

Name .....

Index Number .....

School .....

Candidate's Signature .....

233/2

Date .....

**CHEMISTRY**

**Paper 2**

**(THEORY)**

**2015**

2 hours

**MAKUENI COUNTY KCSE 2015 PREPARATORY EXAMINATION**

**Kenya Certificate of Secondary Education**

**CHEMISTRY**

**Paper 2**

**(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	10	
2	11	
3	13	
4	11	
5	15	
6	11	
7	9	
<b>Total Score</b>	<b>80</b>	

*Sponsored by H.E. Prof. Kivutha Kibwana, Governor, Makueni County.*

TURN OVER

1. (a) Distinguish between isotopes and allotropes. (2 marks)

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- (b) The chart below is part of the periodic table. Study it and answer the questions that follow (the letters are not the actual symbols of the elements).

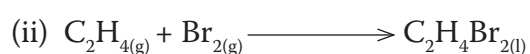
A				B			
C	D					E	

- (i) Select the element in period three which has the shortest atomic radius. Give a reason for your answer. (2 marks)
- .....
- .....
- (ii) Element F has the electronic structure 2.8.18.4. On the chart above indicate the position of element F. (1 mark)
- (iii) State **one** use of elements of the group to which E is a member. (1 mark)
- .....
- (iv) Write an equation to show the action of heat on the nitrate of element C. (1 mark)
- .....
- (c) When 3 litres of chlorine gas were completely reacted with element D, 11.875 g of the product were formed. Determine the relative atomic mass of element D. (Atomic mass chlorine = 35.5, molar gas volume = 24 litres) (3 marks)

2. (a) Give the names of the following compounds.



(b) Ethane and ethene react with bromine according to the equations given below.



Name the type of bromination reaction that takes place in:

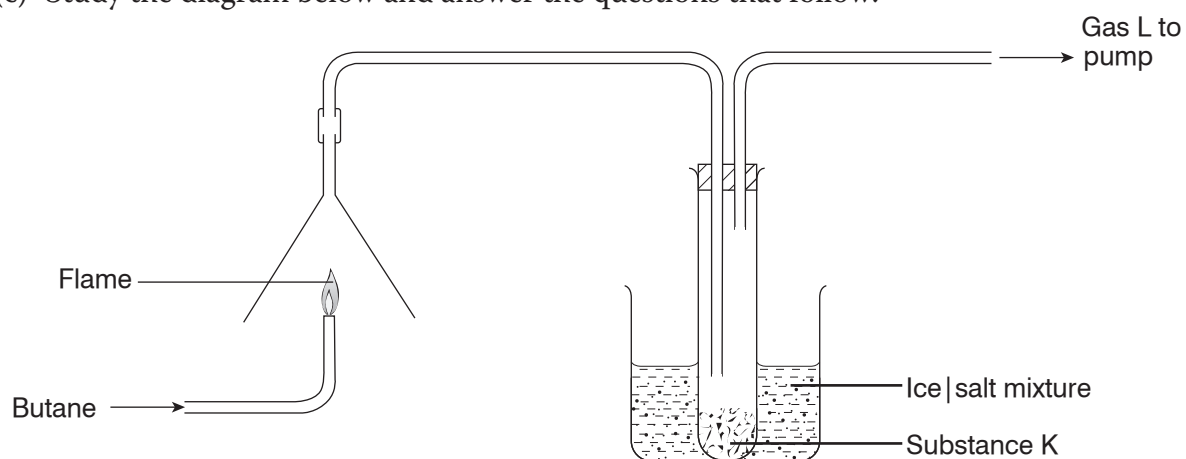
(i) (1 mark)

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(ii) (1 mark)

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(c) Study the diagram below and answer the questions that follow.



(i) Write the equation for the combustion of butane. (1 mark)

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- (ii) The pH of substance K was found to be less than 7. Explain this observation. (2 marks)

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- (d) The polymerisation of tetrafluoroethene ( $C_2F_4$ ) is similar to that of ethene ( $C_2H_4$ ).

- (i) What is meant by the term polymerisation? (1 mark)

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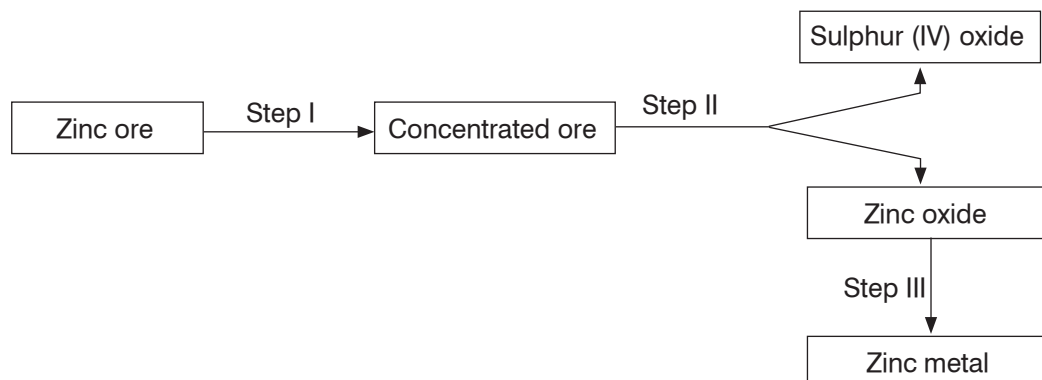
- (ii) Draw the structural formula of a portion of the polymer obtained from the monomer  $C_2F_4$ . (1 mark)

- (e) State any **two** advantages that synthetic polymers have over natural polymers. (2 marks)

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3. (a) The flow chart below summarizes the steps in the extraction of zinc. Study it and answer the questions that follow.



- (i) Write down the formulae and names of **two** ores of zinc. (2 marks)

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- (ii) State **two** processes that are carried out in step I. (1 mark)

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- (iii) State **two** substances that can be used for the processes in step III. (1 mark)

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- (iv) Write a chemical equation for the process in step II. (1 mark)

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- (v) State **one** environmental impact of releasing sulphur (IV) oxide to the environment. (1 mark)

.....

- (vi) State any **two** uses of zinc metal. (2 marks)

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- (b) Zinc oxide is reduced to zinc as shown by the equation.

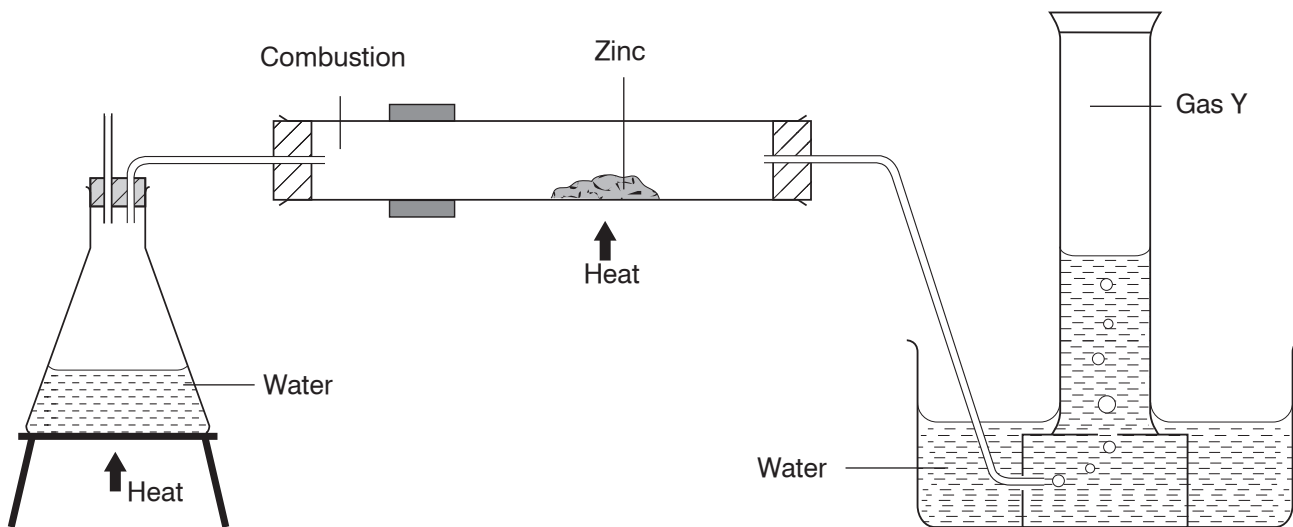


Calculate the mass of zinc obtained from 243 kg of zinc oxide and 24 kg of coke.

(C = 12.0, O = 16.0, Zn = 65)

(2 marks)

(c) Study the set-up below and answer the questions that follow.



(i) State the observation made in the combustion tube T during the experiment. (1 mark)

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(ii) Identify gas Y. (1 mark)

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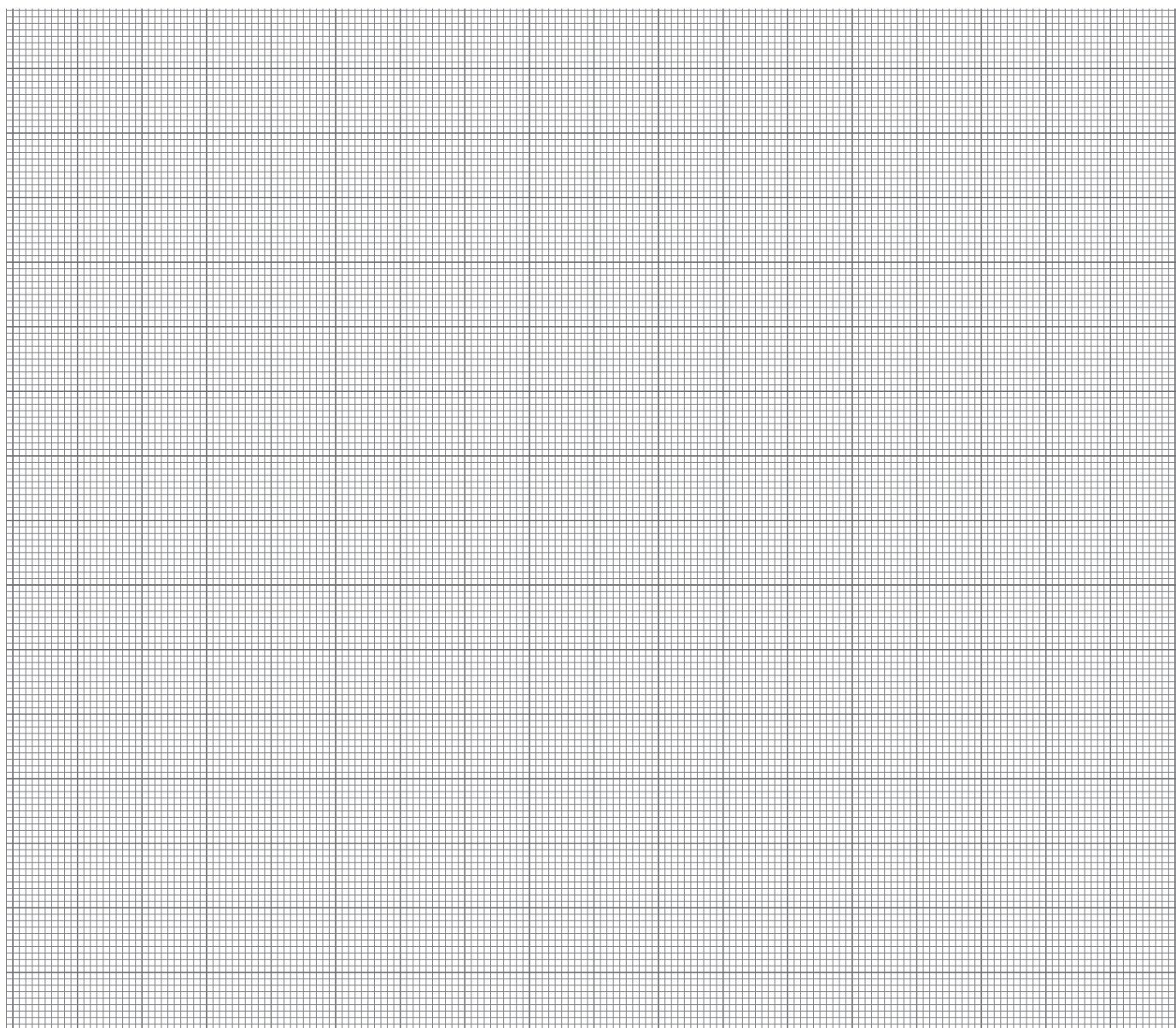
(iii) Write an equation for the reaction in combustion tube T. (1 mark)

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4. In an experiment, 50 cm<sup>3</sup> of 1.0 M sodium hydroxide solution was placed in a suitable apparatus and 5.0 cm<sup>3</sup> portions of hydrochloric acid were added at intervals. The resulting mixture was stirred with a thermometer and the temperature taken after each addition. Both solutions were initially at 20°C.

Volume of HCl (cm <sup>3</sup> )	5	10	15	20	25	30	35	40
Temperature (°C)	21.5	22.5	24.5	25.0	25.6	27.5	28.0	28.0

(a) (i) Plot a graph of temperature rise against volume of the acid added. (3 marks)



(ii) Use the graph to determine the concentration in moles per litre of the hydrochloric acid. (2 marks)

(iii) Calculate the enthalpy of neutralization of the alkali with hydrochloric acid. (Specific capacity of the mixture =  $4.2 \text{ kJ kg}^{-1} \text{ K}^{-1}$  and density of the solution =  $1.0 \text{ g/cm}^3$ ). (2 marks)



(b) Draw the energy level diagram for the reaction.

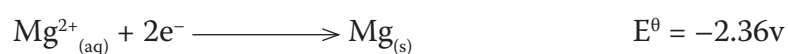
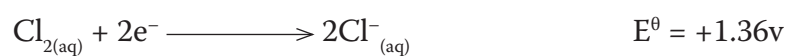
(2 marks)

(c) Suggest two possible sources of error.

(2 marks)

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5. (a) The standard electrode potentials for the elements chloride and magnesium are:



(i) Which one of the two elements will act as an oxidizing agent? Explain your choice.

(2 marks)

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- (ii) Calculate the electromotive force of a cell where the overall reaction is: (1 mark)



- (b) The table below gives the standard electrode potentials for divalent metals represented by the letters P, Q, R and S (not their true element symbols). Use it to answer the questions that follow.

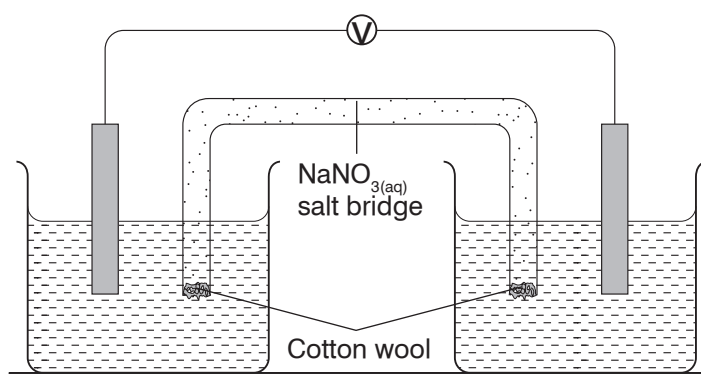
Metal	$E^\ominus$ (Volts)
P	+1.50
Q	-0.44
R	+0.34
S	-0.76

- (i) Which one of the metals cannot be displaced from a solution of its ions by any other metals in the table? Explain. (2 marks)

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- (ii) Metals P and Q were connected to form a cell as shown in the diagram below.



I. On the diagram, label the metals P and Q and indicate the ions in solution. (2 marks)

II. Write equations (half equations) of the reactions taking place at the electrodes.

Electrode P (1 mark)

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Electrode Q (1 mark)

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III. State two functions of the salt bridge. (2 marks)

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IV. What must be observed about the choice of a salt bridge? (1 mark)

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(iii) A metallic couple of the metal S and metal Z produced a voltage of +1.71 volts (assume that S has the higher negative electrode potential).

I. Calculate the standard electrode potential (S.E.P) for metal Z. (1 mark)

II. Arrange the metals P, Q, R and Z in their decreasing order of reactivity. (1 mark)

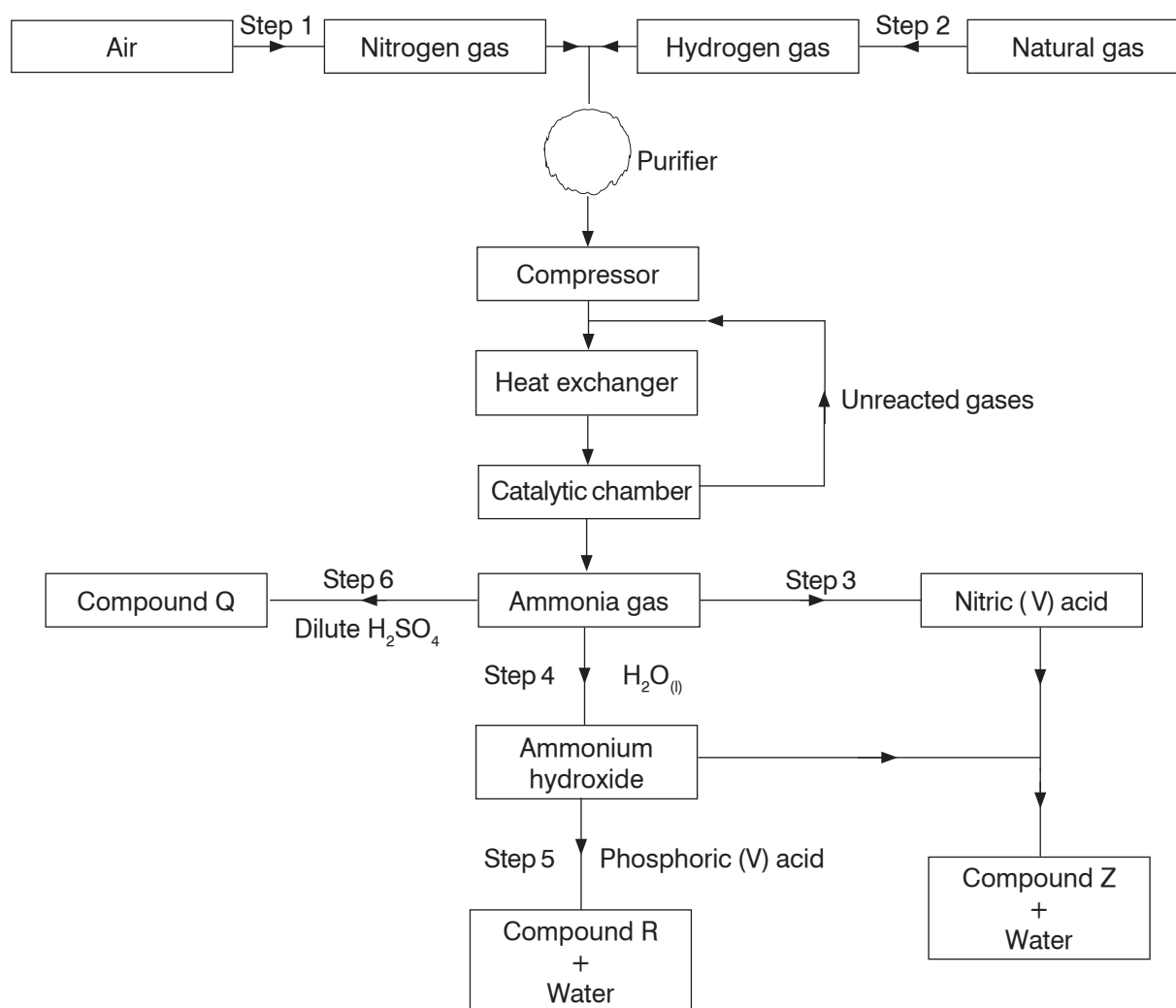
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III. State any **two** factors that affect preferential order of discharge of ions in electrolysis. (1 mark)

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6. The flow chart below shows the industrial preparation of ammonia and the processes used in the manufacture of some ammonium compounds. Study it and answer the questions that follow.



(a) Give the name of the:

(i) process in Step 1.

(1 mark)

.....

(ii) reaction that takes place in Step 5.

(1 mark)

.....

(b) State **one** other source of hydrogen gas apart from natural gas. (1 mark)

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(c) Explain why it is necessary to compress nitrogen and hydrogen in this process. (2 marks)

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(d) Write an equation for the reaction which takes place in Step 6. (1 mark)

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(e) Name the catalyst and the reagents used in Step 3. (1 mark)

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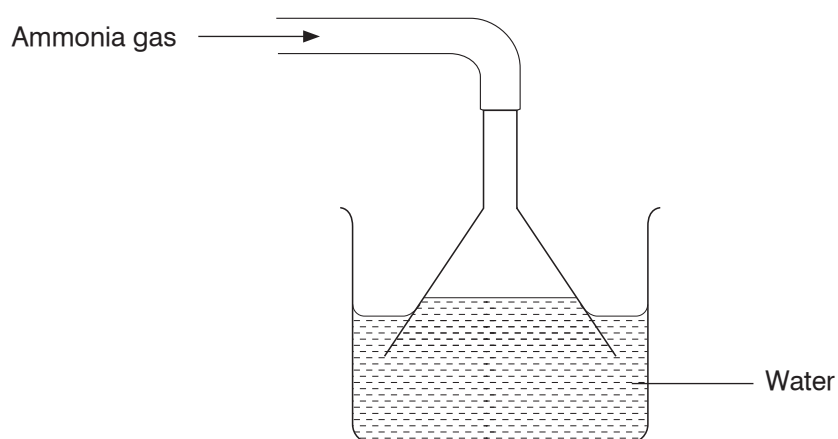
(f) Name compound Z. (1 mark)

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(g) Give one commercial use of compound R. (1 mark)

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(h) Ammonia gas was passed into water as shown below.



(i) Explain why the pH of the solution is above 7. (1 mark)

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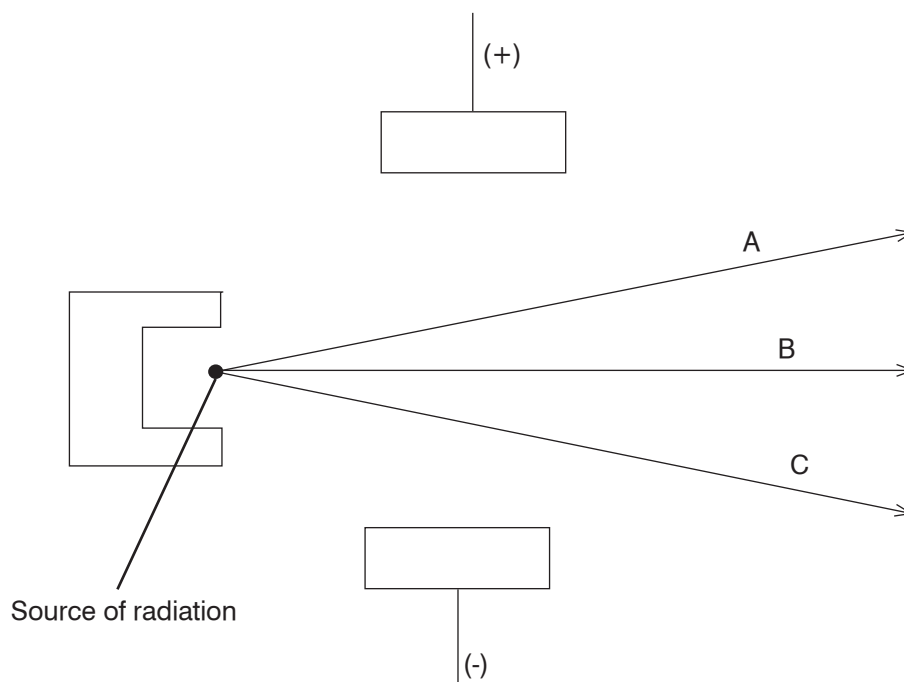
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(ii) What is the use of the inverted funnel? (1 mark)

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7. A radioactive material emitted radiations as shown below.



(a) Which radiation contains helium particles? (1 mark)

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(b) Which radiation has the:

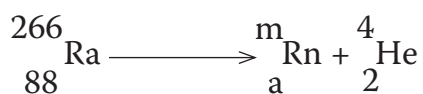
(i) lowest ionizing power? (1 mark)

.....

(ii) lowest penetrating power? (1 mark)

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(c) Radium Ra decays as shown below.



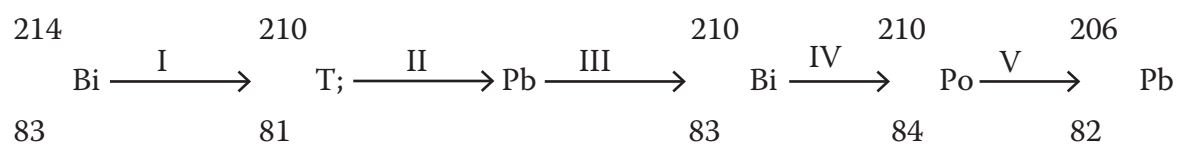
Give the values of a and m.

(1 mark)

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- (d) Randon, Rn, undergoes alpha decay taking 15 days for the original mass to reduce by 6.25%. Calculate the half-life of Randon. (2 marks)

- (e) Study the following scheme and answer the questions that follow.



Identify the particles emitted in:

(2 marks)

- (i) I.

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- (ii) II.

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- (f) State one difference between a chemical reaction and a nuclear reaction.

(1 mark)

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