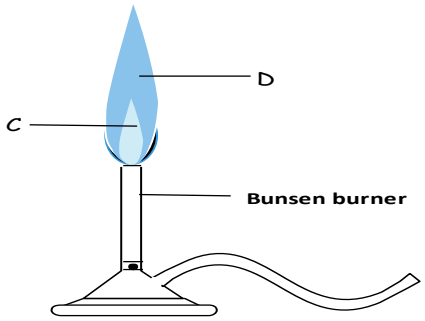
FORM ONE

1. INTRODUCTION TO CHEMISTRY

1. State any two differences between luminous and non – luminous flames (2 marks)

2. The diagram below shows a Bunsen burner when in use.



Name the regions labeled C and D. (2marks)

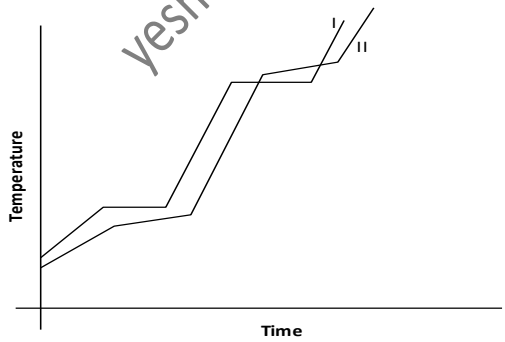
C

D

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

2. SIMPLE CLASSIFICATION OF SUBSTANCES

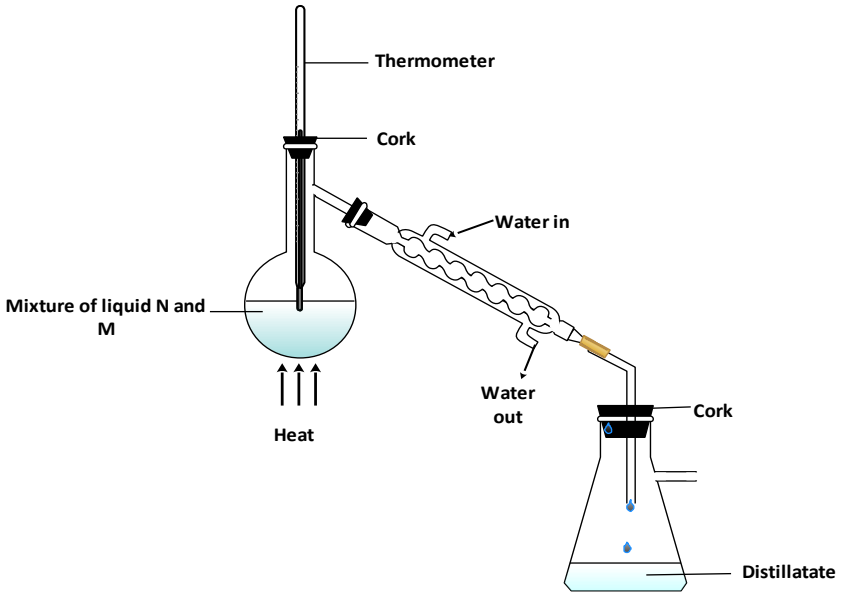
1. The curve below represents the variation of temperature with time when pure and impure samples of a solid were heated separately.



Which curve sows the variation in temperature for the pure solid? Explain (2mks)

2. In an experiment to separate a mixture of two organic liquids, liquid M (b.p 56^{o}C) and liquid N (b.t. 118C^{o}),

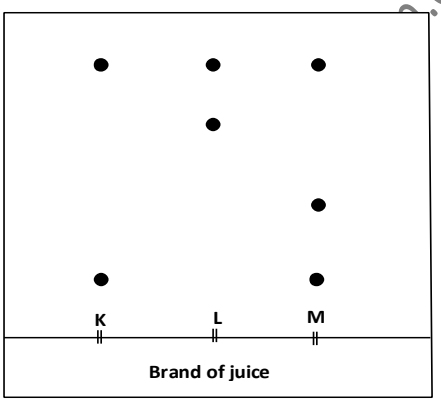
3. a student set up the apparatus shown below.



(a) Identify two mistakes in the set – up (2marks)

(b) What method would the student use to test the purity of the distillates obtained? (1 mark)

4. The diagram below represents a paper chromatogram for three brands of juices suspected to contain banned food colorings.

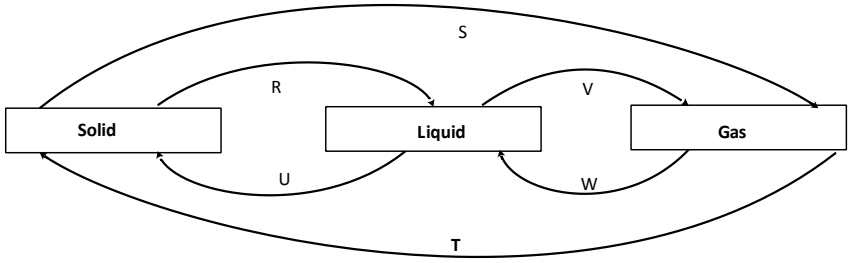


The results showed the presence of banned food colorings in L and M only. On the same diagram:

(a) Circle the spots which show the banned food colorings (2 marks)

(b) Show solvent front. (1 mark)

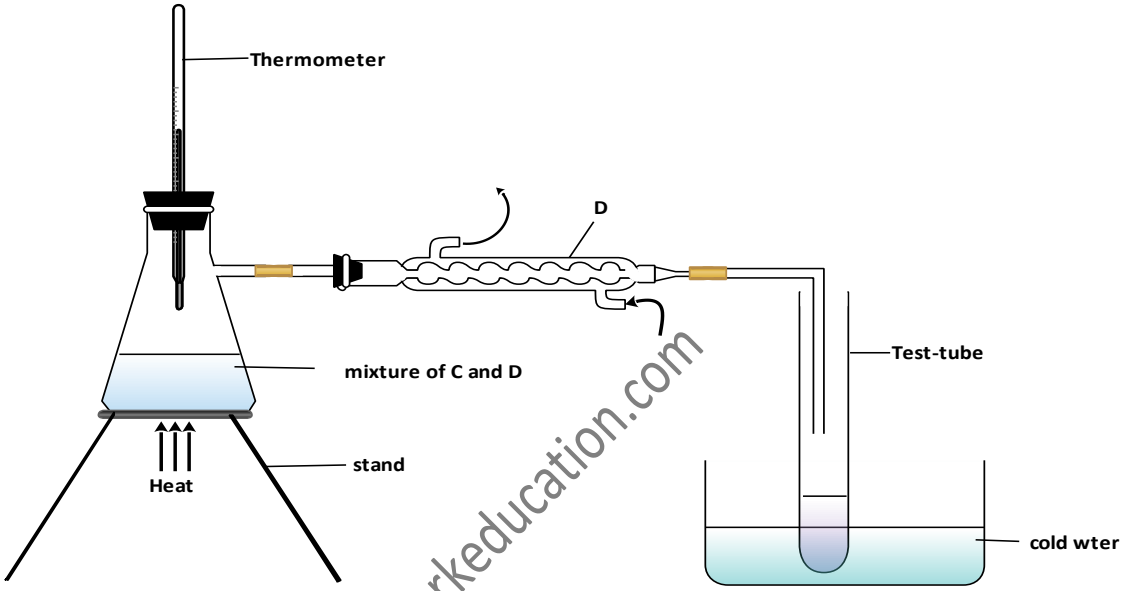
5. The diagram below shows the physical state of matter. Study it and answer the questions that follow.



(a) Identify the processes R, V, w and U (2 marks)
(b) Name one substance which can undergo the process represented by S and T. (1 mark)

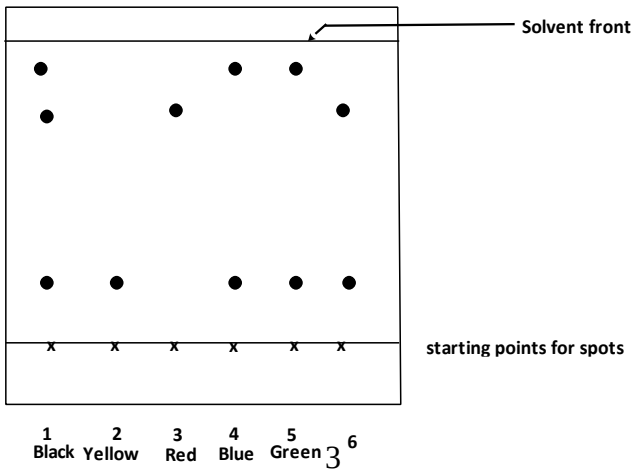
6. Explain the change in mass that occurs when the following substances are separately heated in open crucibles.
(a) Copper metal
(b) Copper (II) nitrate (3 marks)

7. The set – up below represents the apparatus that may be used to separate a mixture of two miscible liquids C and D whose boiling points are 80^0C and 110^0C.



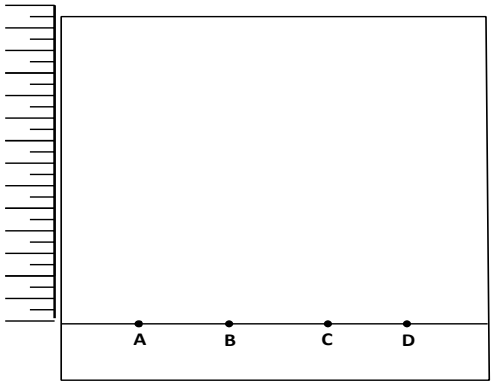
(a) Name B (1 mark)
(b) What is the purpose of the thermometer (1mark)
(c) Which liquid was collected in the test tube? (1mark)

8. A piece of chromatography paper was spotted with coloured inks obtained from pens labeled 1 to 6. The diagram below shows the spots after the chromatogram was developed.



(a) Which two pens contained in the same pigment? (1mark)
(b) Which pens contained only one pigment (1mark)
(c) According to the chromatogram, which pigments are present in the ink of pen number 6? (1mark)

9. (a) The diagram below shows spots of pure substance A,B and C on a chromatography paper. Spot D is that of a mixture.



After development, **A, B** and **C** were found to have moved 8cm, 3cm and 6 cm respectively. **D** has separated into two spots which had moved 6cm and 8 cm

(i) On the diagram
I Label the baseline. (origin) (1 mark)
II Show the positions of all the spots after development (3 marks)
(ii) Identify the substances present in the mixture D (2 marks)

(b) Describe how solid ammonium chloride can be separated from a solid mixture of ammonium chloride and anhydrous calcium chloride (2 marks)

(c) The table shows liquids that are miscible and those that are immiscible.

Liquid	L_3	L_4
L_1	Miscible	Miscible
L_2	Miscible	Immiscible

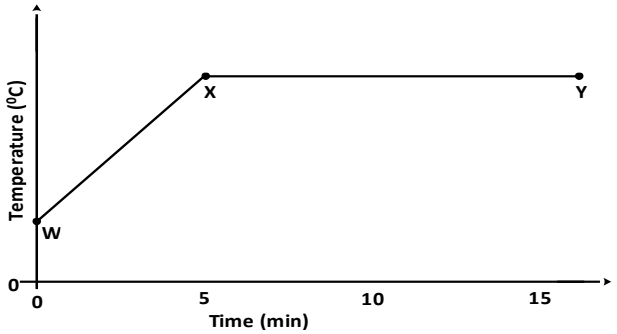
Use the information given to answer the questions that follow
(i) Name the method that can be used to separate L1 and L3 from a mixture of two (1 mark)
(iii) Describe how a mixture of L_2 and L4 can be separated (2 marks)

10. Study the properties of substances V1 to V4 in the table below and answer the questions that follow.

Substance	Solubility in water	Solubility	Melting Point(^oC)	Boiling point(^oC)
V1	Insoluble	Soluble	-30	250
V2	Insoluble	Insoluble	1535	3000
V3	Insoluble	Soluble	16.8	44.8
V4	Insoluble	Soluble	75	320

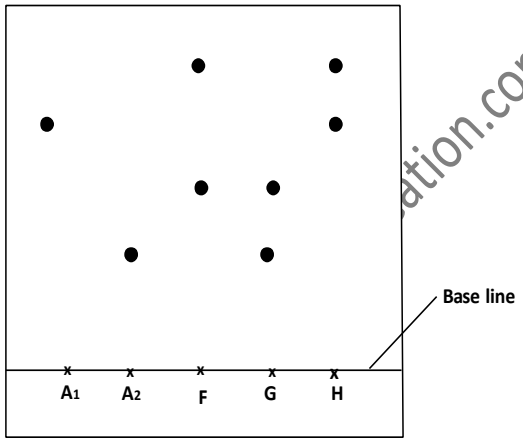
a) Which of the substances are liquids at 24^0C? (1 mark)
b) Describe how a mixture containing V2 and V4 can be separated (2marks)

11. The graph below shows a curve obtained when water at 20^0C was heated for 15 minutes.



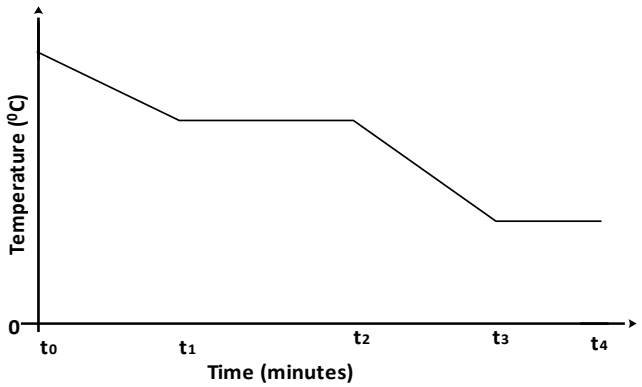
(a) What happens to the water molecules between points W and x? (1mark)
(b) In which part of the curve does a change of state occur? (1mark)
(c) Explain why the temperature does not rise between points X and Y. (1mark)

12. Samples of urine from three participants F, G and H at an international sports meeting were spotted onto a chromatography paper alongside two from illegal drugs A_1 and A_2. A chromatogram was run using methanol. The figure below shows the chromatogram.



(a) Identify the athlete who had used an illegal drug. (1 mark)
(b) Which drug is more soluble in methanol? (1 mark)

13. The graph below is a cooling curve of a substance from gaseous state to solid state.



Give the name of the:
(a) Process taking place between t_0 and t_1. (1 mark)

(b) Energy change that occurs between t_3 and t_4 (1 mark)

14. Classify the following processes as either chemical or physical. (3 marks)

Process	Type of change
a) Heating copper (II) sulphate crystals	
b) Obtaining kerosene from crude oil	
c) Souring of milk	

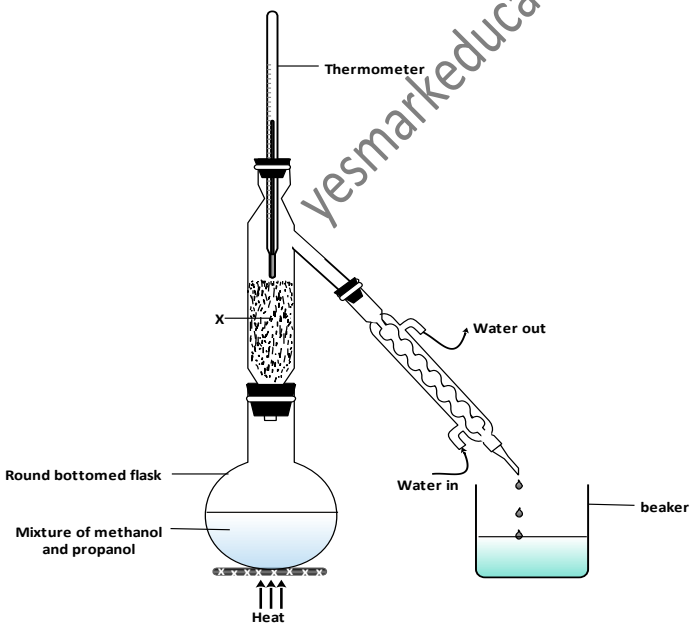
15. Hydrate cobalt (II) chloride exists as pink crystals and anhydrous cobalt (II) chloride is a blue powder. Describe a laboratory experiment that can be used to show that the action of heat on hydrated cobalt (II) chloride is a reversible reaction. (3 marks)

16. A mixture contains ammonium chloride, copper (II) oxide and sodium chloride. Describe how each of the substances can be obtained from the mixture. (3 marks)

17. A sample of water in a beaker was found to boil at 101.5°C at 1 atmospheric pressure. Assuming that the thermometer was not faulty, explain this observation. (1 mark)

18. Describe an experimental procedure that can be used to extract oil from nut seeds (2 marks)

19. The chromatogram below was obtained from a contaminated food sample P. contaminants Q, R, S and T are suspected to be in P. Use it to answer the following questions.



(a) Identify the contaminants in mixture P? (1 mark)

(b) Which is the most soluble contaminant in P? (1 mark)

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

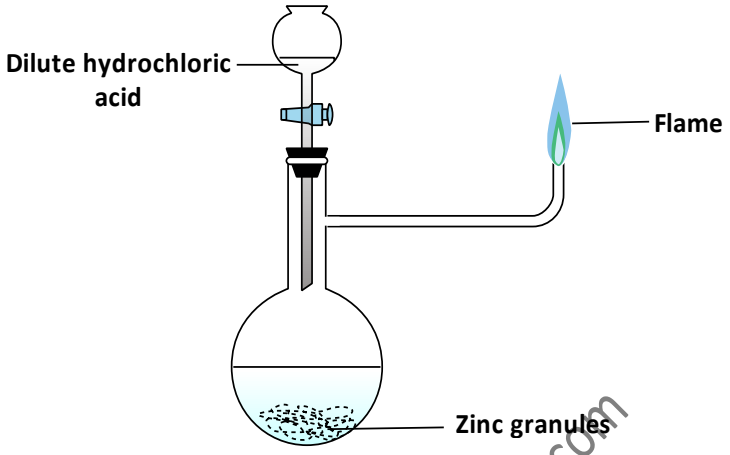
21. The set up below was used to separate a mixture of methanol and propanol. Study it and answer the questions that follow.

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

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

3. ACIDS, BASES AND INDICATORS

1. Study the diagram below and answer the questions that follow.



Write an equation for each of the two reactions that take place in the experiment represented by the diagram above (2 mks)

2. 10gm of sodium hydrogen carbonate were dissolved in $20cm^3$ of water in a boiling tube. Lemon juice was then added drop wise with shaking until there was no further observable change.

(a) Explain the observation, which was made in the boiling tube when the reaction was in progress.(2marks)

(b) What observation would have been made if the lemon juice had been added to copper turnings in a boiling tube? Give reason? (1 mark)

3. The P^H of a sample of soil was found to be 5.0.An agricultural office recommended the addition of calcium oxide in the soil. State two functions of the calcium oxide in the soil. (2mark)

4. When a student was stung by a nettle plant, a teacher applied an aqueous solution of ammonia to the affected area of the skin and the student was relieved of pain .Explain. (2marks)

5. A student added very dilute sulphuric (VI) acid to four substances and recorded the observations shown in the table below.

Test	Substance	Gas given off
1	Sodium	Yes
2	Iron	No
3	Carbon	Yes
4	Copper	No

For which tests are the observations wrong? Explain (3marks)

6. Starting with red roses, describe how;

(i) a solution containing the pigment may be prepared; (1mark)

(ii) the solution can be shown to be an indicator. (2marks)

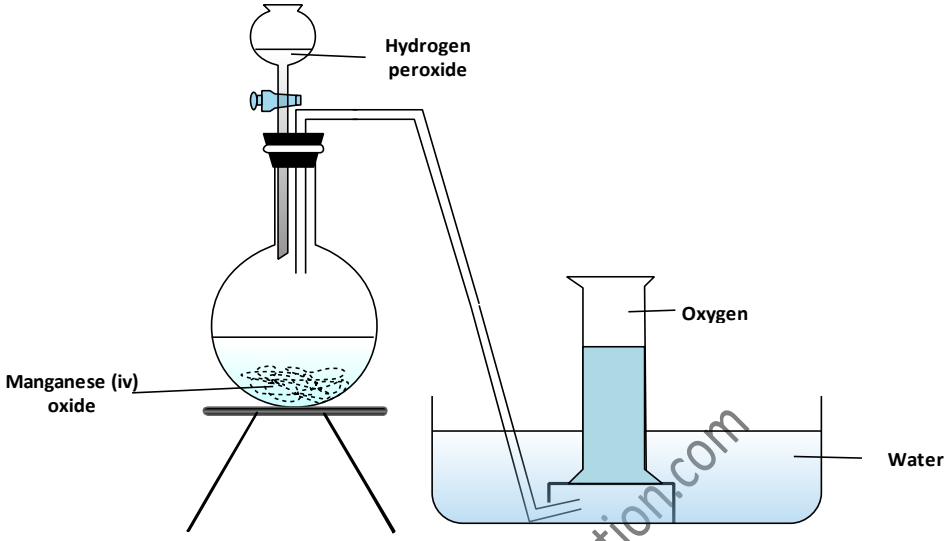
7. Describe how the P^H of anti-acid (Actal) powder can be determined in the laboratory. (2 marks)

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

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

4. AIR AND COMBUSTION

1. The diagram below represents a set – up that can be used to prepare and collect oxygen.



a) Write an equation for the reaction that takes place (1mark)

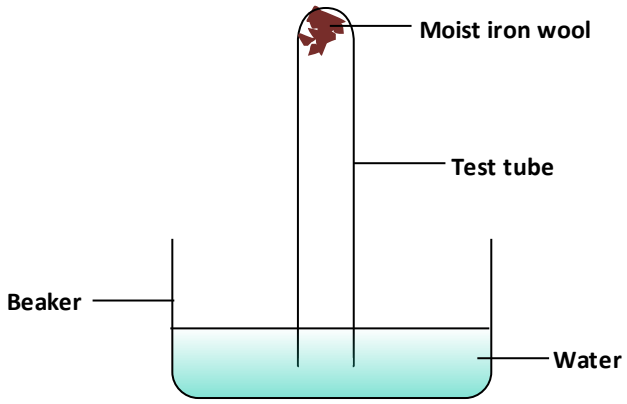
b) What property of oxygen makes it possible for its collection as indicated by the diagram (1mark)

c) Explain why it is important not to collect any gas for the first few. Seconds of the experiment. (1mark)

2. Explain how you would separate mixture of nitrogen and oxygen gases given that their boiling points are – 196°C and 183°C respectively (2marks)

3. When magnesium metal is burnt in air, it reacts with both oxygen and nitrogen gases giving a white ash. Write two equations for the reactions that take place. (2marks)

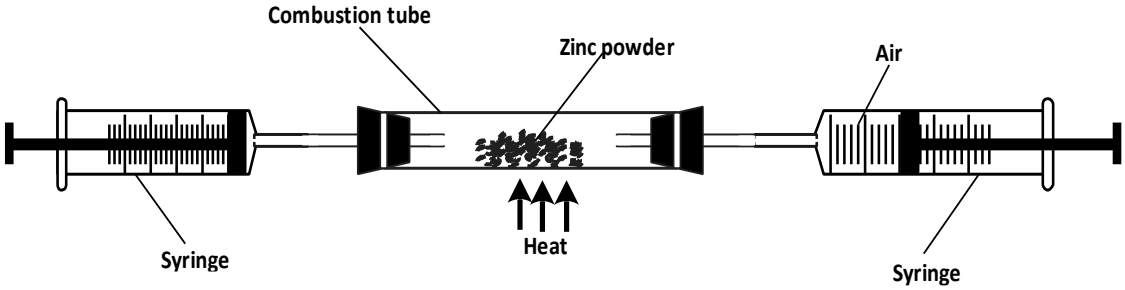
4. The set – up below was used to study some properties of air.



State and explain **two** observations that would be made at the end of the experiment.

(3marks)

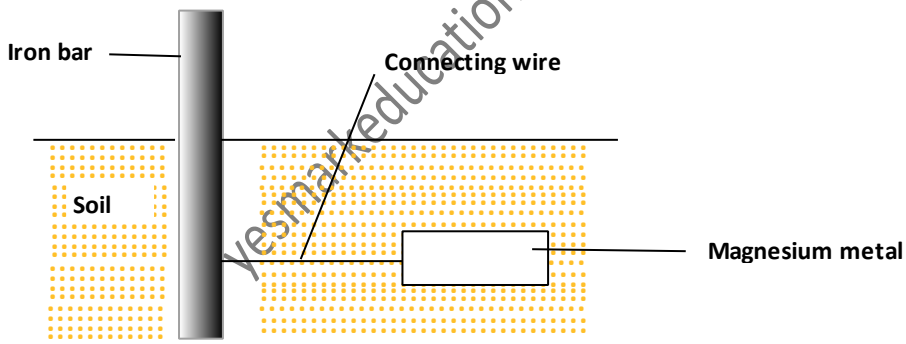
5. In an experiment a certain volume of air was passed from syringe to syringe over heated excess zinc powder as shown in the diagram below.



The experiment was repeated using excess magnesium powder. In which of two experiments was the change in volume of the air greatest. (Give reasons) (3marks)

6. Name another gas, which is used together with oxygen in welding (1marks)

7. The diagram below shows an iron bar, which supports a bridge. The Iron bar is connected to a piece of magnesium metal.



Explain why it is necessary to connect the piece of magnesium metal to the iron bar.

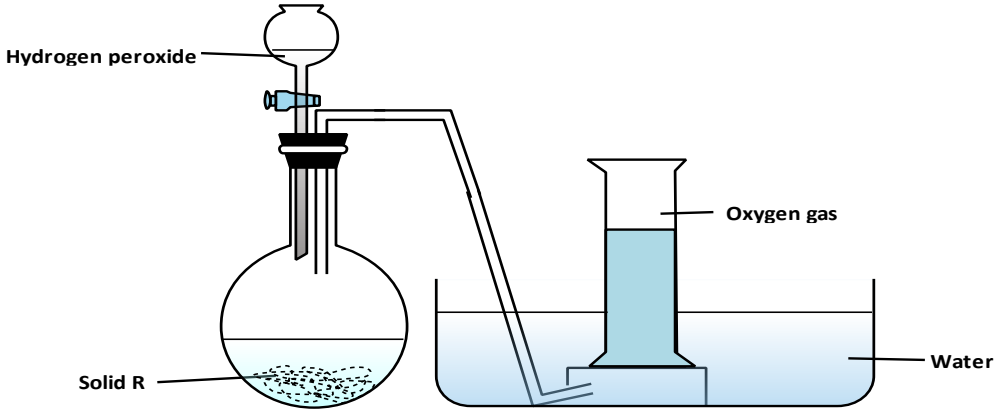
(3marks)

8. The oxides of elements A and B have the properties shown in the table below. (the letter do not represent the actual symbols of elements)

A	B
Gaseous at room temperature	Solid at room temperature
Dissolves in water to form an acidic solution	Dissolves in water to form an alkaline solution

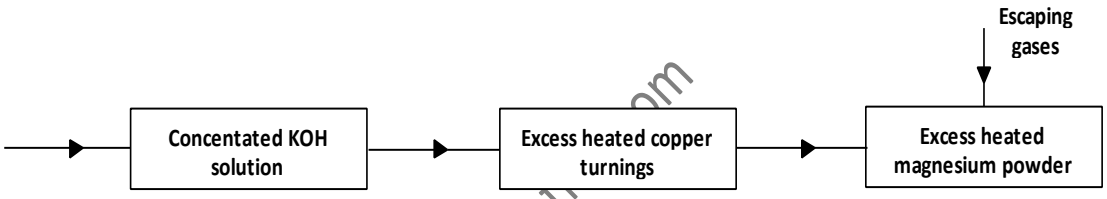
Give one example of elements A and B (2marks)

9. The diagram below is set – up for the laboratory preparation of oxygen gas



(a) Name solid R. (1mark)
(b) Write an equation for the reaction that takes place in the flask (1mark)
(c) Give one commercial use of oxygen (1mark)

10. Air was passed through several reagents as shown in the flow chart below.



(a) Write an equation for the reaction, which takes place in chamber with magnesium powder (1 mark)
(b) Name one gas, which escapes from the chamber containing magnesium powder. Give a reason for your answer. (2 marks)

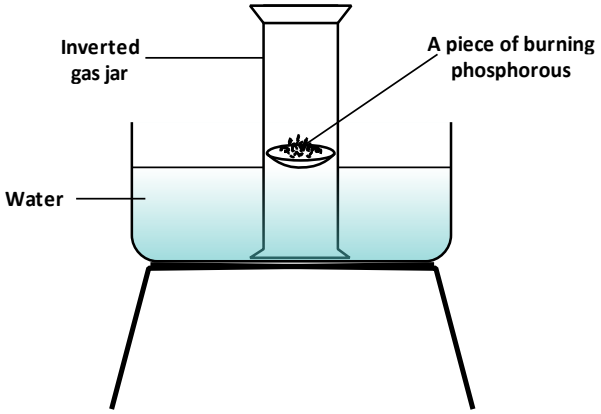
11. When wood is burnt, a grey powder called ash remains. The ash is stirred with water and filtered, a colourless solution is obtained.

(a) (What is the main component of the colourless solution? (1 mark)
(b) Explain your answer in (a) above (2 marks)

12. In an experiment, a piece of magnesium ribbon was cleaned with steel wool. 2.4 g of the clean magnesium ribbon was placed in a crucible and completely burnt in oxygen. After cooling, the product weighed 4.0g.

(a) Explain why it was necessary to clean the magnesium ribbon (1 mark)
(b) What observation was made in the crucible after burning (1 mark)
(c) Why was there an increase in mass? (1 mark)
(d) Write the equation for the reaction which took place in the crucible (1 mark)
(e) The product in the crucible was shaken with water and filtered. Explain the observation which was made when blue and red litmus papers were dropped into the filtrate. (3 marks)
(f) Calculate the volume of oxgen gas used during the burning. (0 = 16.0; Molar volume of a gas = 24,000cm^3 at room temperature). (3 marks)

13. The diagram below represent a set-up that was used to show that part of air is used during burning.

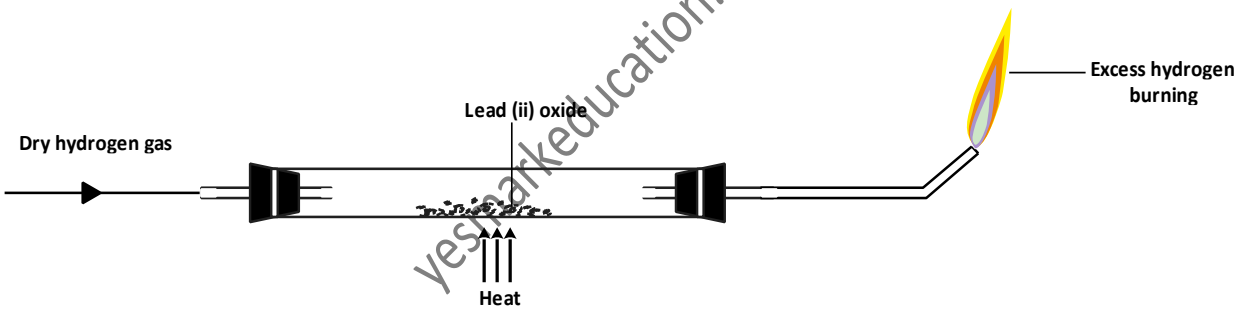


(a) Given that phosphorus used was in excess, draw a diagram of the set-up at the end of the experiment (when there was no further observable change). (1 mark)

(b) Suggest one modification that should be made on the apparatus if the percentage of the air used is to be determined. (1 mark)

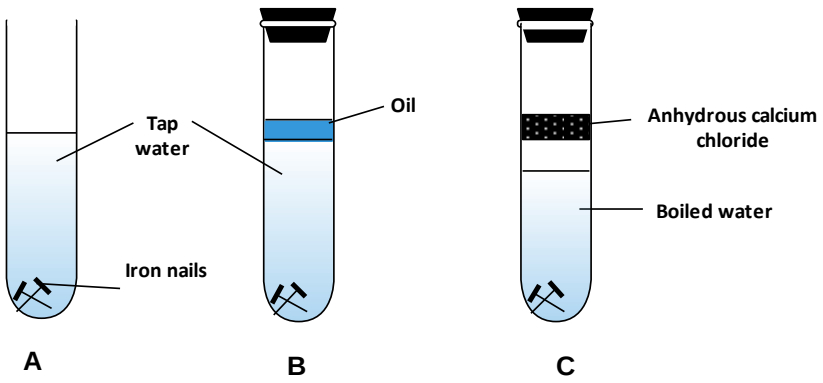
14. A water trough, aqueous sodium hydroxide, burning candle, watch class and a graduated gas jar were used in an experimental set up to determine the percentage of active part of air. Draw a labeled diagram of the set up at the end of the experiment. (3 marks)

15. In an experiment, dry hydrogen gas was passed over heated Lead (II) Oxide as shown in the diagram below.



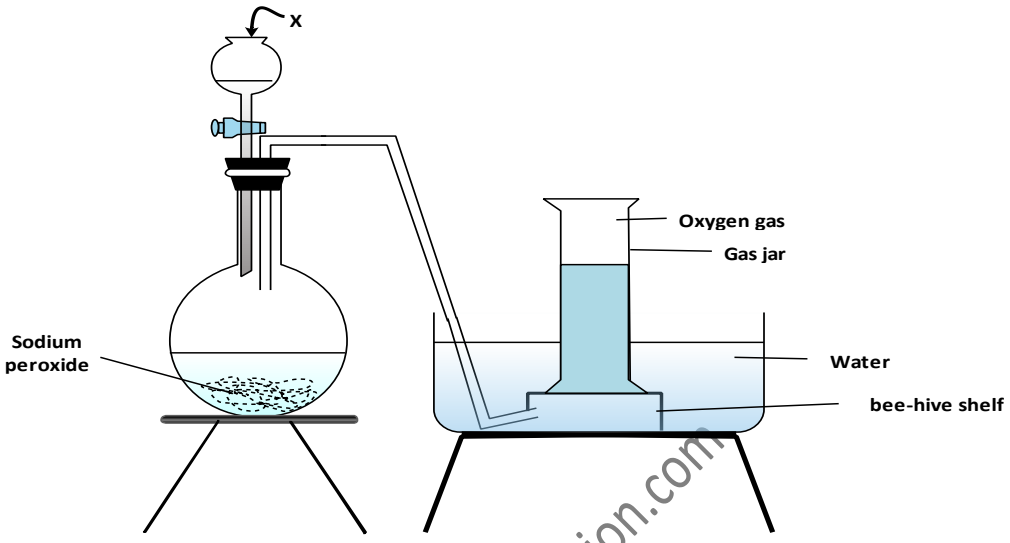
State and explain the observations made in the combustion tube. (3 marks)

16. The following set up of three test-tubes was used to investigate rusting of iron. Study it and answer the questions that follow.



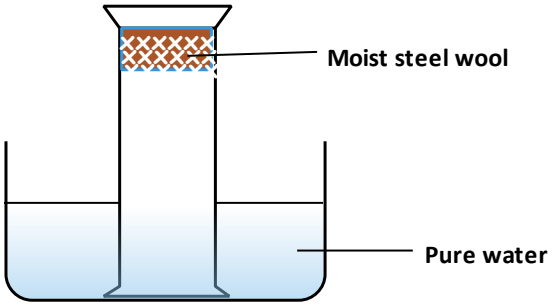
(a) Give a reason why rusting did not occur in test-tube C. (1 mark)
(b) Aluminium is used to protect iron sheets from rusting. Explain **two** ways in aluminium protects iron from rusting. (2 marks)

17. The set up below can be used to prepare oxygen gas. Study it and answer the questions that follow.



(a) Identify X (1 mark)
(b) What property of oxygen makes it possible for it to be collected as shown in the above set up? (1mark)
(c) State t**wo** uses of oxygen. (1 mark)

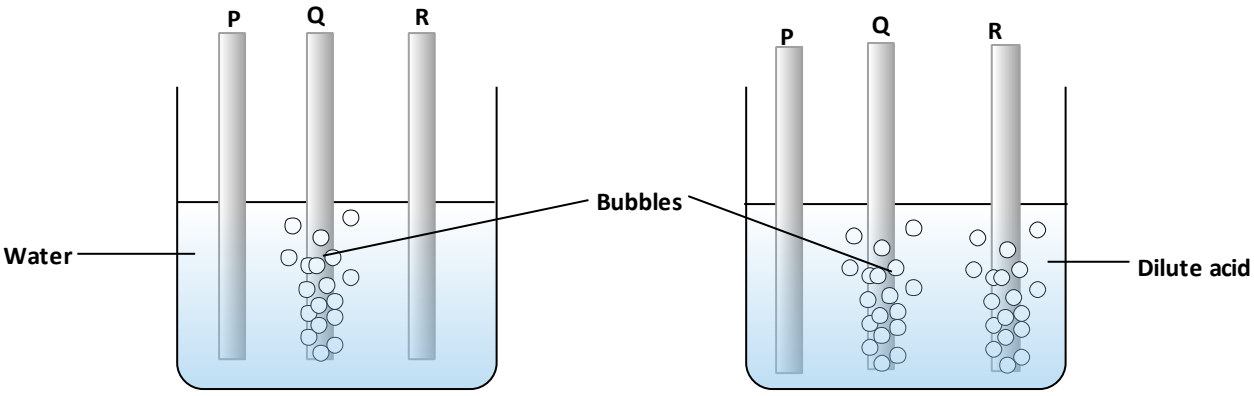
18. A measuring cylinder fitted with moist steel wool was inverted in a trough of water as shown in the diagram below.



(a) State and explain the observations made on the:
(i) Moist steel wool after four days. (1 mark)
(ii) Water level in the measuring cylinder after four days (1 mark)
(b) What would be the effect of using steel wool moistened with salty water? (1 mark)

1. WATER AND HYDROGEN

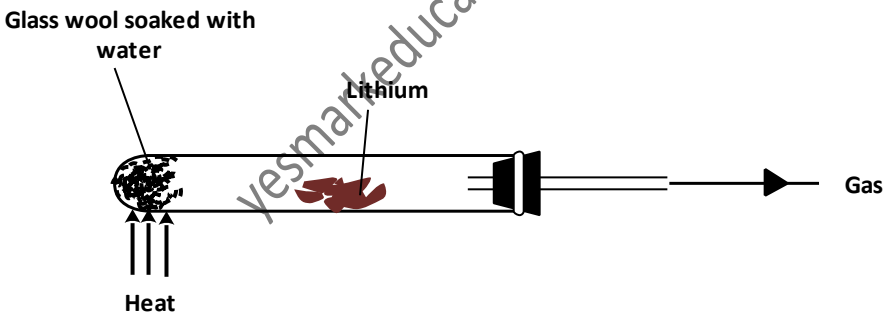
1. In an experiment, rods of metals P, Q and R were cleaned with sand paper and placed in a beaker containing water. Another set of rods was also cleaned and placed in a beaker containing dilute acid. After placing the rods in the two liquids bubbles of gas were seen around some of the rods as shown in the diagrams below.



(a) Why is it necessary to clean the rods with sand paper before dipping them into the liquid (1 mark)

(b) Arrange the three metals in order of their reactivity starting with the most react (2 marks)

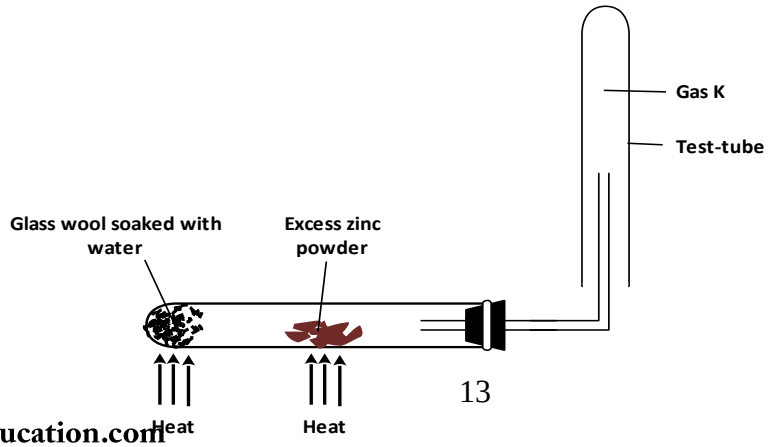
2. The diagram below represents a set-up that was used to react lithium with water study it and answer the questions that follow:



(a) Write an equation for the reaction that takes place; given that the atomic number of lithium is 3. (1mark)

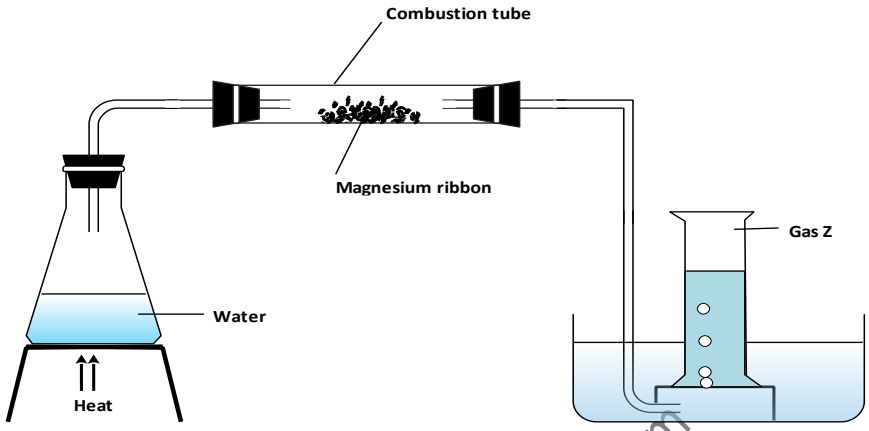
(b) Why would it not be advisable to use potassium in place of lithium in the above set-up? (1mark)

3. A student set up the experiment below to collect gas K the glass wool was heated before heating the Zinc powder.



(a) Why was it necessary to heat the moist glass wool before heating zinc powder (1mark)
(b) What would happen if the zinc powder was heated before heating the glass wool? (1mark)
(c) What property of gas K makes I possible for it to be collected as shown in the diagram? (1mark)

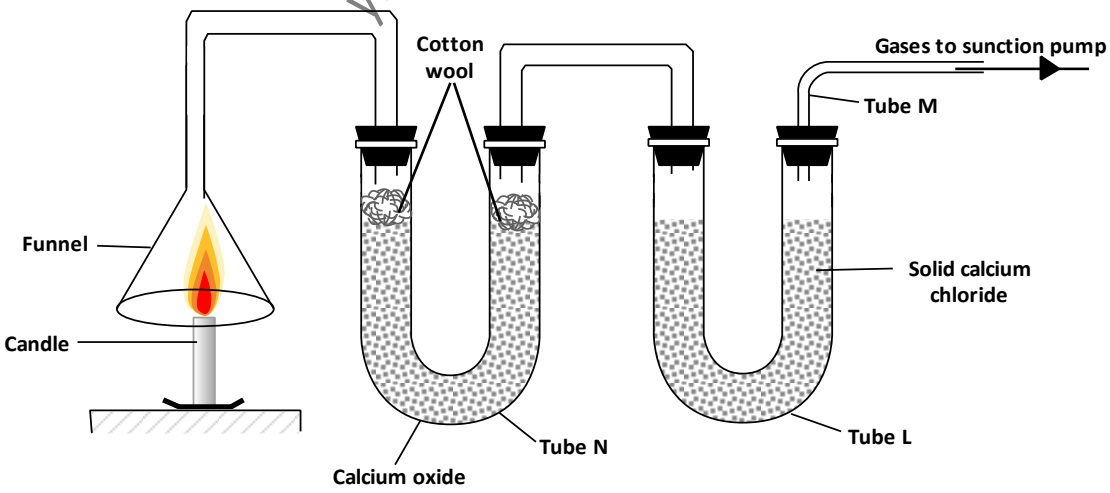
4. Study the set- up below and answer the questions that follow



(a) Write an equation for the reaction, which take place in the combustion tube. (1 mark)
(b) What property of gas Z allows it to be collected as shown in the diagram? (1 mark)

5. (a) Candle wax is mainly a compound consisting of two elements. Name the two elements (2marks)

The set- up below was used to investigate the burning of a candle study it and answers the questions that follow.

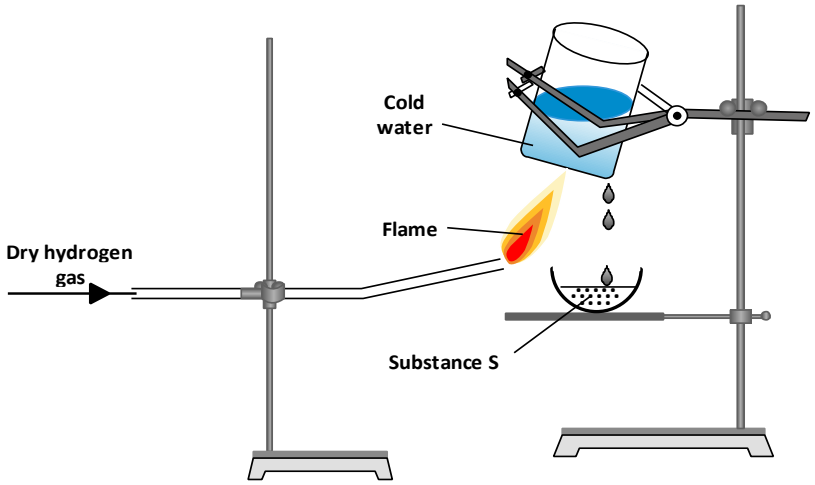


(i) What would happen to the burning candle if the pump was turned off? Give reasons (3 marks)
(ii) State and explain the changes in mass that are likely to occur in tube **N** by the end of the experiment. (3 marks)
(iii) Name two gases that come out through tube **M** (2 marks)
(iv) What is the purpose of calcium chloride in tube L? (1mark)

(v) Name another substance that could be used in the place of calcium oxide in tube **N**. (1 mark)

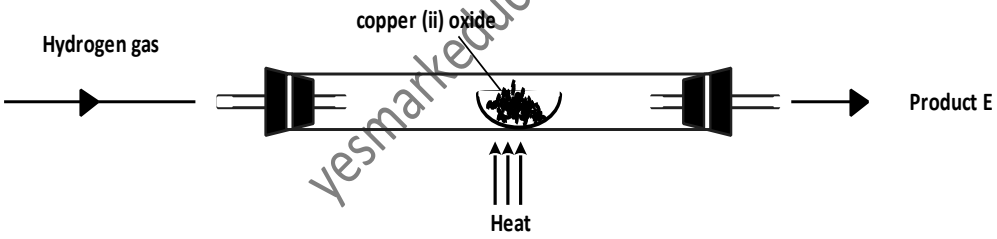
6. When a candle was brunt completely. The total mass product was found to be greater than the original mass of the candle. Explain. (2 marks)

7. Study the diagram below and answer the question that follows.



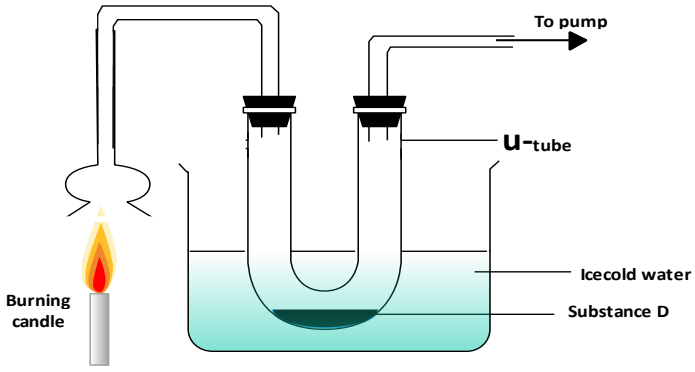
Describe one chemical test that can be carried out to identify substance S. (2marks)

8. In a laboratory experiment hydrogen gas was passed over heated copper (II) oxide as shown the diagram below.



Describe a chemical test that can be used to identify the product E. (2marks)

9. An experiment was set up as shown in the diagram below:

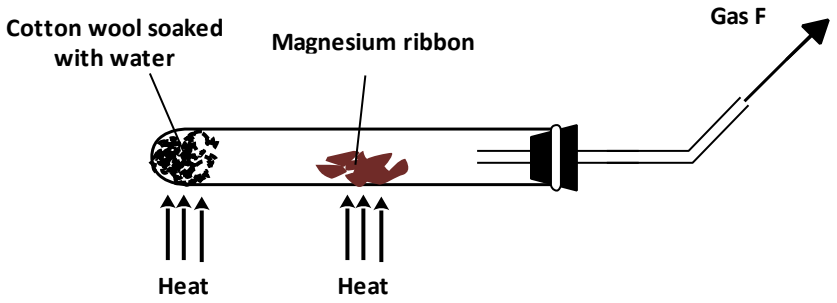


(a) Identify substance D. (1 mark)

(b) Describe how the other product of the burning candle could be prevented

From getting into the environment. (2 marks)

10. A student used the set up shown in the diagram below in order to study the reactions of some metals with steam. The experiment was carried out for ten minutes



(a) What observation would be made if gas **F** is ignited? (1 mark)

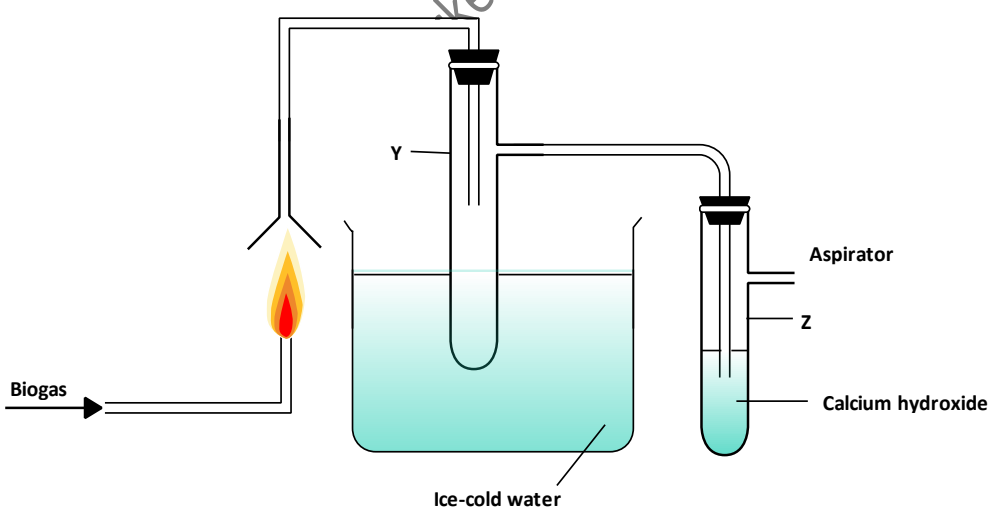
(b) When the experiment was repeated using iron powder instead of magnesium ribbon very little gas **F** was obtained.

(i) Give a reason for this observation (1mark)

(ii) What change in the conditions of the experiment should the student have made in order to increase the volume of gas **F** Produced? (1mark)

11. State two reasons why hydrogen is not commonly used as a fuel. (2marks)

12. The set up below was used to investigate the products of burning biogas (methane). Study it and answer the questions that follow.



(a) What product will be formed in test-tube Y? (1 mark)

(b) State and explain the observations which will be made in Z. (2 marks)