark)

(b) Explain the role of molten cryolite in aluminium smelting. (1 mark)

_____

_____

_____

(c) Aluminium does not apparently react with dilute nitric acid. Explain. (1 mark)

_____

_____

_____

21. (a) Determine the values of χ and y in the nuclear equation shown **below**. (1 mark)

$$^{235}_{92}U + {}^{1}_{0}n \longrightarrow {}^{141}_{56}Ba + {}^{\chi}_{y}Kr + 3{}^{1}_{0}n$$

χ _____ _____

(b) State **one** application of this type of reaction. (1 mark)

_____

(c) State **one** danger associated with exposure of human beings to radioactive substances. (1 mark)

_____

_____

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22. The grid **below** is a section of the periodic table. Study it answer the questions that follow. The letters do not represent actual symbols.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | A | | | | | | |
| B | | | C | | | D | |
| E | | | | | | F | |
| | | | | | | | |

(a) State the name given to the family of **B** and **E**. (1 mark)

_____

(b) Identify the most reactive metal. (1 mark)

_____

(c) State the type of bond that exists in the compound of elements **B** and **D**. (1 mark)

_____

23. The reversible reaction represented below is for the equilibrium established in the reaction of hydrogen and iodine.

$H_{2(g)} + I2_{(g)} \rightleftharpoons 2HI_{(g)}$ , $\Delta H = -10KJmol^{-1}$

(a) State and explain the effect on the equilibrium of decreasing the pressure. (2 marks)

_____

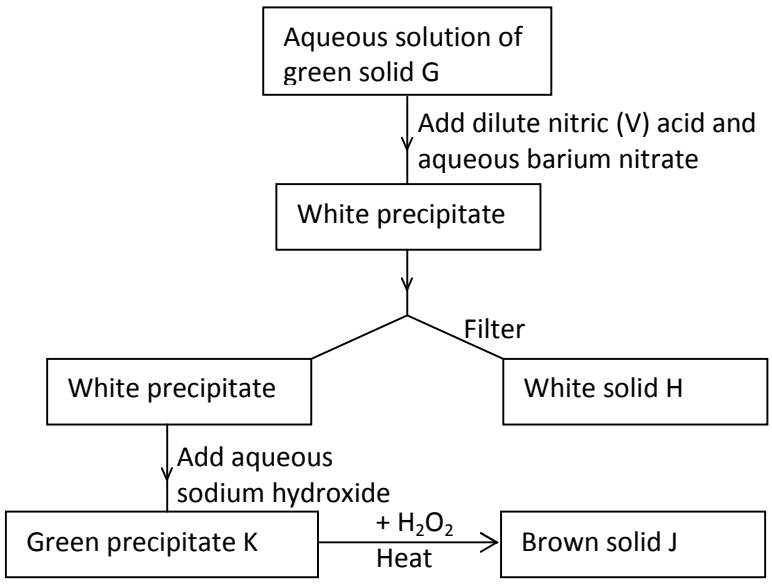
_____

(b) Of lowering the temperature. (2 marks)

_____

_____

24. The scheme **below** shows a series of reactions.




Identify the following:

(a) White solid **H** _____ (1 mark)

(b) Green precipitate **K** _____ (1 mark)

(c) Brown solid **J** _____ (1 mark)

(d) Green solid **G** _____ (1 mark)

25. (a) State Graham's law. (1 mark)

_____

_____

_____

(b) Two gases L and M have relative densities 1.98 and 2.90 respectively. They diffuse under similar conditions. If the relative molecular mass of M is 64, determine the relative molecular mass of L. (2 marks)

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26. When concentrated sulphuric (VI) acid reacts with hydrogen bromide gas the following reaction takes place.

$2HBr(g) + H_2SO_{4(l)} \rightarrow Br_{2(g)} + SO_{2(g)} + 2H_2O_{(g)}$

(a) State the observation made during the reaction. (1 mark)

_____

_____

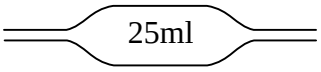
(b) Give the property of concentrated sulphuric (VI) acid demonstrated in the reaction. (1 mark)

_____

_____

_____

27. (a) Name the apparatus shown **below**. (1 mark)




_____

(b) Sate **one** safety measure to be taken while using the apparatus shown. (1 mark)

_____

(c) State the use of this apparatus in the laboratory. (1 mark)

_____

_____