THE AMKA CHEMISTRY EXAMINATION.
Kenya Certificate of Secondary Education

233/1 -   CHEMISTRY   -   Paper 1

(Theory)
FEB 2024 - 2 hours

Name ....   Index Number.......................

School ....   Admission No.......................

Date.....................................

Instructions to Candidates

(a) *Write your name and Index number in the spaces provided.*

(b) *Write the Name of the School and the Admission number and Date in the spaces provided.*

(c) *Answer **all** the questions in the spaces provided*

(d) *ALL working MUST be clearly shown where necessary*

(e) *Mathematical tables and electronic calculators may be used.*

(f) ***Candidates must answer the questions in English.***

FOR EXAMINER'S USE ONLY

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

17	18	19	20	21	22	23	24	25	26		TOTAL SCORE	

1. Element **X** and **Y** have atomic numbers 15 and 8 respectively.
    (i) Write down the electron arrangement of the ions and draw the structure of the ions .

    (a) X^{3+} ....(2mks)
        Structure of the ion

    (b) **Y⁻** ....(2mks)
        Structure of the ion

    (c) Write down the stoichiometric equation for the reaction between **X** and **Y**.
    (1mk)

    ....

2. When hydrogen gas was passed over heated lead (II) oxide in a combustion tube and the gaseous products cooled, a colourless liquid was obtained.

    (i)   Which chemical test would you use to confirm the colourless liquid above?
          (1mk)

          ....

    (ii) What observation was made in the combustion tube?
          (1mk)

          ....

    (iii) Write an equation for the reaction between hydrogen and lead (II) oxide.
          (1mk)

          ....
    (iv) Identify the reducing agent in the reaction above   (1mk)

          ....

3.   35.0cm³ of ethyne gas were mixed with 50.0cm³ of oxygen and the mixture was sparked to complete the reaction. If all volumes were measured at a pressure of one atmosphere and 25⁰C, calculate the volume of the resulting gaseous mixture

(3mks)

(ii)   Identify and state the Gas Law that is applied in the calculation above   (2mks)

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4.   A stream of chlorine gas was bubbled through a solution of dilute sodium Hydroxide which contained litmus paper.
a) State and explain the observation made   (2mks)

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b) Write an equation for the reaction between chlorine and dilute sodium hydroxide solution (1mk)

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

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

   (2mks)

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   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. (1mk)

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6. (a) Using dots (.) and crosses (X) to represent electrons in the outermost energy level, draw a diagram to show bonding in the compound formed between phosphorous and hydrogen. (H = 1, P = 15).   (1mk)

   (b) In what state would you expect the compound in (a) above to be at room temperature? Explain.   (2mks)

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7. The table below shows results obtained from experiment carried out on a salt solution M.

	Experiment	Results
I	A few drops of barium nitrate added to solution M.	No white precipitate.
II	A few drops of lead (II) nitrate added to solution M.	White precipitate present.
III	Ammonia solution added drop wise until in excess.	White precipitate which dissolves to form a colourless solution.

(a) Identify the cation and anion present in solution M.

    Cation...

    Anion...

(b) Write an ionic equation for the formation of white precipitate in experiment II.
    (1mk)

    ....
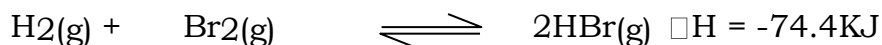
(c) Write the formula of the ion responsible for the formation of colorless solution in
    experiment III.   (1mk)

    ....

8.   Study the reaction equation given below.

      $H_2(g) + Br_2(g) \rightleftharpoons 2HBr(g)$ $\Delta H = -74.4KJ$

      (a)   Draw an energy level diagram showing the catalysed and uncatalysed
             reaction.(2mks)

      (b)   State the effect on formation of hydrogen bromide if pressure was increased in
   the equilibrium mixture above. Explain. (1mk)

      ....
      ....

c) What is the effect of increasing temperature to the above system at Equilibrium
    (2mks)

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    ....

9. An organic compound has a formula of CH3CCCH3.
   (a) Draw the structural formula of the organic compound. (1mk)

   (b) To which homologous series does the compound belong? (1mk)

   ....

   (c) Name the compound formed when chlorine gas diluted in inert gas is reacted to the above organic compound. (1mk)

   ....

10. Xcm^3 of 0.25m sodium chloride was added to lead (II) nitrate until in excess. 3.86g of a white precipitate were formed (Na = 23, Pb = 207, Cl = 35.5, N = 14, O = 16).
    (i) Write an ionic equation for the formation of white precipitate. (1mk)

    ....

    (ii) Work out the value of X. (2mks)

11. Distinguish between Ionization energy and Electron affinity. (2mks)

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    (a) Name **two** reagents that are reacted to produce both carbon (IV) oxide and carbon (II) oxide.
    (1mk)
    ....

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12. Ammonia reacts with oxygen as shown by the thermo chemical

equation shown below.

$4NH_3(g) + 5O_2(g) \rightarrow 4NO(g) + 6H_2O(g) \quad \Delta H = -1208KJ$
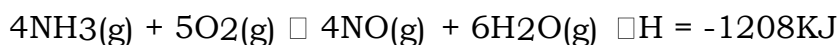
(a)   Work out:
(i)   Energy evolved when one mole of ammonia reacts with oxygen. (1mk)
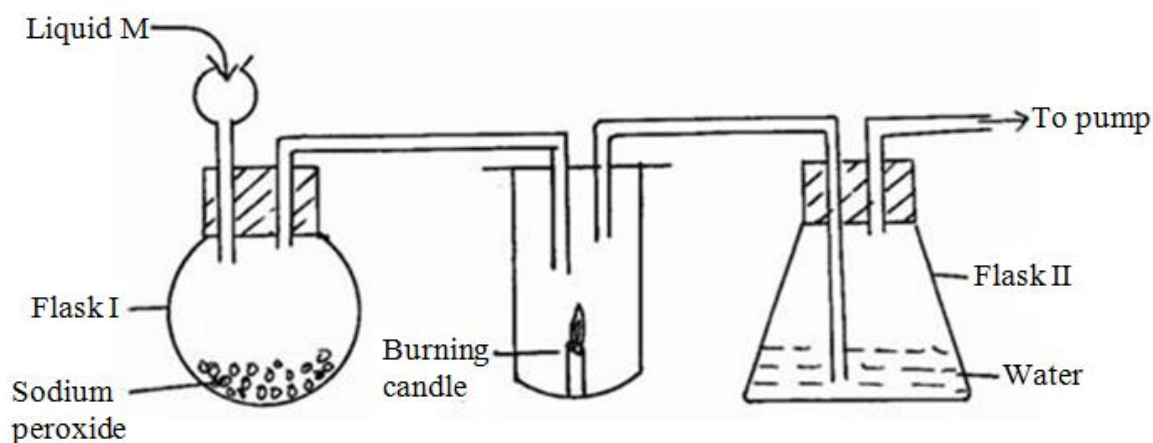
(ii)   Enthalpy change when $2.4dm^3$ of ammonia reacts as shown in the
equation at r.t.p.

(1mk)

(b)   Name the catalyast used in this reaction.   (1mk)

13. The diagram below shows a set up of apparatus used to prepare oxygen gas and
pass it over burning candle. The experiment was allowed to run for several
minutes.

(i)   Identify liquid **M**.   (1mk)

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(i)   The PH of the solution in flask **II** was found to be less than **7**. Explain.
(2mks)

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(ii)   Write an equation for the reaction that forms oxygen gas in the set up.
(1mk)

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14.   The following information is contained in a bottle containing Nitriv (V) acid .

I   Density   = $1.43g/cm^3$
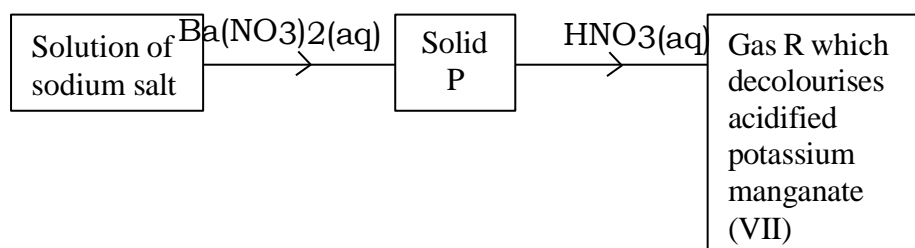
II   Assay/Percantage purity   = 63-65%

III   R.F.M   = 63
   a) What is the Molarity of this solution

   b) How much of this solution is required to make $2000cm^3$ of 0.15M solution

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

| Solution of sodium salt | $Ba(NO_3)_2(aq)$ → | Solid P | $HNO_3(aq)$ → | Gas R which decolourises acidified potassium manganate (VII) |

(a)   Name the solid **P**.   (1mk)

....

(b)   Give the formula of the sodium salt.   (1mk)

....

(c)   Name gas **R**.   (1mk)

....

16.   (a) Write a balanced equation for the formation of Propene gas   (1mk)

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(b) Write an equation to show polymerization of propene   (1mk)

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(c) Starting with Sodium Hydroxide ; Describe how to obtain sodium Carbonate
        (1mk)

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17.   The solubility of potassium nitrate is 85g/100g of water at 50°C and 32g/100g of

water at 25°C.

(a)   Define the term solubility.   (1mk)

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(b)   Calculate the mass of crystals formed if a saturated solution of
        potassium nitrate in 50g of water at 50°C is cooled to 25°C.   (2mks)

18. Describe how to separate a mixture of sodium chloride, Silver chloride and Lead (ii) chloride. (2mks)

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19. A compound W reacts with dilute sulphuric (VI) acid producing a colourless gas that turns a filter paper soaked in lead (II) ethanoate black. The solution obtained formed a white precipitate with aqueous ammonia that dissolves in excess ammonia to form a colourless solution.

    (a)   Name compound W. (1mk)

    ....

    (b)   Write an ionic equation for the formation of the black substance. (1mk)

    ....

    (c)   What is the formula of the ion in the colourless solution formed when the

           white precipitate was dissolved? (1mk)

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20. A given mass of a gas occupies 240cm³ at 91°C and 78mmHg. What volume will the gas occupy at s.t.p? (2mks)

21. (a)   What are isotopes?   (1mk)

    ....

    ....

    (b)   The R.A.M of element P is 63.5. It has two isotopes of masses 63 and 65
          respectively. Determine the percentage abundance of each isotope.(2mks)

22. In an experiment to monitor the rate of reaction of magnesium and hydrochloric acid a student recorded the volume of hydrogen at regular time intervals and obtained the graph shown below.
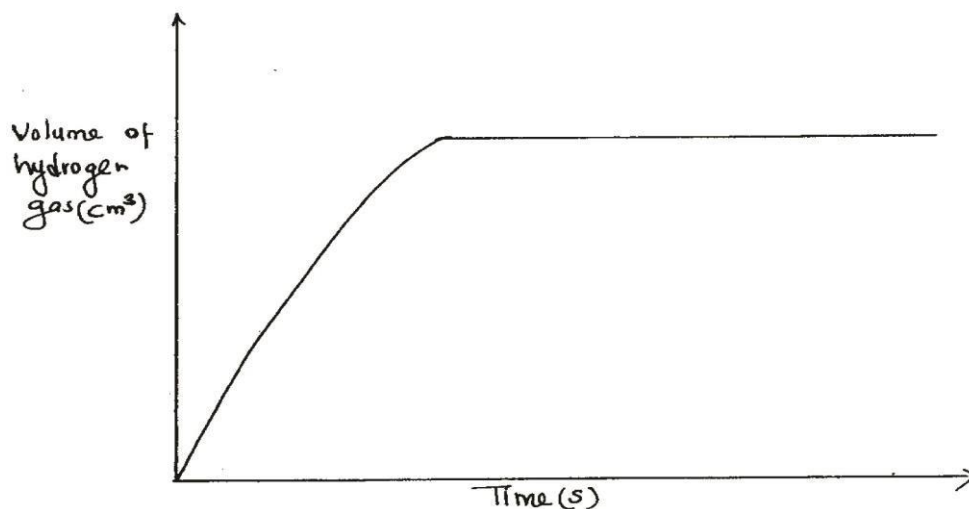
(a) On the same set of axes sketch the curve expected if the experiment is repeated with a few crystals of copper (II) Sulphate added to the reactants. (1mk)

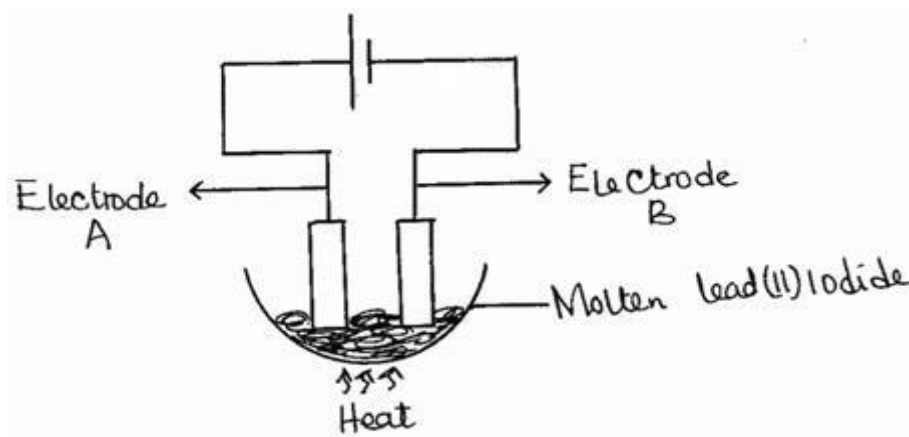(b) Explain the shape of the curve drawn in (a) above.(1mk)

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23. (a) What is a binary electrolyte?(1mk)

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(b) The set-up below was used to electrolyse molten lead (II) iodide.

(i) State the observation that was made during electrolysis at electrode **B**.(1mk)

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(ii) Write the ionic equation for the reaction that took place at the anode.(1mk)

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24. Calculate the oxidation number of chromium in the ion CrO_4^-.(1mk)

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25. State Le Chatalier's Principle :

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b) Explain the effect of adding lime water to the system in Equilibrium below (2mks)

$$2CO_{(g)} + O_{2(g)} \rightleftharpoons 2CO_{2(g)} \quad \Delta H = -74.4KJ$$

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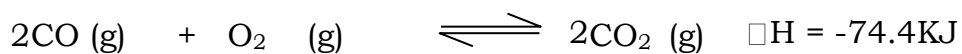
26. You are provided with the following two set-ups to prepare aqueous ammonia in the laboratory.

Ammonia
nia

Water

Ammo

Filter funnel

(a)   (b)
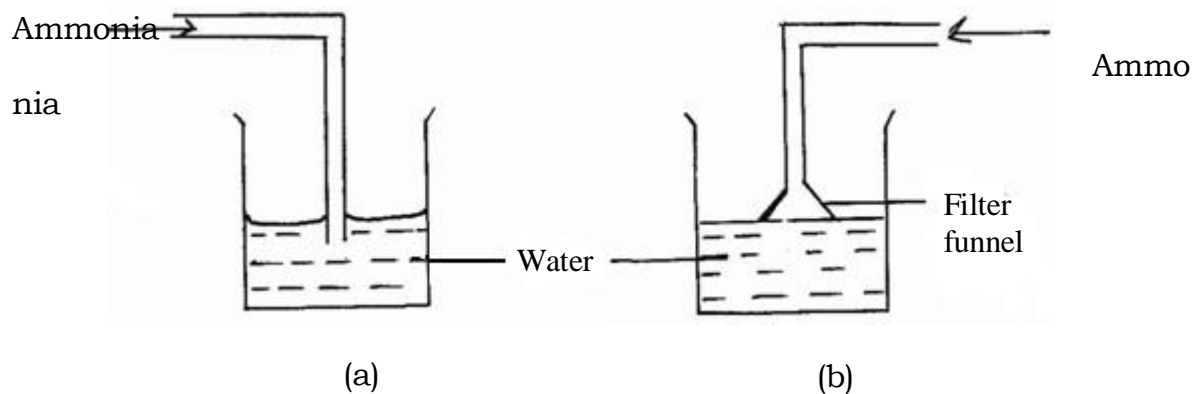
Which of the two set-ups **(a)** and **(b)** would you prefer? Explain.(1mk)

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