NAME……..... INDEX NO……...…

SCHOOL ……. CANDIDATE'S SIGNATURE…..……

DATE……...……

233/1
CHEMISTRY
PAPER 1
(THEORY)
JUNE 2014
TIME: 2 HOURS

COMA JOINT EXAM 2014

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

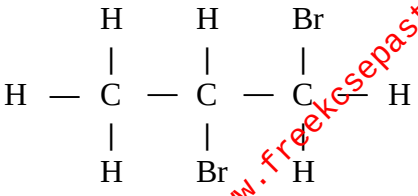
Instructions to candidates:

- 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.
- Electronic calculators **may be** used.

For Examiner's Use Only

Questions	Maximum Score	Candidate's Score
1 – 28	80	

1. Bromine reacted with compound **Q** to form a compound with structural formula.



(i) Write the structural formula of **Q**. (1 mark)

_____

_____

(ii) When **Q** is reacted with concentrated sulphuric (VI) acid compound P is formed which further reacted with water to form K.

I Identify substance K. (1 mark)

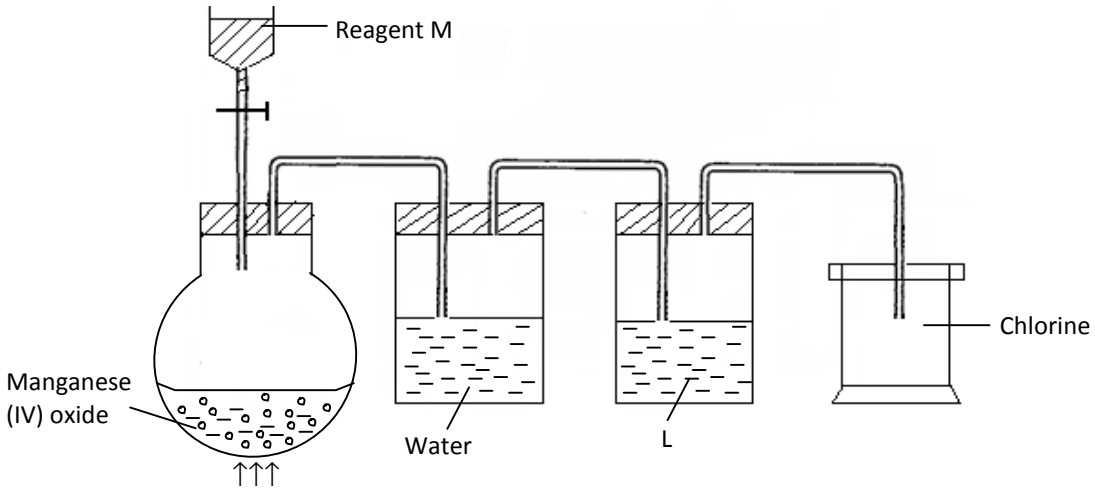
_____

II Write an equation to show how compound **K** reacts with sodium metal. (1 mark)

_____

_____

2. The set-up **below** was used to prepare dry chlorine gas. Study and answer the questions that follow.



(a) Name reagents **M** and substance **L**.

M: _____ (½ mark)

L: _____ (½ mark)

(b) A warm red phosphorus was lowered into the gas jar of chlorine using a deflagrating spoon:

(i) State any **one** observation made in this experiment. (½ mark)

_____

(ii) Identify the substance formed in the above reaction. (½ mark)

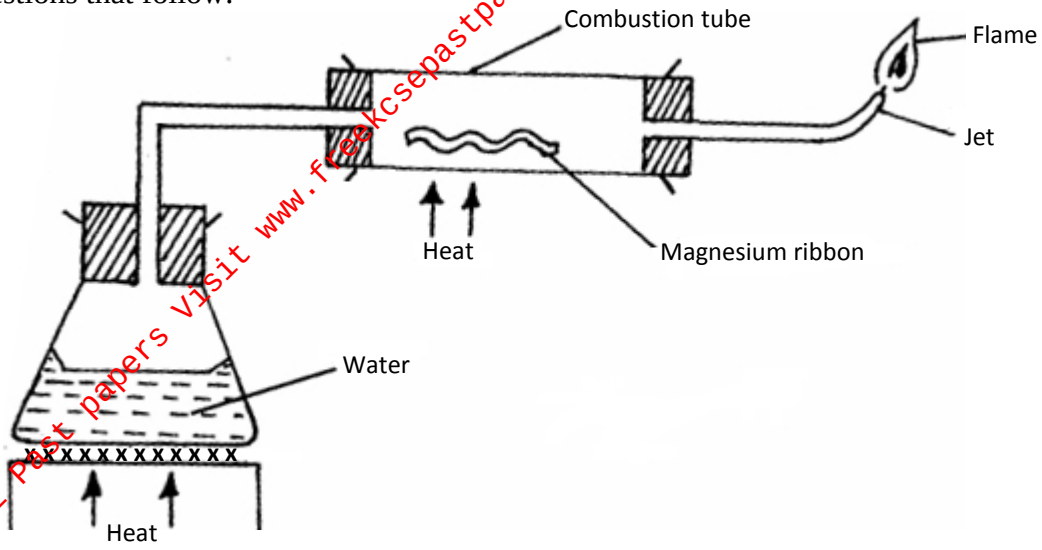
_____

(c) Both substances in **(ii) above** undergo hydrolysis when exposed to air. Write an equation to show how anyone of them undergoes hydrolysis. (1 mark)

_____

_____

3. Steam was passed over magnesium ribbon as shown in the diagram **below**. Study it and answer the questions that follow.



(a) State **one** precaution which should be taken before lighting the gas at the jet. (1 mark)

_____

_____

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

(i) Combustion tube. (1 mark)

_____

_____

(ii) Jet (burning flame). (1 mark)

_____

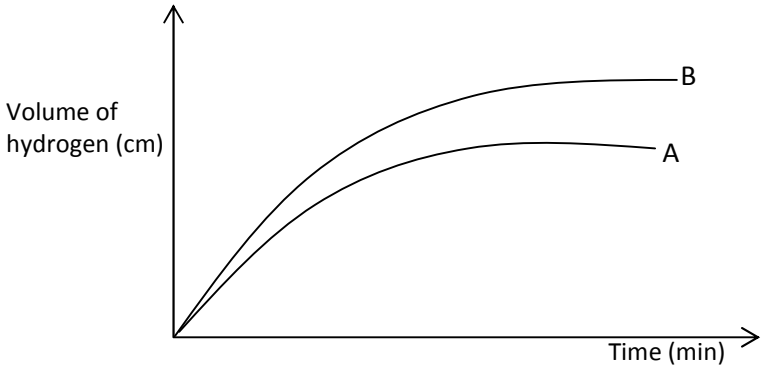
_____

4. Two experiments were carried out as follows and the volume of hydrogen gas evolved measured at intervals of 10 seconds for 100 seconds.

(i) 8cm of magnesium ribbon was added to 1M hydrochloric acid.

(ii) 8cm of magnesium ribbon was added to 0.5M hydrochloric acid.

Graphs of volume of hydrogen evolved against time were plotted thus:



(a) Which of the graphs was obtained for reaction (i) Explain? (2 marks)

_____

_____

_____

_____

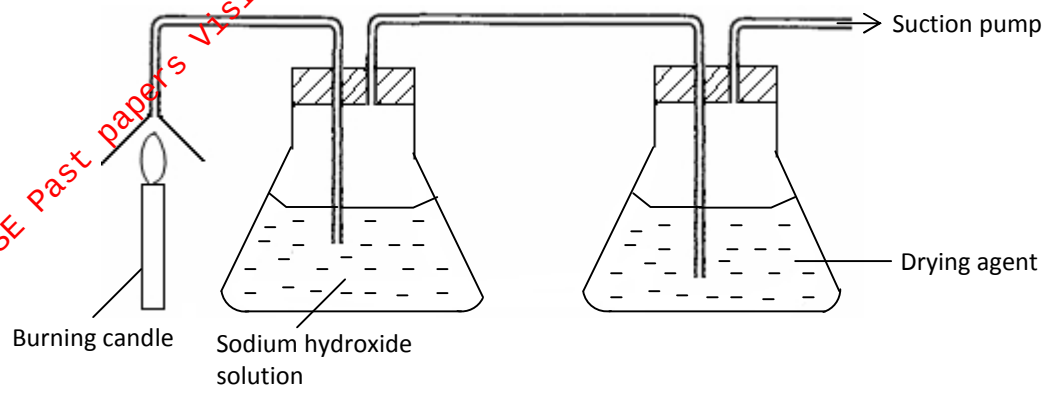
(b) Explain the general shape of graphs. (1 mark)

_____

_____

_____

5. The set up of diagram shown **below** is used to prepare dry nitrogen gas from air. Study it and answer the questions that follow.



(a) What is the purpose of using.

(i) A burning candle. (½ mark)

_____

_____

(ii) Sodium hydroxide solution. (½ mark)

_____

_____

(b) Name:

(i) **One** impurity present in nitrogen gas prepared. (½ mark)

_____

(ii) A suitable drying agent used. (½ mark)

_____

(c) Give **two** uses of nitrogen gas. (1 mark)

_____

_____

6. (i) Using a dot (**.**) and cross (x) show how NH_4^+ ion is formed from NH_3 molecule and H^+ ion. (2 marks)

(ii) State the type of bond that exists between the NH_3 and H^+ ion. (½ mark)

(iii) Molecular substances have low melting points. Give **one** reason why they have low melting points. (½ mark)

7. Study the information in the table **below** and answer questions that follows:

Ions	Electron arrangement	Ionic radius
Na^+	2, 8	0.95
K^{2+}	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^+. (1 mark)

(c) Mg^{2+} is smaller than that of Na^+. (2 marks)

8. (a) Differentiate between exothermic and endothermic reaction. (1 mark)

(b) The table **below** gives bond energies of some covalent compound.

Bond	Bond energy KJ mol^{-1}
C – H	413
O = O	497
C = O	804
H - O	464

Calculate the enthalpy change for the combustion of methane in excess oxygen gas.(2 marks)

9. The grid **below** shows part of the periodic table. Study it and answer the questions that follow. The letters do not represent the true symbols of the elements.

T				V			S		
	W		Q		R			U	

(a) Which element forms ion with the charge of -3. (½ mark)

_____

(b) What is the nature of oxide formed by **Q**. (½ mark)

_____

(c) Using crosses (X) and dots (**.**), show how the ion of S is formed. (1 mark)

10. (a) Define Grahams law of diffusion. (1 mark)

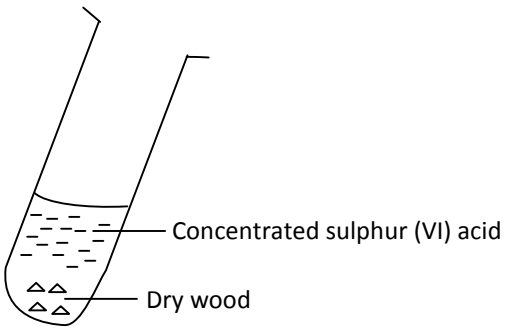
_____

_____

_____

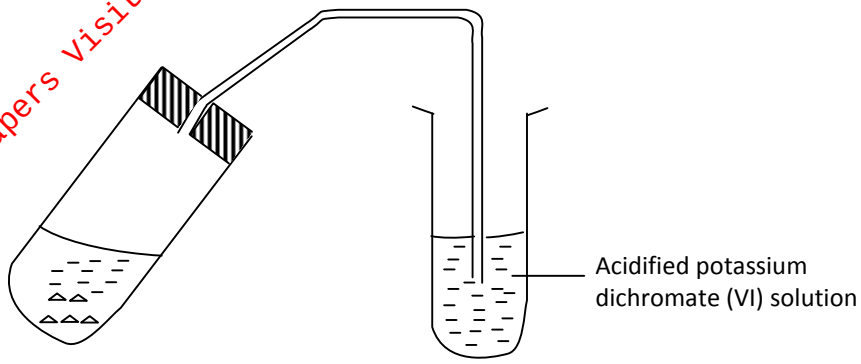
(b) Given that the density of g X is 1.4290×10^{-3}g/cm³ and the density of gas Y is 1.2506×10g/cm³. How many times will gas X diffuse faster than Y? (2 marks)

11. Excess concentrated sulphuric (VI) acid was mixed with pieces of dry wood as shown **below**.



(a) State the observation made. Explain. (1 mark)

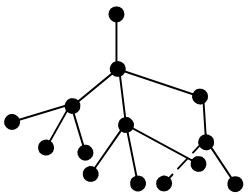
(b) When the reaction was complete, the mixture was heated gently, then strongly and set-up adjusted as shown **below**.



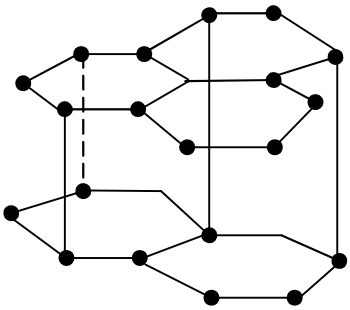
Explain the observation made on acidified potassium dichromate (VI) solution. (2 marks)

12. The following diagrams shows the structure of two allotropes of carbon. Study them and answer the questions that follow.

A



B



(a) Name the allotropes. (1 mark)

A _____

B _____

(b) Give **one** use of **A**. (½ mark)

(c) Which allotrope conducts electricity? Explain. (1½ marks)

13. Write half equations for the electrode reactions when molten sodium chloride is electrolysed using graphite electrodes.

Anode. (1 mark)

Cathode . (1 mark)

14. Give **two** reasons why helium is used in weather balloons. (2 marks)

15. 80g of a saturated calcium chloride was prepared at 25°C. Calculate mass of calcium chloride and mass of water used to prepare a saturated solution given that the solubility of calcium chloride at 25°C is 72g/100g of water. (3 marks)

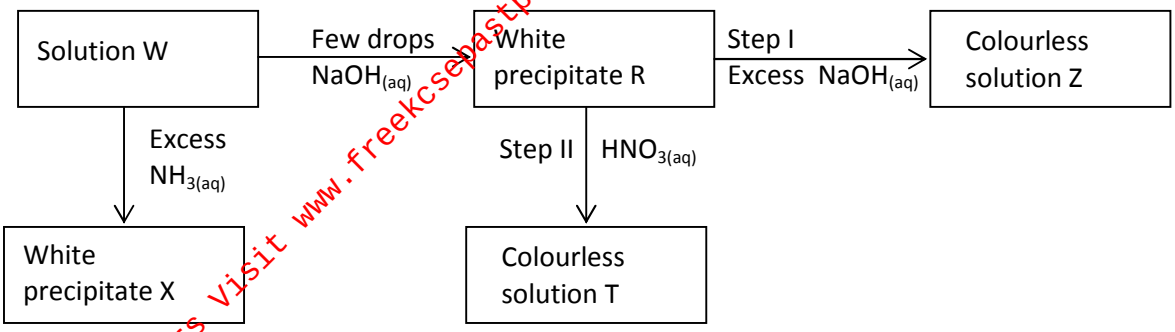
16. Sulphur (IV) oxide and nitrogen (IV) oxide react as shown in the equation **below**.

$$SO_{2(g)} + NO_{2(g)} \rightarrow SO_{3(g)} + NO_{(g)}$$

(i) Using oxidation number of either sulphur or nitrogen show that this is a redox reaction. (2 marks)

(ii) Identify the reducing agent. (1 mark)

17. Study the reaction scheme **below** and answer the questions that follow.



(a) What property of the white precipitate **R** is demonstrated by steps **I** and **II**. (1 mark)

_____

(b) If the metal ion in solution **W** is divalent suggest its identity. (1 mark)

_____

(c) Write an ionic equation for the reaction taking place in step **I**. (1 mark)

_____

_____

18. The PH – values of various solutions are given in the table **below**. Study it and answer the equations that follow.

Solution	PH – value
W	14.0
X	6.0
Y	7.0
Z	2.0

(a) Select a pair of solutions that if reacted would have the highest heat change of the reaction (DHR). Give a reason for your answer. (2 marks)

_____

_____

_____

_____

(b) Select the solutions in which a sample of aluminium oxide is likely to dissolve. (1 mark)

_____

19. Describe how a sample of lead (II) chloride can be prepared using the following reagents:
- Dilute nitric acid.
- Dilute hydrochloric acid and lead (II) carbonate. (3 marks)

20. (a) Radioactive isotope decays as shown **below**.

$$^{222}_{86}Rn \rightarrow ^{206}_{82}Pb + m\sim + n$$

Determine the values of m and n. (2 marks)

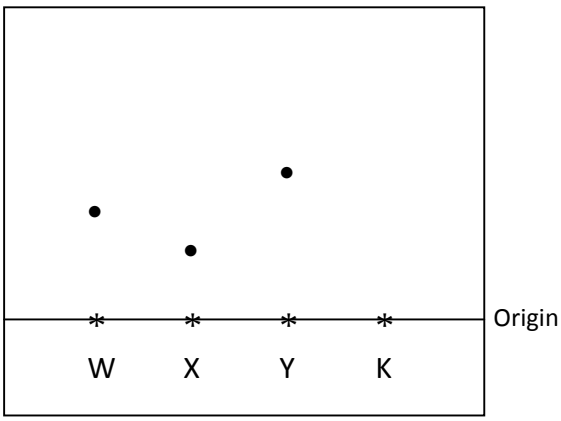
(b) Give **one** harmful effect of exposure to radioactive emission. (1 mark)

_____

_____

_____

21. The diagram **below** represents a paper chromatogram of pure **W**, **X** and **Y**. A mixture **K** contains **W** and **Y** only. Indicate on the diagram the chromatogram of **K**. (2 marks)



(i) Show the solvent front. (1 mark)

22. A compound has an empirical formula C_3H_6O and relative formula mass of 116.

(a) Determine its molecular formula. (H = 1, C = 12, O = 16). (2 marks)

(b) Calculate the percentage composition of carbon by mass in the compound. (1 mark)

23. In the laboratory hydrogen sulphide gas is prepared by the action of dilute hydrochloric acid on metal sylphides.

(a) Name the metal sulphide that can be used in preparing the gas. (1 mark)

_____

(b) Write down the equation for the reaction in (a) above. (1 mark)

_____

_____

(c) Give **one** chemical test for hydrogen sulphide gas. (1 mark)

_____

_____

24. The table **below** gives atomic numbers of elements represented by the letters **A**, **B**, **C** and **D**.

Elements	A	B	C	D
Atomic numbers	15	16	17	20

Use the information to answer the questions that follow.

(a) Name the type of bonding that exists in the compound formed when **A** and **D** react. (1 mark)

_____

(b) Select the letters which represents the best oxidizing agent. Give a reason for your answer. (2 marks)

_____

_____

_____

_____

25. Element T is in period 2 of the periodic table and forms a stable ion, T^{2+}.

(a) State the atomic number of element **Q** which is directly below **T** in the periodic table.

_____ (1 mark)

(b) Compare the reactivity of **T** and **Q** with chlorine. (2 marks)

26. $20.0cm^3$ of a solution containing $4.5gdm^{-3}$ of sodium hydroxide reacted exactly with $24.0cm^3$ of dilute sulphuric acid solution, using methyl orange as indicator. Calculate the molarity of the sulphuric acid. (3 marks)

27. Ammonia is produced in large scale by Haber process.

(i) Write an equation for the formation of ammonia gas. (1 mark)

(ii) State **two** optimum condition for obtaining a high yield of ammonia in the process. (2 marks)

28. The table **below** gives elements represented by letters which are not the actual symbols.

Element	U	V	W	X	Y	Z
Atomic No.	8	12	13	15	17	20

(i) Select an element that can form divalent anion. (1 mark)

(ii) What is the structure of the oxide of **W**? (1 mark)

(iii) Compare the atomic radius of **W** and **X**. (1 mark)