



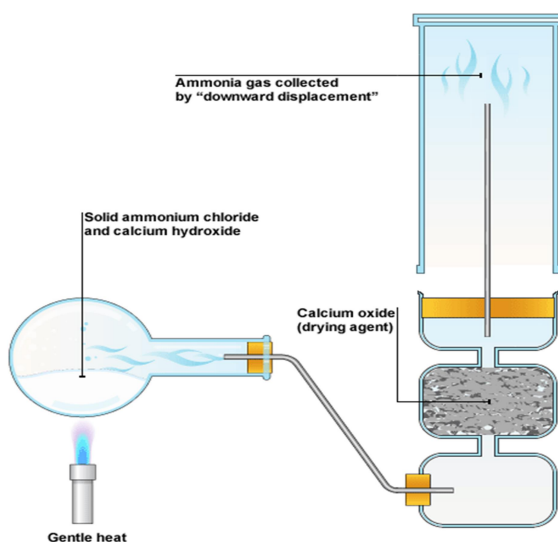
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The Sign of Knowledge

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INDUSTRIAL CHEMISTRY BASED QUESTIONS

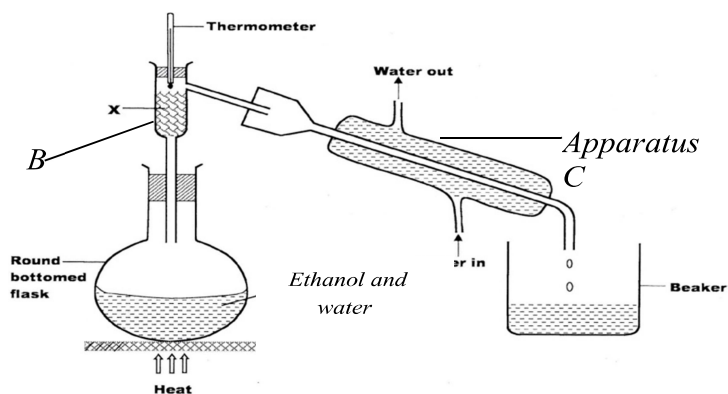


For the complete questions and marking schemes based on industrial chemistry call tr. stephen 0711410583.

The following are new resources and they are available:

- ✓ Document of questions based on flow charts. (chemistry)
- ✓ Document of questions based on structural diagrams. (chemistry)
- ✓ Brilliant pre-mocks and mocks.
- ✓ Brilliant holiday assignments trial 2.

1. The set up below was used by a student of St. Kevin Nyali Elite High School to separate a mixture of water and ethanol with the boiling points 100°C and 78°C respectively. Use it to answer the questions that follow.



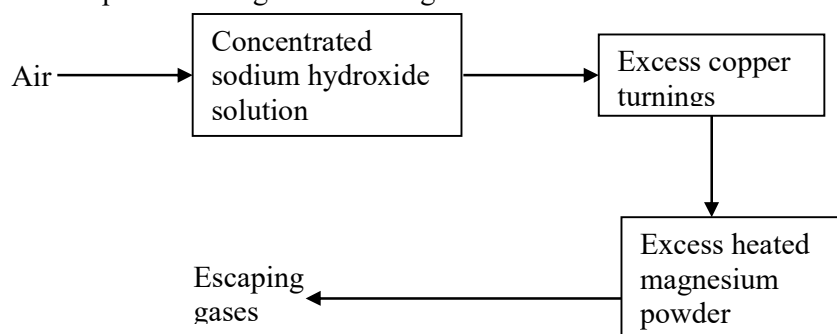
- (i) Name the method of separation used above.
- (ii) Name the parts label X and B
- (iii) Name the apparatus marked C and state its role.
- (iv) Explain the role played by the part marked B.
- (v) State the role of the part marked X.
- (vi) Explain why it is possible to separate a mixture of water and ethanol by method named in (i) above.
- (vii) Which liquid will be collected as the first distillate? Explain
- (viii) What would happen if the inlet and outlet were exchanged in the apparatus marked C.
- (ix) State the three applications of method named in (i) above.

2. The set-up below was used to prepare a sample of dry oxygen gas. Study it and answer the questions that follow.



- (i) Complete the diagram to show how dry Oxygen can be collected. (3 marks)
- (ii) Write a chemical equation of the reaction to produce oxygen. (1 mark)

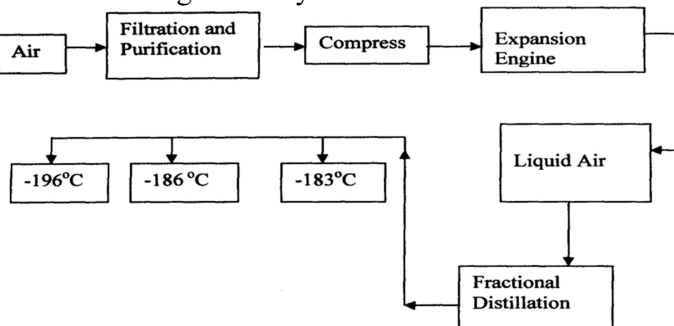
3. Air was passed through several reagents as shown below:



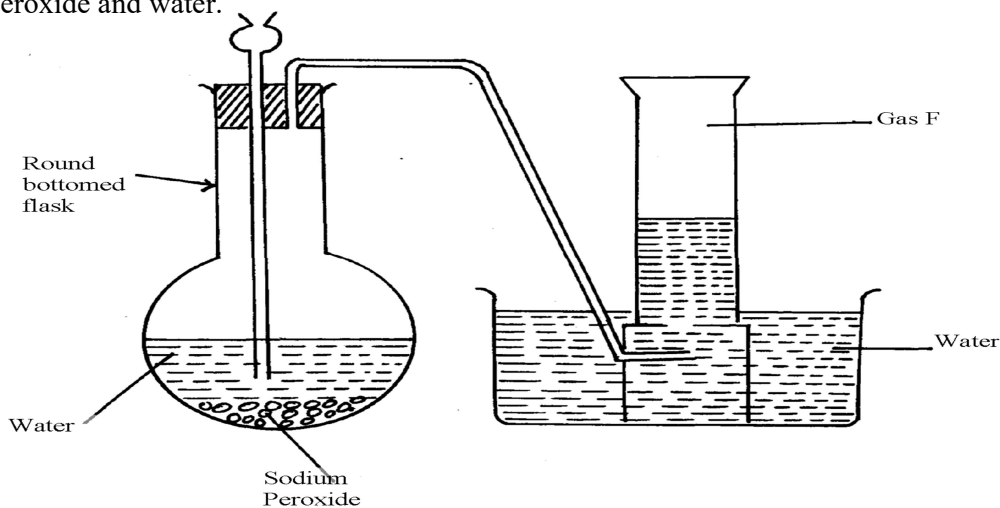
- (a) Write an equation for the reaction which takes place in the chamber containing magnesium powder. (1 mark)
- (b) Give another solution that can be used in place of sodium hydroxide solution. (1mark)
- (c) State the observation made at the chamber containing copper. (1 mark)
- (d) The product of the chamber containing magnesium powder was added water and a colourless solution was formed. A gas with a pungent choking irritating was also formed.
- (i) State and explain the observation that would be made if red litmus was dipped in the solution above. (1 mark)
- (ii) Write a balance chemical equation of the reaction that took place in the reaction of the product and water. (1 mark)

- (e) Name **one** gas which escapes from the chamber containing magnesium powder.
Give a reason for your answer.
(1 mark)

4. Oxygen is obtained on large scale by the fractional distillation of air as shown on the flow chart below.

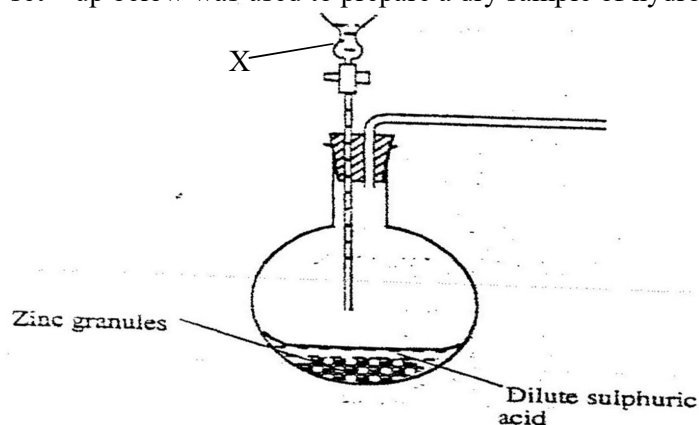


- a) Identify the substance that is removed at the filtration stage . (1 mark)
- b) Explain why Carbon (IV) oxide and water are removed before liquefaction of air. (4mark)
- c) Identify the component that is collected at -186°C. (1 mark)
5. The set-up below was used to collect gas **F** produced by the reaction between sodium peroxide and water.



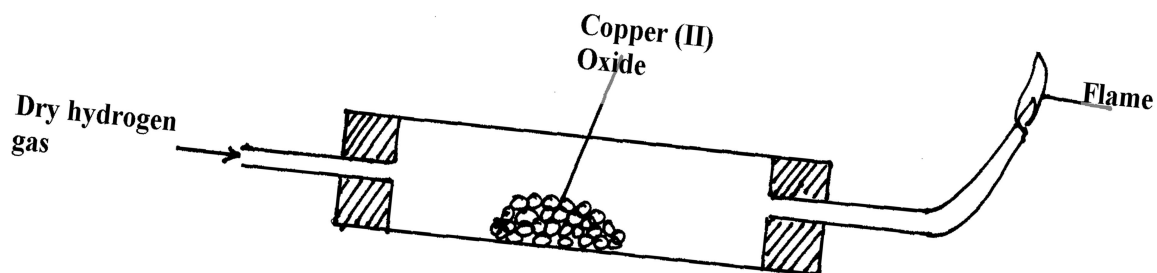
- Name gas **F**.....
- At the end of the experiment, the solution in the round bottomed flask was found to be a strong base. Explain why this was so
- Which property of gas **F** makes it be collected by the method used in the set-up?
- Give **one** industrial use of gas **F**

6. The set – up below was used to prepare a dry sample of hydrogen gas



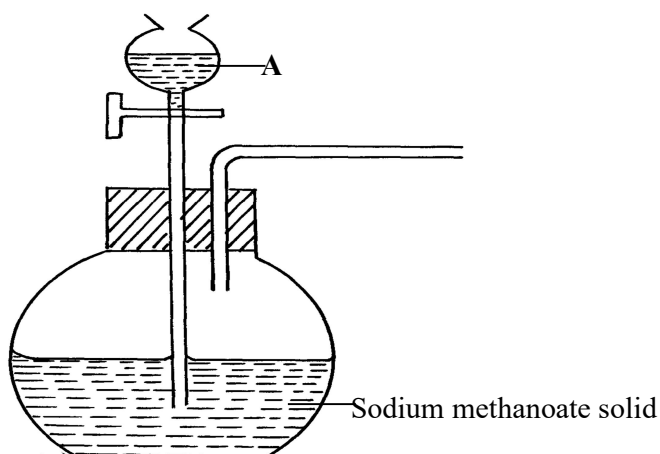
- i. Complete the diagram to show how a dry sample of hydrogen gas can be collected (3marks)
- ii. Label the apparatus X (1mark)
- iii. Explain why Nitric(V) acid cannot be used in the preparation of hydrogen gas. (1mark)
- iv. Write the chemical equation that took place in the flask. (1 mark)
- v. Write an equation for the reaction, which takes place when hydrogen gas burns in air. (1mark)
- vi. Name another metal that could be used in place of zinc granules. (2 marks)
- vii. Explain what can be done to aluminum metal for to fit this experiment in place of zinc granules. (1 mark)
- viii. 1.2 litres of hydrogen gas produced at room temperature and pressure when 3.27g of zinc was used. Determine the relative atomic mass of zinc.(Molar gas volume is 24 litres) (4marks)
- ix. State one industrial use of hydrogen gas. (1mark)
- x. Describe a test for hydrogen gas. (2marks)

7. The set-up below is used to investigate the properties of hydrogen.



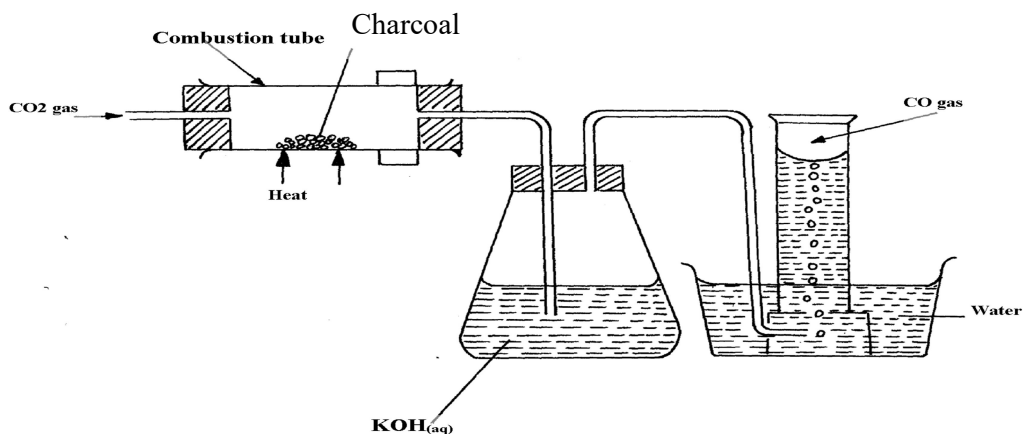
- i) On the diagram, indicate what should be done for the reaction to occur. (1mark)
- ii) State and explain the observations made in the combustion tube. (2 marks)
- iii) Hydrogen gas is allowed to pass through the tube for some time before it is lit. Explain. (1 mark)
- iv) Explain why excess hydrogen burned and not allowed to escape into the air. (1mark)
- v) Explain **one** different observation that would be made if lead (II) oxide is used in place of copper (II) oxide. (1 mark)
- vi) Explain why the combustion tube is placed in a slanting position. (1 mark)
- vii) Write an equation for the reaction that occurs in the combustion tube. (1 mark)
- viii) When the reaction is complete, hydrogen gas is passed through the apparatus until they cool down. Explain (1 mark)
- ix) What property of hydrogen is being investigated? (1 mark)
- x) What observation confirms the property stated in (v) above? (1 mark)
- xi) Why is zinc oxide not used to investigate this property of hydrogen gas?(1mark)

8. The set-up below was used to prepare a carbon (II) oxide gas.



- Give the name of substance A
- Complete the diagram to show how the gas can be collected
- Write the equation for the reaction

9. The set-up below was used to prepare dry carbon (II) Oxide gas. use it to answer the questions below it:

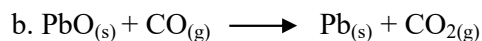


- State **two** mistakes committed in the set-up arrangement above
- The student produced carbon (IV) oxide gas from the reaction between Lead (II) Carbonate and dilute hydrochloric acid. The gas was produced for a short time and the reaction came to a stop. Explain
 - Write the equation for the reactions taking place in the combustion tube and the conical flask:
Combustion tube:.....

Conical flask

(iv) State **one** use of carbon (IV) Oxide gas apart from fire extinguisher

(v) Give **two** properties that make carbon (IV) Oxide to be used as fire extinguisher

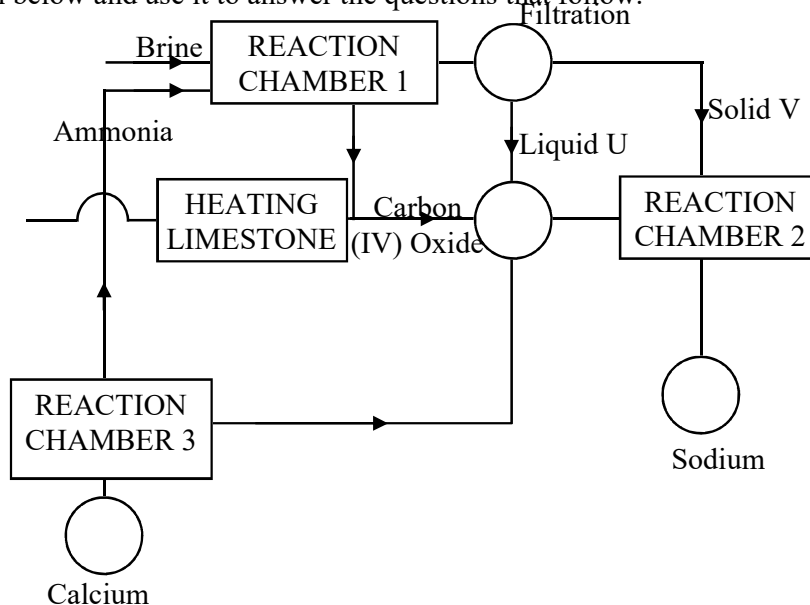


Which property of carbon (II) Oxide is demonstrated by the above equation?

c. Aluminium carbonate does not exist. Give a reason.

d. Ammonium carbonate decomposes when heated. Write a chemical equation to represent this decomposition.

10. The figure below shows the stages in the manufacture of sodium carbonate. Study the diagram below and use it to answer the questions that follow.



a. (i) Name **three** starting materials in the manufacturer of sodium carbonate.

(ii) Which substances are recycled in this process?

(iii) Identify the chambers in which the recycled substances are regenerated.

(iv) Name the substances **U** and **V**.

(b) Give an equation for the reaction which occurs:

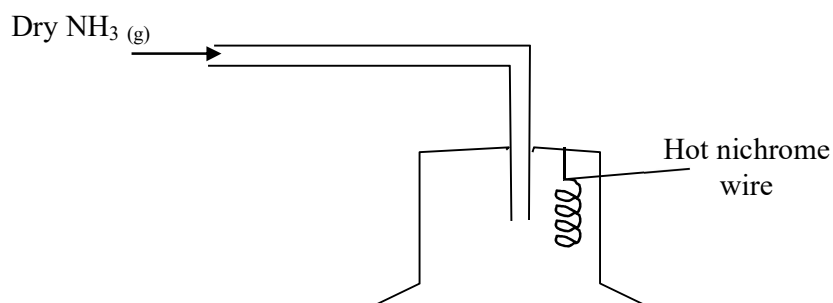
(i) In the reaction chamber 1

(ii) When solid V is heated.

(iii) In the reaction chamber 3.

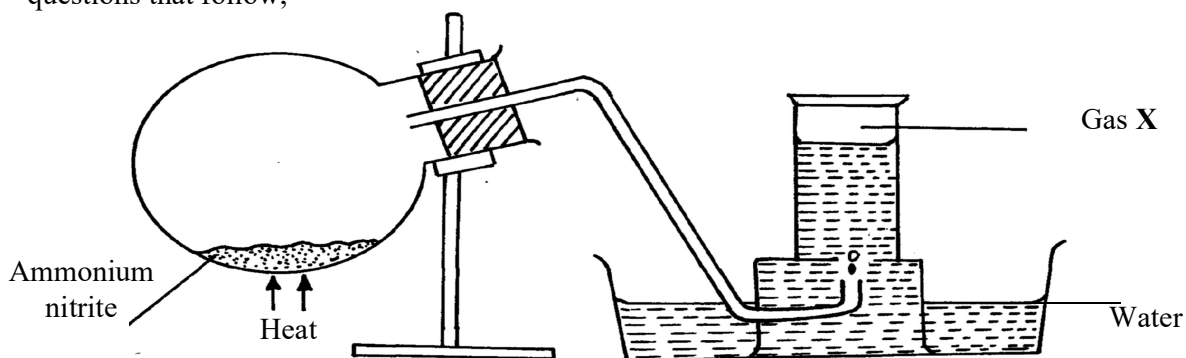
(c) State **one** commercial use for Sodium carbonate.

11. The apparatus below was set-up to show the catalytic oxidation of ammonia. Study the diagram and answer the questions that follow:-



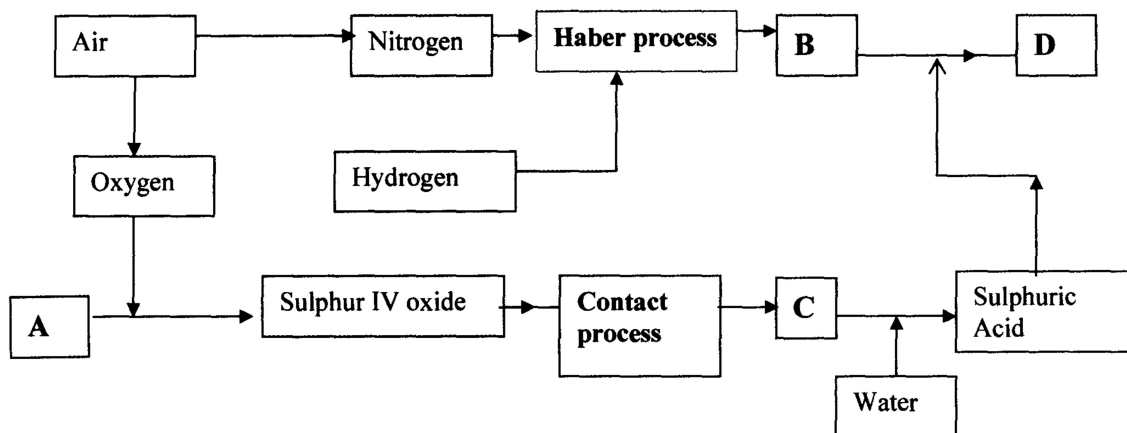
- (i) Write an equation for the reaction that takes place (1 mark)
- (ii) Why is it necessary to have a hot nichrome wire in the gas jar? (1 mark)
- (iii) Write the formula of the complex ion formed when excess ammonia gas is passed through a solution containing Zn²⁺ ions. (1 marks)

12. The diagram below is used in preparation of a gas in the laboratory. Answer the questions that follow;



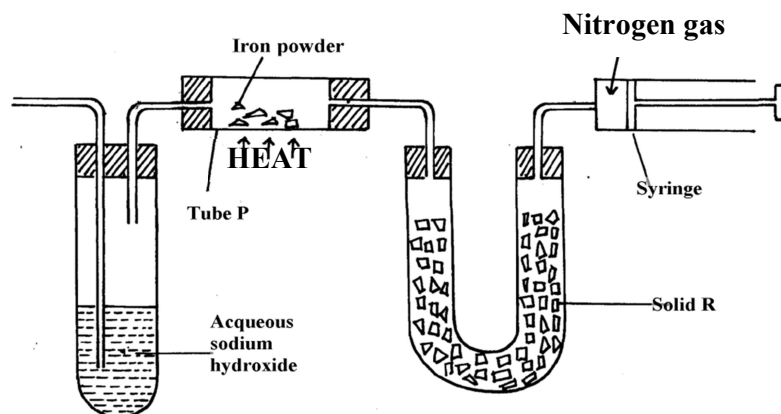
- i. Name gas X.
- ii. State **one** physical property which makes it possible for the gas to be collected as shown above.
- iii. State **one** commercial use of gas X

13. The flow chart below illustrates two industrial processes, **Haber process** and the **Contact process**:



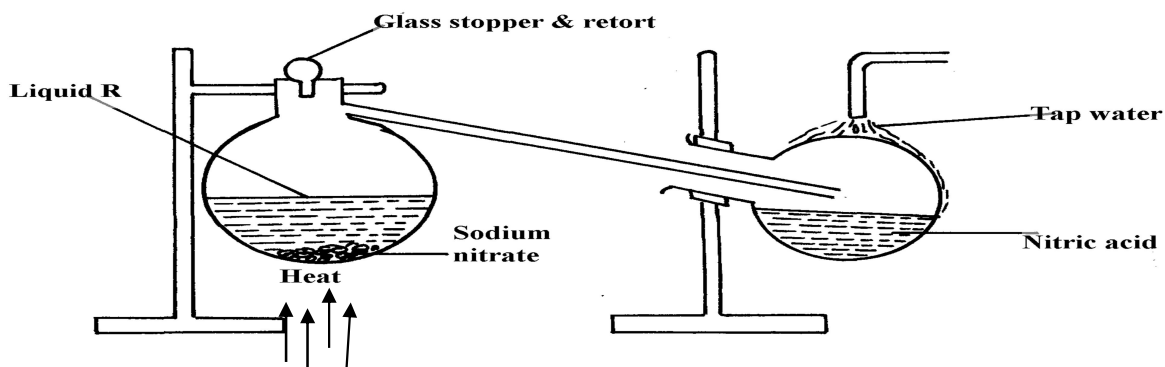
- a. (i) Give the name of the process by which air is separated into oxygen and nitrogen
- (ii) Apart from oxygen and nitrogen gases produced from process (a)(i) Name **one** other gas produced
- b. Name the substances represented by the letters **A, B, C** and **E**
- c. Name the catalysts used in:
 - (i) Haber Process
 - (ii) Contact Process
- (d) Explain the role of the catalysts in both the Haber and the Contact processes
- (e) Write a chemical equation for the formation of compound **B**
- (f) Calculate the percentage by mass of the nitrogen present in compound **D**
- (g) Give **one** major use of compound **E**

14. The diagram below represents a set-up used to obtain nitrogen from air. Study it and answer the questions that follow:-



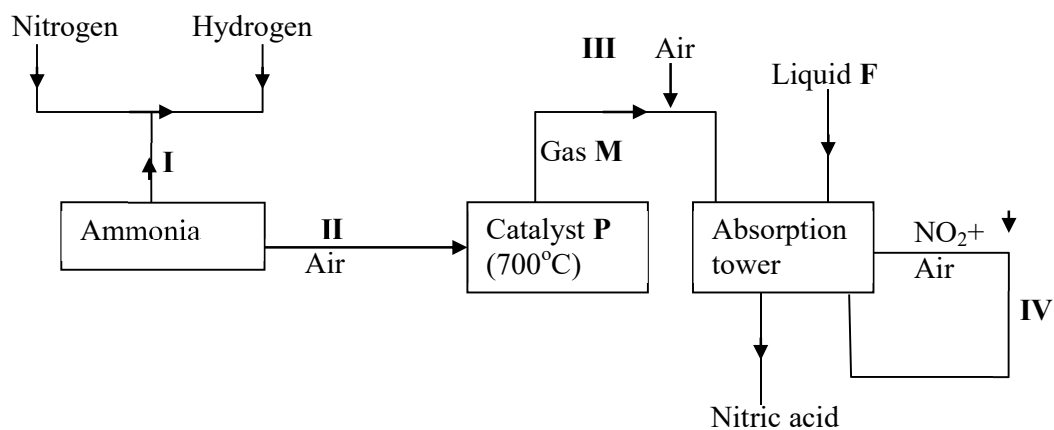
- (i) Name solid **R**
- (ii) What is the purpose of sodium hydroxide?
- (iii) Write an equation for the reaction which took place in tube “**P**”
- (iv) Give the name of **one** impurity in the nitrogen gas obtained.
- (v) Give a reason why liquid nitrogen is used for storage of semen for artificial insemination.

(b) The set-up below was used to prepare nitric acid.



- (i) Give the name of liquid ‘**R**’
- (ii) Explain the following:-
 - (a) Nitric acid is stored in dark bottles
 - (b) The reaction between copper metal with 50% nitric acid in an open tube gives brown fumes.

15. Study the flow chart below and answer the questions which follow:



- (i) Give **one** source of the following raw materials;
 - (a) Nitrogen gas

(b) Hydrogen gas

(ii) State **three** conditions required in process I

(iii) Name: catalyst **P**.....

Gas **M**.....

(iv) Write chemical equations for;

(a) Formation of gas **M**.

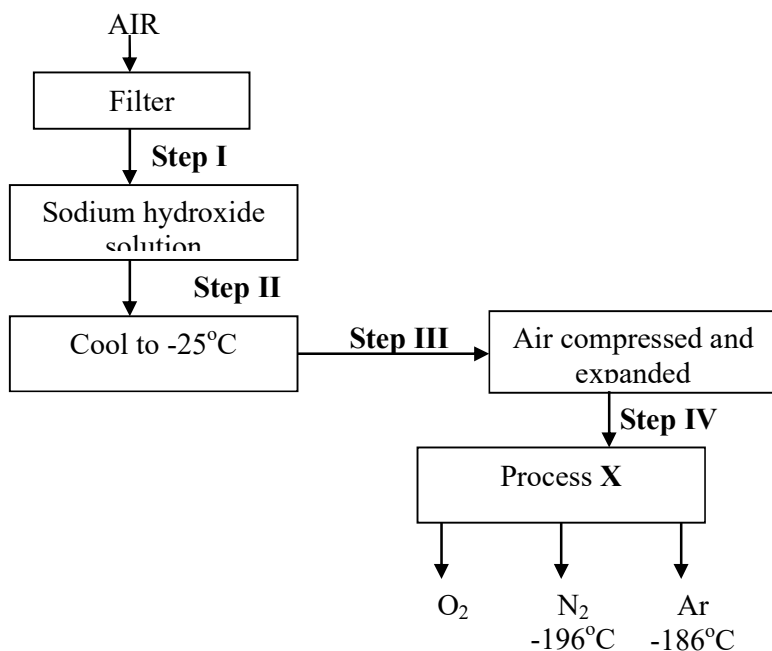
(b) The reaction in the absorption tower.

(v) Give **two** reasons why step IV is necessary.

(vi) Describe how you would test if a given liquid is a nitrate.

(vii) Give **three** uses of nitric acid.

16. Study the flow chart below and answer the questions which follow:



(a) Name another substance which can be used instead of sodium hydroxide

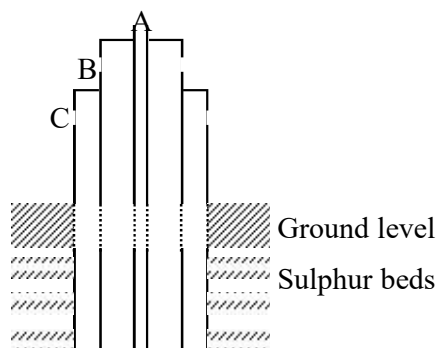
(b) What is the function of filters?

(c) Identify the substance removed at **step III**

(d) At what temperature does liquid oxygen distil?

- (e) Identify **process X**
- (f) Describe how **process X** occurs
- (g) I. State **one** industrial use of Nitrogen
- (II) Air is a mixture but not a compound. Give **two** reasons

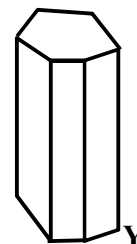
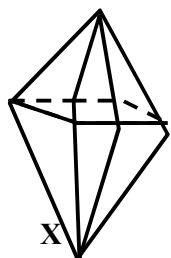
17. The diagram below shows the extraction of sulphur by Frasch process.



- a) State the uses of pipes A, B and C.
- b) Give **two** crystalline allotropes of sulphur.
- c) Write an equation for the combustion of sulphur.
- d) Name the product formed when a mixture of sulphur and Iron is heated.
- e) Give **two** uses of sulphur.
- f) 6.0 dm^3 of sulphur (IV) oxide were oxidized by oxygen to sulphur (VI) oxide.
- (i) Write an equation for the reaction.
- (ii) Calculate the number of moles of sulphur (IV) oxide and oxygen used at R.T.P.
- (iii) Determine the volume of oxygen used.

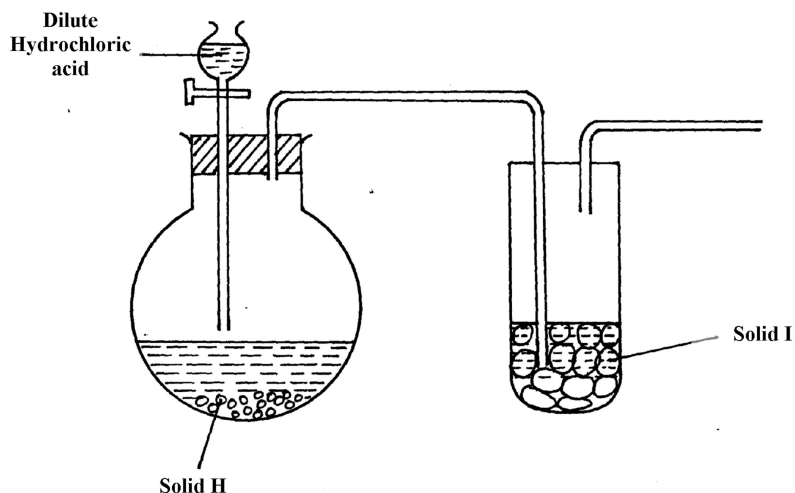
(Molar volume of a gas at R.T.P. is 24.0 dm^3)

18. The diagrams below represent two allotropes of Sulphur. Study them and answer the question which follow:-



- (i) Name the **two** allotropes labelled **X** and **Y**.
- (j) State 3 differences between allotrope **X** and **Y**.
- (k) Explain why a piece of burning magnesium continues to burn in a gas jar of Sulphur (IV) Oxide.

19. The set-up below was used to prepare dry sample of hydrogen sulphide gas



(a) (i) Complete the diagram to show how the gas was collected.

(ii) Identify the following:-

- I. Solid H
- II. Solid I

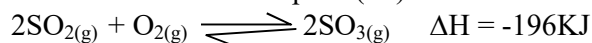
(iv) Write an equation for the reaction that occurred in the flask between solid **H** and dilute Hydrochloric acid.

(b) When hydrogen sulphide gas was passed through a solution of Iron (III) chloride, the following observations were made:-

- (i) the colour of the solution changed from reddish-brown to green and
- (ii) a yellow solid was deposited

Explain the observations.

(c) In the manufacture of Sulphuric (VI) acid by contact process sulphur (IV) oxide is made to react with air to form sulphur (VI) oxide as shown:-



(i) Name the catalyst in this reaction

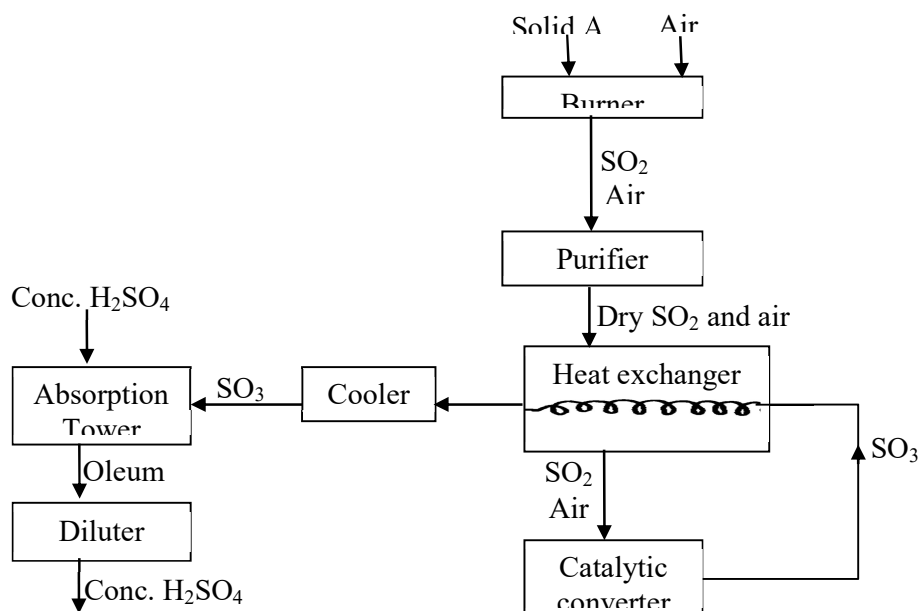
(ii) State and explain the effect of the following changes on the yield of sulphur (VI) oxide.

- I. Increasing the pressure

II. Using a catalyst

(iii) Explain why sulphur (VI) oxide gas is absorbed in concentrated sulphur (VI) acid before dilution.

20. The scheme below represents the steps followed in the contact process. Study it and answer the questions that follow:-



- Name **two** possible identities of solid A
- Name **one** impurities removed by the purifier
- Why is it necessary to remove impurities?
- Write down the equation of the reaction taking place in the converter
- (I) Name the **two** catalysts that can be used in the converter
(II) What is the function of heat exchanger?
- Sulphuric (VI) Oxide is not dissolved directly into water? Explain
- (I) Name the main pollutant in the contact process.
(II) How can the pollution in (g) (I) above be controlled?

(h) Give **one** use of sulphuric (VI) acid.