Name ............................................................

233/1
CHEMISTRY
Paper 1
(THEORY)
Oct./Nov. 2014
2 hours

Candidate's Signature ...............................

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

## THE KENYA NATIONAL EXAMINATIONS COUNCIL
### Kenya Certificate of Secondary Education
CHEMISTRY
**Paper 1**
**(THEORY)**
2 hours

## Instructions to candidates

(a)  *Write your name and index number in the spaces provided above.*
(b)  *Sign and write the date of examination in the spaces provided above.*
(c)  *Answer **all** the questions in the spaces provided in this question paper.*
(d)  *KNEC mathematical tables and silent electronic calculators may be used.*
(e)  *All working **must** be clearly shown where necessary.*
(f)  ***This paper consists of 15 printed pages.***
(g)  *Candidates should check the question paper to ascertain that all the pages are printed as*
     *indicated and that no questions are missing.*
(h)  *Candidates should answer the questions in English.*

### For Examiner's Use Only

| Questions | Maximum Score | Candidate's Score |
|-----------|---------------|-------------------|
| 1 - 30    | 80            |                   |

1   Explain how the hotness of a Bunsen burner flame can be increased.          (1 mark)

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2   When dilute hydrochloric acid was reacted with solid B, a colourless gas which extinguished a burning splint was produced. When an aqueous solution of solid B was tested with a blue litmus paper, the paper turned red/ pink.

(a)   Identify the anion present in solid B.                                     (1 mark)

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(b)   Write an ionic equation for the reaction between solid B and dilute hydrochloric acid.
                                                                                (1 mark)

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3   Dry ammonia gas was passed over heated lead (II) oxide and the products passed over anhydrous copper (II) sulphate as shown in the diagram below.
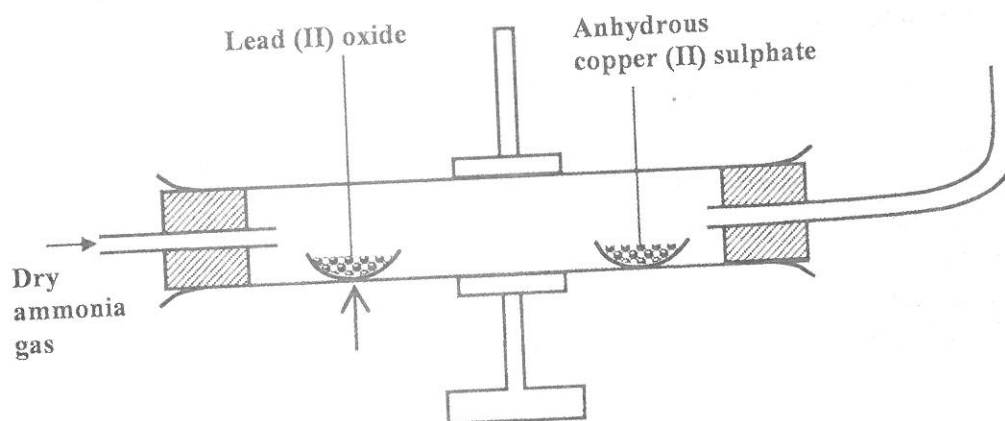


State:                                                                          (2 marks)

(a)   **two** observations made in the combustion tube.

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(b)     the property of ammonia gas shown in this experiment.                    (1 mark)

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4     Starting with zinc sulphate solution, describe how a sample of zinc oxide can be obtained.

(3 marks)

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5     Explain how conduction of electricity takes place in the following:

(a)     iron metal;                                                                          (1 mark)

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(b)     molten lead (II) iodide.                                                       (1 mark)

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6     $100 \ cm^3$ of a sample of ethane gas diffuses through a porous pot in 100 seconds. What is the molecular mass of gas Q if $100 \ cm^3$ of the gas diffuses through the same porous pot in 121 seconds under the same conditions?
        (C = 12.0, H = 1.0)                                                             (3 marks)

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7  (a)  Draw and name the isomers of butyne.                               (2 marks)

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   (b)  State **one** use of polystyrene.                                    (1 mark)

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8  Complete the nuclear reaction below:

   (a)  $^{226}_{88}Q \longrightarrow {}^{222}_{86}P +$                     (1 mark)

   (b)  State **two** uses of radioisotopes in health.                       (2 marks)

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9  The table below shows the relative molecular masses and boiling points of pentane and
   ethanoic acid.

| | Relative molecular mass | Boiling point (°C) |
|---|---|---|
| Pentane | 72 | 36 |
| Ethanoic acid | 60 | 118 |

Explain the large difference in boiling point between ethanoic acid and pentane.     (2 marks)

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**10** One of the ores of copper has the formula, $CuFeS_2$.

(a) Describe how iron in the ore is removed during extraction of copper metal. (1 mark)
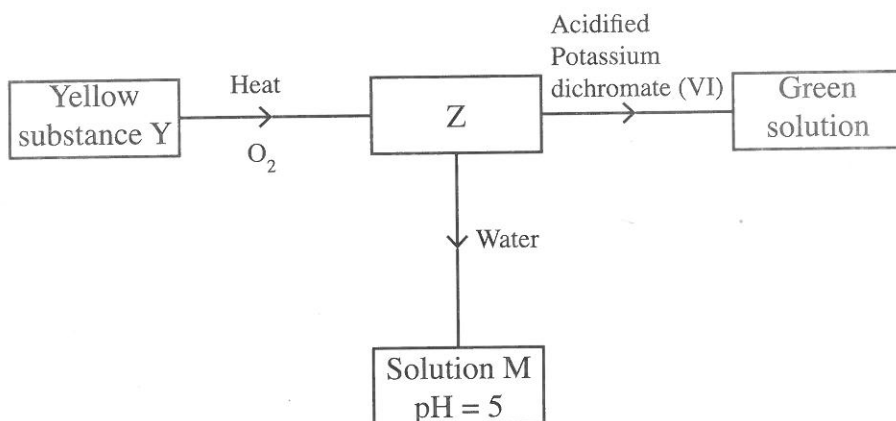
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(b) State **two** environmental problems associated with extraction of copper metal.

(2 marks)

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



Identify Z and M. (2 marks)

Z .......................................................................................................................................

M .......................................................................................................................................

**12** The table below shows the pH values of solutions A, B, C and D.

| Solution | A | B | C | D |
|----------|---|---|---|----|
| pH | 2 | 7 | 11 | 14 |

Select solutions in which a sample of lead (II) hydroxide is likely to dissolve. Give reasons for each solution selected. (3 marks)

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**13** 100 cm³ of 0.05 M sulphuric (VI) acid were placed in a flask and a small quantity of anhydrous sodium carbonate added. The mixture was boiled to expel all the carbon (IV) oxide. 25 cm³ of the resulting solution required 18 cm³ of 0.1 M sodium hydroxide solution to neutralise it. Calculate the mass of sodium carbonate added.
(Na = 23.0; O = 16.0; C = 12.0) (3 marks)

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**14** When 20 cm³ of 1 M sodium hydroxide was mixed with 20 cm³ of 1 M hydrochloric acid, the temperature rose by 6.7 °C. Assuming the density of the solution is 1 g/cm³ and the specific heat capacity of the solution is 4.2 $Jg^{-1} k^{-1}$;

(a) calculate the molar heat of neutralisation; (2 marks)

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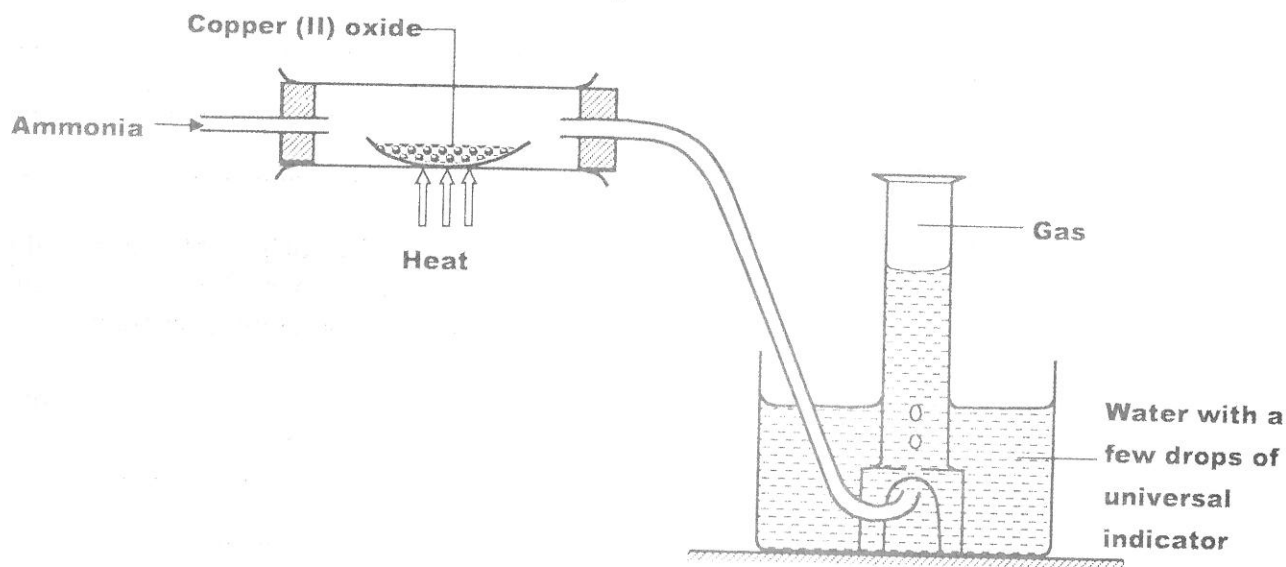
(b)    when the experiment was repeated with 1 M ethanoic acid, the temperature change was found to be lower than that with 1 M hydrochloric acid. Explain.    (1 mark)

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**15**    Study the set-up below and answer the questions that follow.



(a)    Write an equation for the reaction between ammonia and copper (II) oxide.

(1 mark)

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(b)    During the experiment, the colour of the contents in the water trough changed. State the colour change observed and give an explanation.    (2 marks)

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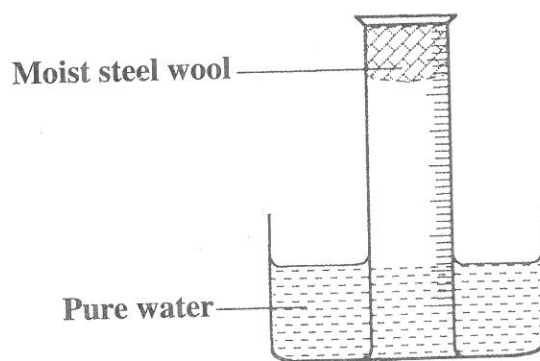...................................................................................................................................

16  A measuring cylinder fitted with moist steel wool was inverted in a trough of water as shown in the diagram below.



(a)  State and explain the observations made on the:

   (i)  moist steel wool after four days.  (1 mark)

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   (ii)  water level in the measuring cylinder after four days.  (1 mark)

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(b)  What would be the effect of using steel wool moistened with salty water?  (1 mark)

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17    In an experiment on rates of reaction, potassium carbonate was reacted with dilute sulphuric (VI) acid.

(a)    What would be the effect of an increase in the concentration of the acid on the rate of the reaction?                                                                                              (1 mark)

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(b)    Explain why the rate of reaction is found to increase with temperature.          (2 marks)

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18    Use the part of the periodic table given below to answer the questions that follow. (Letters are not the actual symbols of the elements).



(a)    Identify the element that forms giant covalent structures.                                (1 mark)

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(b)    Identify **one** element that does not form compounds.                                    (1 mark)

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(c)    Write the formula for the nitride of M.                                                          (1 mark)

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19    Draw a set up that can be used to separate a mixture of sand and iodine.        (3 marks)

20    In the contact process, during the production of sulphur (VI) oxide, a catalyst is used.  Give
      **two** reasons why vanadium (V) oxide is preferred to platinum.        (2 marks)

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21    Given that the atomic number of Y is 13 and that of Z is 9:

      (a)    write the electronic arrangement of Y and Z;        (1 mark)

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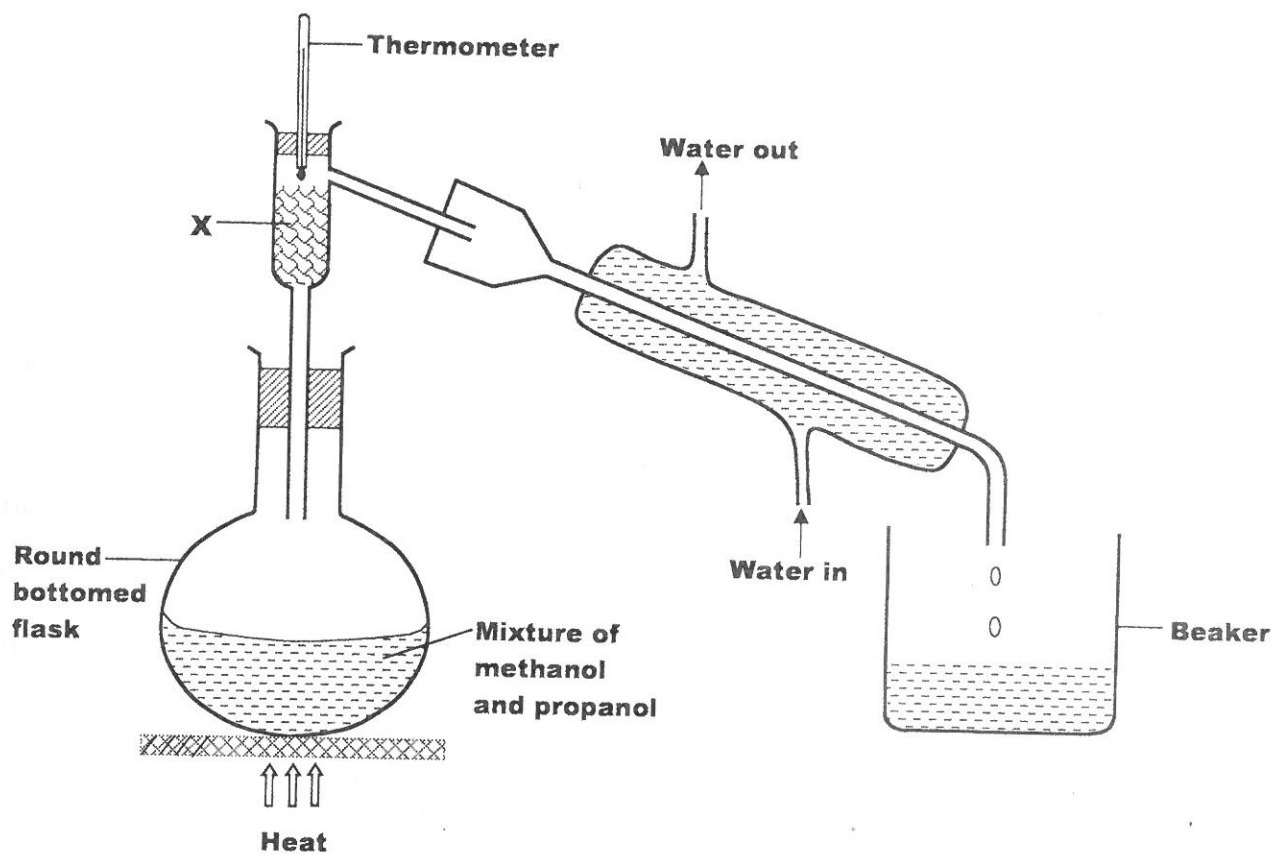
      (b)    draw the dot ( . ) and cross (x) diagram for the compound formed by Y and Z.
                                                                                (1 mark)

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**22** The set up below was used to separate a mixture of methanol and propanol. Study it and answer the questions that follow.
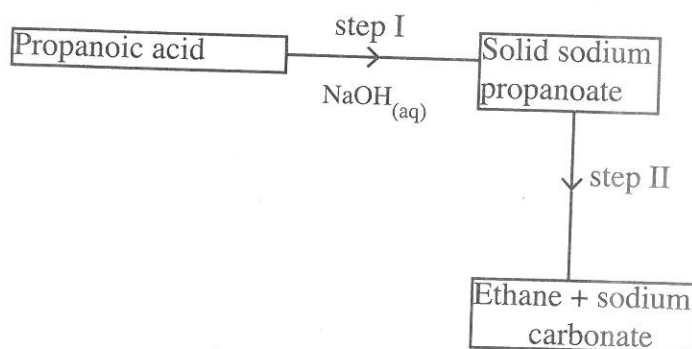


(a) State the function of X. (1 mark)

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(b) Which liquid will collect first in the beaker? Give a reason. (2 marks)

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

**19**

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┌─────────────────┐   step I        ┌─────────────────┐
│ Propanoic acid  │ ─────────────►  │ Solid sodium    │
└─────────────────┘   NaOH(aq)      │ propanoate      │
                                    └─────────────────┘
                                            │
                                            ▼ step II
                                    ┌─────────────────┐
                                    │ Ethane + sodium │
                                    │ carbonate       │
                                    └─────────────────┘
```

(a)   Name the process in step I.

(1 mark)

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(b)   Identify the reagent in step II.

(1 mark)

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(c)   Give **one** use of ethane.

(1 mark)

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**24**   (a)   A student electrolysed dilute sodium chloride solution using inert carbon electrodes.
**20**   Name the products at:

(i)   anode;

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(ii)   cathode.

**21**

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(2 marks)

(b)   If the experiment was repeated using concentrated sodium chloride instead of dilute
sodium chloride solution, write the half equation at the anode.

(1 mark)

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25 An organic compound had the following composition 37.21% carbon, 7.75% hydrogen and the rest chlorine. Determine the molecular formula of the compound, given that the molecular mass of the compound is 65. $(C = 12.0; H = 1.0; Cl = 35.5)$. (3 marks)

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26 Cotton is a natural polymer. State **one** advantage and **one** disadvantage of this polymer.

(2 marks)

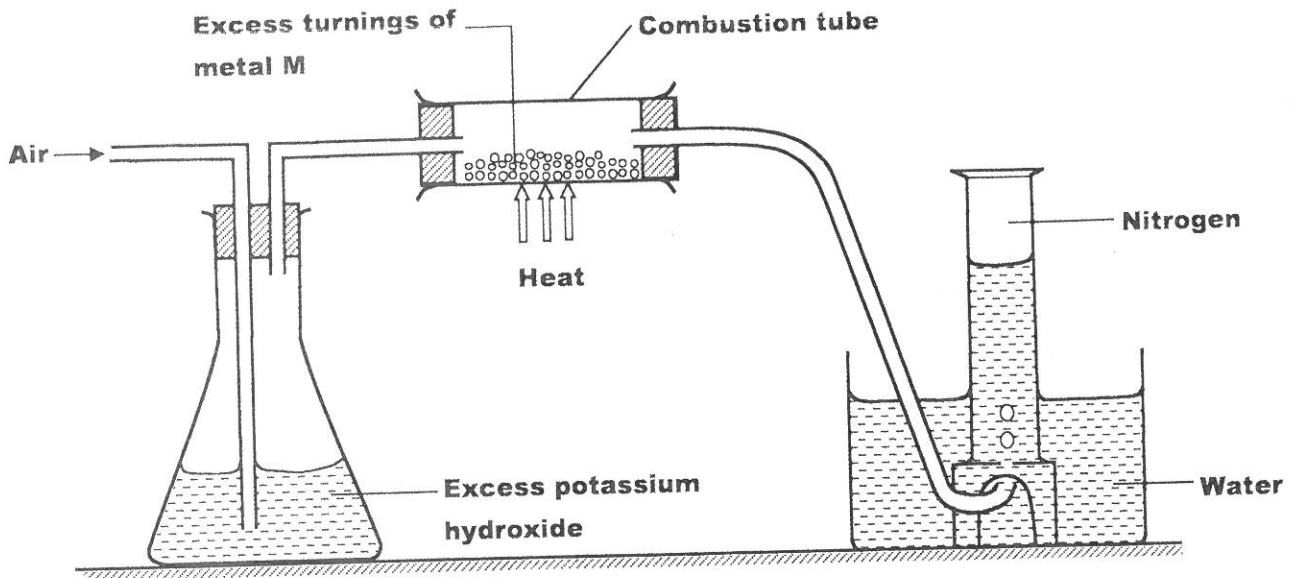Advantage: ................................................................................................................................

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Disadvantage: ..........................................................................................................................

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27 (a) Name a suitable solvent for extracting an indicator from flowers; (1 mark)

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(b) Give a reason why the solvent named in (a) above is used. (1 mark)

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*Chemistry Paper 1*
*THEORY*
*2403020*

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**Turn over**

**28** A student used the set up below to prepare a sample of nitrogen gas.



(a) State the function of potassium hydroxide in the set up. (1 mark)

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(b) Give a suitable metal M for use in the combustion tube. (1 mark)

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(c) Give a reason why the nitrogen gas obtained is not pure. (1 mark)

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29   (a)   What is meant by the term radical?                                    (1 mark)

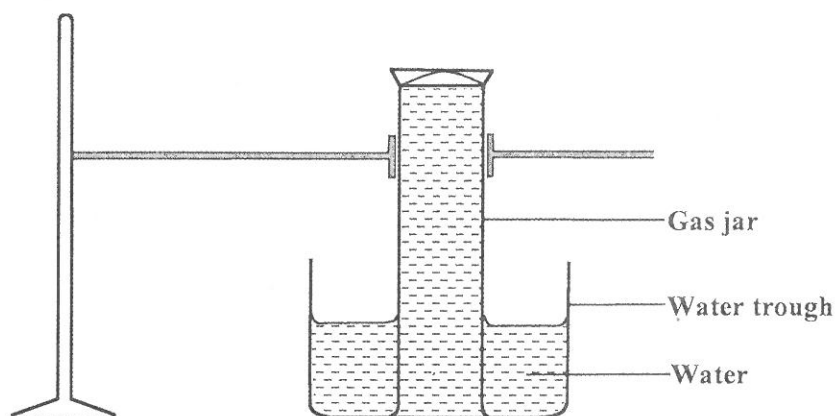.....................................................................................................................

(b)   The table below contains atoms that form common radicals. Complete the table to show radicals formed from various atoms.

| Element | N | S |
|---------|------|------|
| H | $NH_4^+$ | //////// |
| O | | |

(2 marks)

30   A gas jar full of chlorine water was inverted over water and allowed to stand for sometime.



— Gas jar

— Water trough

— Water

(a)   State and explain **two** observations made in the gas jar after some time.   (2 marks)

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(b)   Write the equation for the reaction between chlorine and hot concentrated potassium hydroxide.                                                              (1 mark)

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