NAME:.. INDEX NO.....................................

SCHOOL.. SIGN................................. DATE......................

233/1
CHEMISTRY THEORY
PAPER I
FORM 4
MARCH/APRIL 2013
TIME: 2 HOURS

PENTAGON JOINT EXAMINATIONS -2013
WARENG DISTRICT

The Kenya Certificate of Secondary Education

INSTRUCTIONS TO CANDIDATES

a) Write your **name**, **Index number**, **school** and **sign** on the spaces provided.

b) Answer **ALL** the questions in the spaces provide in the question paper.

c) Mathematical tables and silent electronic calculators may be used.

d) All working **MUST** be clearly shown where necessary.

For official use only

Questions	Maximum score	Candidates score
1-28	80	

1. a) Name two major components of air?   (2marks)

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    b) Write an equation for the reaction that would take place when one of the components of air named in

    (a)   above is passed over heated magnesium.   (1mark)

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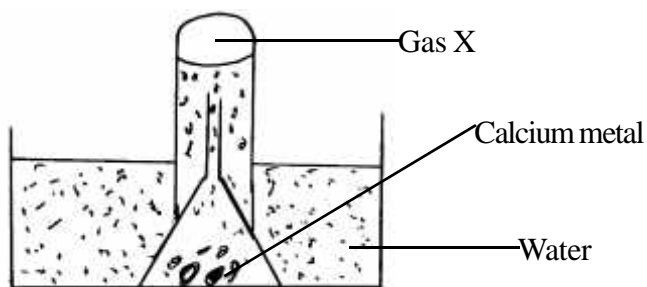
2. Study the information given below and use it to answer the questions that follow;

    Red dye is more soluble than green dye, green is more soluble than yellow whereas blue dye is the least soluble.

    i)   Represent the three dyes on a round paper chromatography.   (2marks)

    ii)   Name one industrial application of chromatography.   (1mark)

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3. a) What is a fuel?   (1mark)

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    b) Calculate the heat value of ethanol if its molar enthalpy of combustion is $-1360kjmol^{-1}$

        (C=12.0, O=16.0, H=1.0)   (2marks)

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4. Study the set up below and use it to answer the questions that follow.

    a) What physical property of calcium metal is demonstrated in the diagram above?   (1mark)

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    b) What would be observed if water was replaced with Sulphuric (VI) acid?   (2marks)

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5. i) What is electroplating?   (1mark)

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ii) Draw a well labeled diagram to show how an iron spoon can be electroplated with silver. (2marks)
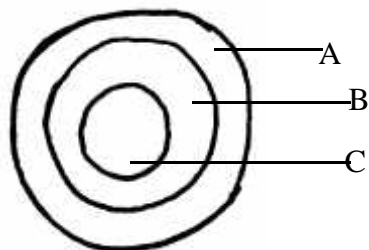
6. A hydrocarbon decolorizes chlorine gas in presence of ultra violet light but does not decolorize acidified potassium manganate (VII) solution.

   i) Name the homologous series to which the hydrocarbon belongs. (1mark)

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   ii) Draw the structural formula and name the fourth member of the homologous series to which the hydrocarbon belongs? (2marks)

7. Explain why a solution of hydrogen chloride in water turns blue litmus paper red but a solution of hydrogen chloride in methylbenzene has no effect on litmus papers. (3marks)

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8. The diagram below represents a cross section of the apparatus used to extract sulphur from its deposits. Study it and answer the questions that follow.

   a) State the role of the substance that is passed through;

   i) A (1mark)

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   ii) C (1mark)

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   b) Give one reason why the method shown in the diagram is suitable for extraction of sulphur. (1mark)

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9. Study the equation below and answer the questions which follow.

   $$H_2O_{(s)} \xrightarrow[\Delta H_4]{\Delta H_1} H_2O_{(l)} \xrightarrow[\Delta H_3]{\Delta H_2} H_2O_{(g)}$$

i) What name is given to the energy change ΔH_2? (1mark)

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ii) Indicate the sign for ΔH_1. Give a reason. (2marks)

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10. Explain how you would obtain magnesium carbonate from a mixture of magnesium carbonate and sodium carbonate. (2marks)

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11. 20g of potassium carbonate were dissolved in 50cm^3 of water in a conical flask. Lemon juice was then added drop wise while shaking until there was no further observable change.

a) Explain the observation that was made in the conical flask when the reaction was in progress. (1mark)

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b) What observation would be made if lemon juice had been added to copper turnings in a conical flask? Give a reason. (2marks)

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12. Explain why a burning magnesium continues to burn in a gas jar full of carbon (IV) oxide while a burning candle would be extinguished. (3marks)

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13. a) Give the names of any two reagents that when reacted with concentrated hydrochloric acid produces chlorine gas. (1mark)

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b) With the aid of an equation, explain the observation made when chlorine gas is reacted with ammonia. (2marks)

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14. 8.4g of carbon (IV) oxide and 3.42g of water are formed when a hydrocarbon is burnt completely in oxygen. Determine the empirical formula of the hydrocarbon.

(H=1.0; C=12.0; O=16.0) (3marks)

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15. The melting point of nitrogen is -196°C while that of sodium is 98°C, in terms of structure and bonding explain the differences in the melting points of nitrogen and sodium. (3marks)

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16. a) What is an amphoteric substance? (1mark)

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b) Identify the reagent that acts as a base in the equation below. Give a reason for your answer.

$$H_2O_{2(aq)} + H_2O_{(I)} \longrightarrow H_3^+O_{(aq)} + HO_{2(aq)}^-$$

(2marks)

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17. The following tests were carried out on three separate portion of a colourless solution H.

Test	Observation
i) Addition of dilute hydrochloric acid to the first portion of solution H.	Colourless gas evolved with effervescence
ii) Addition of aqueous sodium sulphate solution to the second portion of H.	No observable change
iii) Addition of aqueous sodium hydroxide solution to the third portion of solution H.	White precipitate was formed which dissolved in excess sodium hydroxide solution

a) From the information in test (i), name two anions that are likely to be present in solution H. (1mark)

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b) Identify cations that are likely to be present in solution H. (1mark)

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c) Write an ionic equation for the reaction which takes place in test (i)   . (1mark)

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18. Sulphur forms many compounds in which its oxidation state varies.

a) What is meant by oxidation state? (1mark)

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b) Determine the oxidation state of sulphur in $NaHSO_3$. (2marks)

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19. In the industrial manufacture of ammonia gas by Harber process, Nitrogen and hydrogen gases are reacted together.

a) State any two conditions necessary for ammonia to be formed in the Harber process. (1mark)

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b) Nitrogen and hydrogen must be purified before they are reacted. Give a reason. (1mark)

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c) Other than manufacture of fertilizers state one use of ammonia. (1mark)

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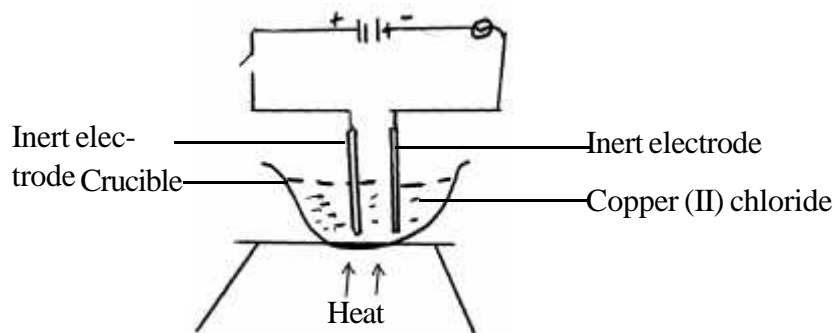
20. Describe how you would prepare crystals of potassium sulphate starting with 100cm³ of 0.5M potassium hydroxide. (3marks)

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21. Distinguish between atomic mass and relative atomic mass. (2marks)

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22. Study the diagram below and use it to answer the questions that follow.

a) State the observation that would be made in the crucible when the circuit is switched on. (1mark)
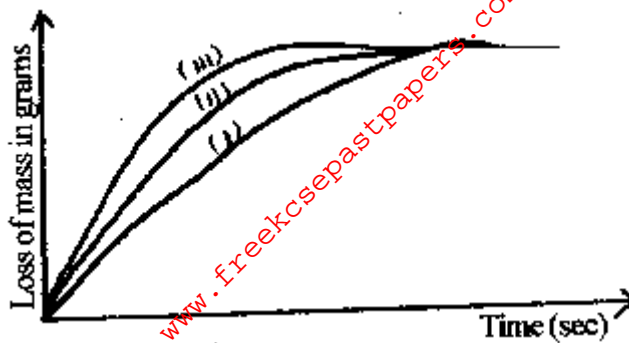
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b) Write an ionic equation for the reaction at anode. (1mark)

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c) Give a reason why this experiment should be performed in the fume chamber. (1mark)

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23. The following curves are obtained from reacting the same amount of marble chips lumps with acids of different concentrations.

a) Which curve represents the reaction with;

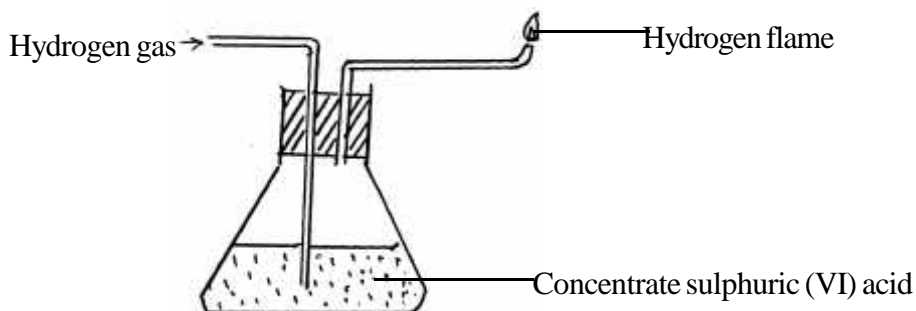i) Least concentrated acid? (1mark)

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ii) Most concentrated acid? (1mark)

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b) Which curve did the reaction complete last? (1mark)

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24. a) State Charle's Law. (1mark)

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b) Explain how the density of gas N compare with that of oxygen given that the time taken for equal volumes of oxygen and gas N to diffuse through the same hole is 35 seconds and 42seconds respectively. (2marks)

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25. Study the diagram below and answer the questions that follow:

a) Name one chemical and one physical property of hydrogen being demonstrated in the set-up above.

i) Physical property. (½mark)

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ii) Chemical property. (½mark)

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b) Name any other substance that can be used in place of concentrated sulphuric (VI) acid. (1mark)

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c) Give a reason why it is necessary to burn the hydrogen gas as shown in the set-up. (1mark)

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26. Elements Q, R and S have the following electronic arrangements.

Q=2,3; R = 2,8,3 and S = 2,8,8,3

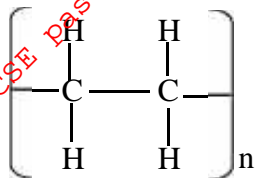i) Are the elements metals or non-metals? (1mark)

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ii) Give the formula of the compound formed when elements R reacts with a sulphate radical. (1mark)

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iii) Selects the element that is most reactive. (1mark)

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27. Below is the structural formula of a given polymer. Use it to answer the questions that follow:

$$\left[\begin{array}{cc} H & H \\ | & | \\ -C & -C- \\ | & | \\ H & H \end{array}\right]_n$$

a) Name the monomer. (1mark)

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b) State one use of the above polymer. (1mark)

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28. Sodium and magnesium fall on the same period in the periodic table and both of them are metals. Explain why magnesium is a better conductor than sodium. (2marks)

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