ST. JULIAN GAYAZA CHEMISTRY

REVISION TOPICAL QUESTION

FOR OLEVEL

1. (a) (i) Draw a labelled diagram to show how a sample of dry hydrogen can be prepared. Your diagram should include apparatus and reagents used.
   (ii) Write an equation for the reaction that takes place.
   (b) Calcium, lead, potassium and zinc form part of the metal activity series.
      (i) Arrange the metals in order of reactivity starting with the most reactive metal.
      (ii) Describe how each metal reacts with cold water. Write equations for the reactions that take place.
   (c) Iron reacts with steam according to the equation

$$3Fe(s) + 4H_2O(g) \rightarrow Fe_3O_4(s) + 4H_2(g).$$

   Calculate the mass of iron required to produce 2.24 l of hydrogen at s.t.p.

2. When hydrogen gas was passed over *x* g of strongly heated copper (II) oxide until there was no further change, 4 g of a solid was formed.
   (a) State what was observed.
   (b) Write equation for the reaction.
   (c) Determine the value of x

3. (a) Write an equation to show how hydrogen gas can be prepared from zinc and dilute sulphuric acid.
   (b) Hydrogen was reacted with copper (II) oxide. State
      (i) The conditions for the reaction.
      (ii) What was observed?

4. A stream of dry hydrogen was passed over 6.85 g of heated lead (II) oxide in a combustion tube. The residue weighted 6.21 g.
   (a) State what was observed in the reaction.
   (b) Write equation for the reaction
   (c) Calculate the moles of the residue

5. (a) A sample of dry hydrogen can be prepared in the laboratory using zinc and dilute sulphuric acid in the presence of a catalyst.
      (i) Draw a diagram to show a set - up of the apparatus that can be used to prepare dry hydrogen in the laboratory. (3 ½ marks)
      (ii) Name the catalyst that can be used in this reaction. (01 mark)
      (iii) Write the equation for the reaction leading to the formation of hydrogen
      (iv) State how hydrogen can be identified. (01 mark)
   (b) Dry hydrogen was passed over heated lead (II) oxide.
      (i) State what was observed. (1 ½ marks)
      (ii) Write equation for the reaction that took place. (1 ½ marks)
   (c) Hydrogen burns in oxygen according to the following equation.

$$2H_2(g) + O_2(g) \rightarrow\!\!-\!\!-\!\!-\!\!-\!\!\rightarrow 2H_2O(l) + heat$$

(i) Name one substance that can be used to identidy the product of the combustion of hydrogen in oxygen. (01 mark)

(ii) State what would be observed if the reagent you have named in (c) (i) was used to identify the product. (01 mark)

(iii) Calculate the volume of hydrogen at s.t.p that would burn in oxygen to produce 5720 J of heat.

(*The molar heat of combustion of hydrogen = - 286 kJ mol^{-1}; 1 mole of gas occupies 22.4 dm^3 at s.t.p*)

6. (a) (i) Write equation to show how hydrogen can be prepared using zinc and dilute sulphuric acid

(ii) State how hydrogen can be tested in the laboratory

(b) Hydrogen reacts with copper(II) oxide according to the following equation

$$CuO(s) + H_2(g) \rightarrow Cu(s) + H_2O(l)$$

(i) State what was observed

(ii) Calculate the volume of hydrogen gas at s.t.p, that would react with copper(II) oxide to form 3.20 g of copper.

($O = 16; Cu = 64;$ *one mole of gas occupies* 22.4 dm^3 *at s.t.p.*)

7. (a) Describe how a dry sample of hydrogen can be prepared in the laboratory (diagram is not required)

(b) Hydrogen burns in air to form a liquid L

(i) Identify L

(ii) Name a reagent that can be used to test for L

(iii) State what is observed when the reagent you have named in b(ii) is used to test for L

(c) Write equation to show the reaction of hydrogen with

(i) Chlorine

(ii) Nitrogen

(iii) Lead(II) oxide

(d) Name the property of hydrogen illustrated in the reaction in c(iii)

(e) State the conditions under which hydrogen reacts with copper(II) oxide and write equation for the reaction

(f) Hydrogen reacts with triiron tetraoxide according to the equation

$$Fe_3O_4(s) + 4H_2(g) \rightarrow 3Fe(s) + 4H_2O(l)$$

Calculate the volume of hydrogen measured at room temperature that would be required to produce 3.36 g of iron

(g) State one industrial use of hydrogen

8. (a) Hydrogen is usually prepared by reacting zinc granules with dilute hydrochloric acid. The reaction is usually warmed

(i) State what is observed during the reaction

(ii) Name the substance that can be used to dry hydrogen

(iii) How is dry hydrogen collected? Give a reason for the method of collection

(b) Name the catalyst used in the reaction

(c) Explain why sulphuric acid is not usually used to react with zinc to produce hydrogen

(d) Explain why nitric acid is not used in the preparation of hydrogen

9. (a) Describe the reaction of hydrogen with each of the following.
   (i) Copper(II) oxide
   (ii) Triiron tetraoxide
   (iii) Lead(II) oxide
   (iv) Oxygen
   (Your answers should include conditions and equations for the reactions and any observations made)
   (b) Magnesium was added to dilute sulphuric acid and a colourless gas T was produced.
   (i) State what was observed
   (ii) Write equation for the reaction
   (iii) Identify the gas T
   (iv) State who gas T can be identified in the laboratory
   (c) State three ways in which the reaction can be made to occur faster
   (d) State the uses of hydrogen

10. (a) Draw a diagram for the set-up of apparatus that can be used to prepare a dry sample of hydrogen in the laboratory
   (b) Write the equation leading to the formation of hydrogen in the apparatus you have drawn
   (c) Explain why hydrogen is not usually prepared by reacting
   (i) Calcium and dilute sulphuric acid
   (ii) Lead and dilute sulphuric acid
   (iii) Lead and dilute hydrochloric acid
   (d) Draw a set-up of apparatus that can be used to show the hydrogen can reduce copper(II) oxide.
   (e) State what is observed and write equation for the reaction that takes place during the reduction of copper(II) oxide and hydrogen
   (f) Explain why hydrogen does not reduce zinc oxide yet it reduces lead(II) oxide
   (g) Hydrogen is a light gas, which is less dense than air. State the application of hydrogen as a result of this property.

11. (a). State the conditions under which the following substances react with water. And in each case, state what would be observed and write the equation for the reaction when the substance is reacted with water
   (i). Sodium
   (ii). Calcium
   (iii). Magnesium
   (iv). Iron
   (v). Zinc

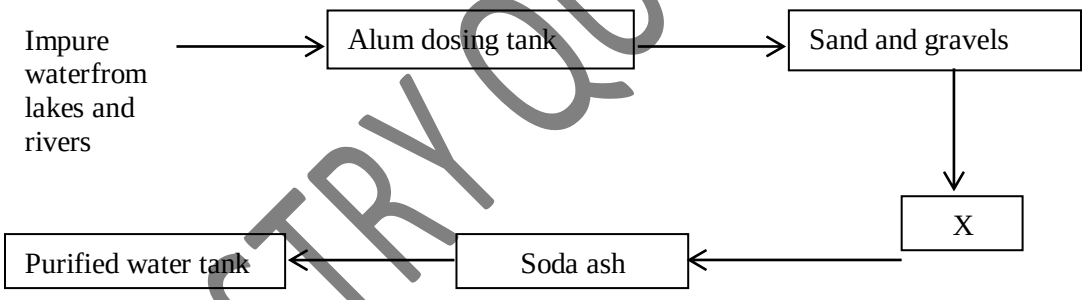
12. (a) (i) What is water pollution?
   (ii) How can you tell that water is polluted? Give two ways
   (b) (i) What is sewage?
   (ii) How does sewage pollute water
   (iii) Describe how urban sewage is treated

(iv) How can sewage be useful to the society

32. (a). State what is meant bythe ter **hard water**
(b). Name **two** cations and **two**anions present in hard water
(c). When a solution of barium nitrate was added to a sample of hard water, followed by dilute nitric acid, a white precipitate was formed that did not dissovle in the acid. Write eqaution for the reactionthat took place.

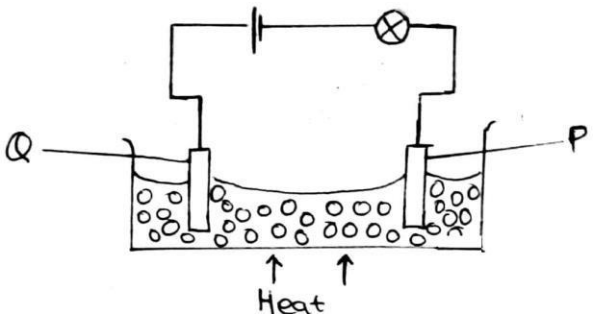
33. (a). State the difference between **hard water** and **soft water**
(b). Name one substance that causes
(i). Temporary hardness
(ii). Permanent hardness
(c). State one method that can be used to remove
(i). Temporary hardness in water
(ii). Permanent hardness in water

34. (a). What is meant by the term water pollution?
(b) (i) Name two substances that can cause water pollution
(ii) Describe how each of the substances you have named in b(i) above cancause water pollution
(c) The flow diagram below shows the general scheme used in water purification



(i) State the purpose of the alum dosing tank and the sand and gravels
(ii) Identify X and state its purpose
(iii) State the role of soda ash
(iv) Write equations to show the role of soda ashs

1) The circuit below was used to study the effect of electricity on lead(II) bromide



a) State was observed
   (i) Before lead(II) bromide melted
   (ii) After lead(II) bromide had completely melted
b) Explain your answer in (a)
c) Write equation for the reaction that took place at
   (i) Terminal P
   (ii) Terminal Q

2) Copper(II) sulphate solution was electrolysed using carbon electrodes
   a) State what was observed at the
      (i) Anode
      (ii) Cathode
   b) Write equations for the reaction at the
      (i) Anode
      (ii) Cathode
   c) Explain your observation at the cathode

3) A clean iron nail was dipped into a solution of copper(II) sulphate and was left to stand for some time
   a) State what was observed
   b) Write equation for the reaction
   c) Explain your observation
   d) State what would be observed in the iron nail was replaced with a silver nail. Give a reason for your answer.

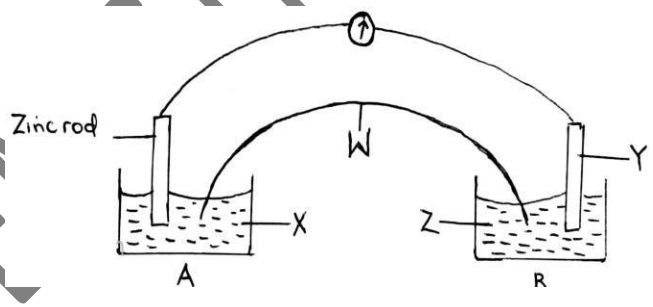
4) The diagram below shows the setup of apparatus for the electrolysis of dilute sulphuric acid using platinum electrodes

a) State what was observed
b) Write equation for the reaction taking place at
   (i) Cathode
   (ii) Anode
c) Explain your observation at the
   (i) Cathode
   (ii) Anode

5) Draw a diagram of a cell consisting of a zinc rod dipped in zinc sulphate and a copper rod dipped in copper(II) sulphate solution, with the solutions separated by a porous wall and the rods connected by a wire
   a) Indicate the
      (i) Charges on each electrode
      (ii) Direction of electron movement in the wire
   b) Write
      (i) Equations for the reaction at each electrode
      (ii) An equation for the overall reaction

6) Zinc powder was added to a solution of copper(II) sulphate in a tube. A brown solid and a colourless solution were formed.
   a) Identify the
      (i) The brown solid
      (ii) Colourless solution
   b) Write equation for the reaction that took place
   c) What kind of reaction has taken place

7) Figure below shows a simple cells

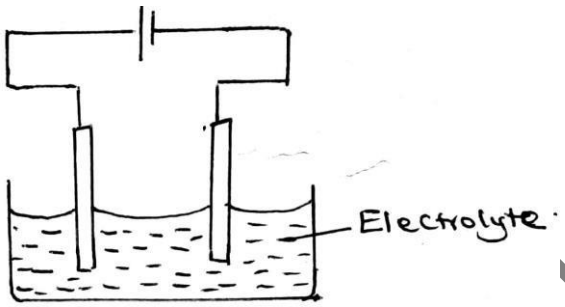


   a) Write equations for the reactions taking place at the
      (i) Anode
      (ii) Cathode
   b) Write the overall equation for the reaction
   c) Draw an arrow on the diagram to show the flow of electrons
   d) Identify substances X, Y and Z

8) a) Define
      (i) electrolysis
      (ii) an electrolyte

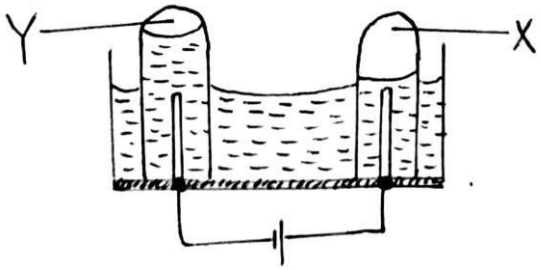
b) Draw a labelled diagram of the apparatus that can be used to electroplate iron with zinc
c) Explain why solid zinc sulphate does not conduct electricity while a solution of zinc sulphate in water conducts

9) The diagram below shows the arrangement of the apparatus used for purification of copper.



a) Name the substance used as the
   (i) Anode
   (ii) Cathode
b) Name the electrolyte
c) Write equation for the reaction taking place at the
   (i) Anode
   (ii) Cathode
d) State what would be observed during the experiment

10) The diagram below is of electrolytic cell of the electrolysis of dilute sulphuric acid



a) Name the gases X and Y
b) Write equation for the reaction taking place at the terminals
c) State two industrial applications of electrolysis
d) Describe the industrial manufacture of sodium hydroxide
e) Draw a diagram for the electrolysis of copper(II) sulphate using copper electrodes
f) Write equations for the reactions taking place at the terminals
g) What is the application of the above cell drawn

11) Excess zinc was added to 100cm^3 of 0.2M copper(II) sulphate solution
a) State what was observed
b) Write equation for the reaction
c) Calculate the

(i) Number of moles of copper(II) ions in 100cm^3 of the solution
(ii) Mass of the solid product

12) Dilute copper(II) sulphate solution was electrolysed using carbon electrodes.
a) State what was observed at the
(i) Anode
(ii) Cathode
b) Write equations for the reactions at the
(i) Anode
(ii) Cathode
c) State what is observed at the anode and cathode when dilute copper(II) sulphate is electrolysed using copper electrodes

13) Acidified water was electrolysed using platinum electrodes
a) Write an equation for the reaction that took place at the
(i) Anode
(ii) Cathode
b) Name one other substance that can be used as electrodes in the electrolysis of acidified water

14 (a) (i) Using examples, state the differences between an electrode and an electrolyte
(ii) Explain why aqueous solution of sodium chloride conducts electricity while solid sodium chloride does not
b) The diagram below shows a setup of an electrochemical cell which can be used to compare the reactivity of zinc and copper.
(i) Identify the rod that is positively charged
(ii) Identify the R and state its purpose
(iii) Write equations for the reactions taking place at the copper and zinc rods
(iv) Write equation for the overall reaction in the cell
(v) State what would happen if zinc metal is dropped in a solution containing copper(II) ions

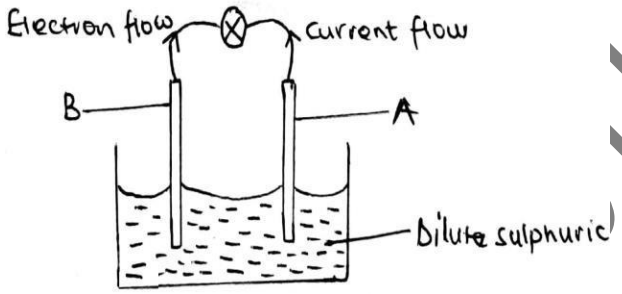
15. (a) An aqueous solution of copper(II) sulphate was electrolysed between graphite electrodes
(i) State what was observed at the anode and cathode
(ii) Write equation for the reaction that takes place at each electrode
b) The solution that remained after electrolysis was tested with litmus solution
(i) State what was observed
(ii) Give a reason for your answer
c) If the electrolysis was repeated using copper terminals, what would be observed at the electrodes?
d) Describe how sodium hydroxide is manufactured by electrolysis of brine

16. (a) State two factors that can determine the product formed at an electrode during electrolysis
(b) Explain why aqueous solution of copper(II) chloride conducts electricity while solid copper(II) chloride does not

(c) A dilute solution of copper(II) chloride was electrolysed using graphite electrodes
   (i) State what was observed at the cathode and write equation for the reaction that took place
   (ii) Name the substance that was produced at the anode
   (iii) Explain how the product at the anode is formed and write an equation to illustrate your answer.

(d) Electrolysis of copper(II) chloride was repeated using copper electrodes. State what was observed at the anode and briefly explain your answer.

17) Figure below shows the setup of the apparatus in which electric current was produced by dipping metals A and B in dilute sulphuric acid.



(a) Name one metal that can be used as
   (i) A
   (ii) B

(b) State which of the metals A and B is the
   (i) Anode
   (ii) Cathode

(c) Both A and B are divalent metals. Write equation for the reaction at
   (i) The anode
   (ii) The cathode

18) An aqueous solution of potassium iodide was electrolysed between carbon electrodes.
(a) State what was observed at the anode
(b) Name the product at the anode
(c) Describe a test that can be carried out identify the product at the cathode
(d) Litmus paper was dropped into the solution around the cathode at the end of the experiment
   (i) State what was observed
   (ii) Give a reason for your answer

19) In order to illustrate a redox reaction, zinc was added to copper(II) sulphate solution and the setup left to stand for some time
(a) State what was observed
(b) State the substance that was
   (i) Oxidised
   (ii) Reduced

(c) Write equation for the redox reaction that took place

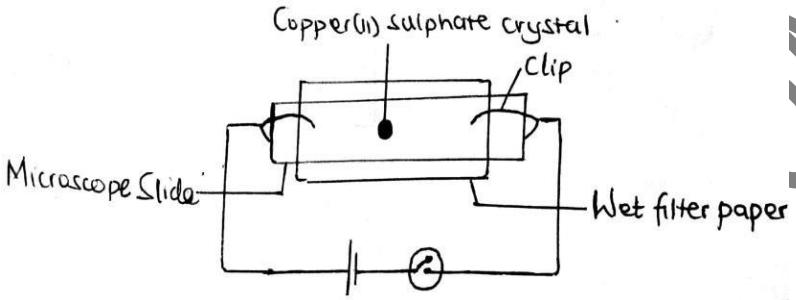
(d) Name one other substance that would react with copper(II) sulphate in a similar way as zinc

(20) (a) Both copper wire and copper(II) sulphate conduct electricity. Name the particles which conduct electricity in

(i) Copper wire

(ii) Aqueous copper(II) sulphate

(b) The setup of apparatus in the diagram below was used to find out what happens when an electrolyte was connected to a source of electric current



State what was observed

(i) When the switch was closed

(ii) If copper(II) sulphate crystal was replaced with potassium manganate(VII)crystal and the switch closed once again.

(c) (i) Give a reason for the observation you have made in b(i) and (ii)

(ii) State any general conclusion that can be drawn following the reasonyou have given in c(i)

(d) Give the applications of electrolysis

(21) (a) Distinguish between the terms anode and cathode

(b) Explain why copper(II) chloride in solid form does not conduct electricity whereas in molten form it does.

(c) A dilute solution of copper(II) chloride was electrolysed using graphite as electrodes

(i) State what was observed at the anode

(ii) Write equation for the reactions at the anode and cathode

(d) Describe how the product at the anode can be identified

(e) The electrolysis of dilute copper(II) chloride was repeated for some time using copper instead of graphite electrodes

(f) State one factor other than change of electrodes that would affect the products of electrolysis of copper(II) chloride solution and indicate how itwould affect the process.

(g) Briefly describe how electrolysis is used to purify copper.

(1) Ammonia reacts with oxygen in the presence of hot platinum to produce a colourless gas X which eventually gives brown fumes,
   (a) Identify X
   (b) Write equation to show the formation of
      (i) X
      (ii) The brown fumes
   (c) State the
      (i) Role of platinum
      (ii) Industrial application of the reaction in (b)

(2) (a) (i) Name two substances from which nitric acid can be prepared in the laboratory
      (ii) Write an equation for the reaction between the substances you have named
   (b) Write equation(s) for the reaction(s) between nitric acid and copper

(3) (a) (i) Write an equation for the reaction between oxygen and
      (ii) Ammonia in the presence of heated platinum
      (iii) Nitrogen monoxide
   (b) State how the product in (a) (ii) can be converted to nitric acid
   (c) Write equation and state the conditions for the reaction between nitric acid and
      (i) Suphur
      (ii) Lead(II) oxide
   (d) In each case, state what would be observed and write the equation for the reaction that takes place when sodium nitrate was heated strongly
      (i) Alone
      (ii) As a mixture with concentrated sulphuric acid

(4) (a) Nitrogen can react with hydrogen in the presence of a catalyst which is finely divided to form ammonia in the Haber process
      (i) State the source of nitrogen
      (ii) Name the catalyst used in the react
      (iii) Explain why the catalyst is finely divided
      (iv) Write equation for the reaction leading to the formation of ammonia
      (v) State two factors that can affect the yield of ammonia in the Haber process
   (b) Write equation for the reaction to show that ammonia can
      (i) Act as a reducing agent
      (ii) Burn in oxygen
   (c) Ammonia obtained by Haber process can be converted to nitrogen(II) oxide
      (i) Write equation for the reaction leading to the formation of nitrogen(II) oxide
      (ii) State the conditions for the reaction
   (d) Write equation to show how nitrogen(II) oxide can be converted to nitric acid.

(e) When aqueous ammonia was added dropwise until in excess to a solution of copper(II) nitrate, a blue precipitate P which dissolved in excess ammonia to give a deep blue solution was formed
   (i) Identify P
   (ii) Write the formula and name of the cation in the blue solution

(1) (a) Write equation to show how ammonia can be prepared from calcium hydroxide
   (ii) Name one substance that can be used to dry ammonia
(b) Ammonia was passed over heated copper(II) oxide
   (i) State what was observed
   (ii) Write equation for the reaction

(6) When aqueous ammonia was added dropwise until in excess to a solution containing a cation X, a white precipitate was formed which dissolved in excess to give a colourless solution.
(a) Identify X
(b) Write the formula of the cation in the colourless solution
(c) Write an ionic equation for the reaction leading to the formation of the white precipitate
(d) Name one other metal ion that when treated with aqueous ammonia would form a precipitate soluble in excess ammonia
(e) State what would be observed in the above mentioned reaction.

(7) (a) (i) Draw a labeled diagram of the setup of apparatus that can be used to prepare a dry sample of ammonia in the laboratory
   (ii) Write equation for the formation of ammonia
(b) Write equation for the reaction between ammonia and
   (i) Hydrogen chloride
   (ii) Lead(II) oxide
(c) State what would be observed if ammonia solution was added to a solution of copper(II) chloride dropwise until in excess
(d) On heating a mixture of ammonium sulphate and aqueous potassium hydroxide, ammonia gas was produced according to the following equation

$$(NH_4)_2SO_4(s) + 2KOH\ (aq) \rightarrow K_2SO_4(aq) + 2H_2O(aq) + 2NH_3(g)$$

Calculate the mass of ammonium sulphate required to produce 424.4cm^3 of ammonia gas at s.t.p.

(8) (a) Describe hoe nitric acid can be manufactured using hydrogen and nitrogen as a raw material
(b) Write equation to show the effect of heat on
   (i) Ammonium nitrate
   (ii) Zinc nitrate
(c) Potassium nitrate was heated with concentrated sulphuric acid. Write equation for the reaction that took place

(9) (a) When dilute nitric acid was reacted with copper, a colourless gas G which turned brown when exposed to air to air was evolved.
   (i) Name gas G
   (ii) Write the equation for the reaction leading to the formation of
      - Gas G
      - The brown gas

   (b) Write an equation for the reaction that would take place if the brown gas was dissolved in water.
   (c) State what would be observed if concentrated nitric acid was heated with iron(II) sulphate

(10) (a) Write equation for the reaction to show the effect of heat on the following
   (i) Sodium nitrate
   (ii) Silver nitrate

   (b) Concentrated nitric acid was added to copper metal and the mixture heated.
   (i) State what was observed
   (ii) Write equation for the reaction

(11) (a) Magnesium was heated in nitrogen. Write equation for the reaction that took place
   (b) Few drops of water were added to the product in (a)
   (i) State what was observed
   (ii) Write equation for the reaction
   (c) A piece of litmus paper was held over the reaction tube in (b).
   (i) State what was observed
   (ii) Explain your answer in (c) (i)

(12) (a) (i) State the conditions under which sulphuric acid can react with sodium nitrate to form nitric acid
   (ii) Write equation for the reaction in (a)(i)

   (b) Sulphur was warmed with concentrated nitric acid
   (i) State what was observed
   (ii) Write equation for the reaction
   (c) Barium nitrate solution was added to the resulting mixture in (b).
   (i) State what was observed
   (ii) Write equation for the reaction

(13) (a) With the help of equations, outline how a dry sample of ammonia can be prepared in the laboratory starting from ammonium chloride.
   (b) Draw a labeled diagram of the setup of apparatus to show that ammonia is very soluble in water
   (c) Using equations, explain why when dry ammonia is passed over heated lead(II) oxide, a colourless liquid and a grey solid is obtained.
   (d) Ammonium nitrate dissolves in water according to the equation

$$NH_4NO_3(aq) + H_2O(l) \leftrightharpoons NH_4OH(aq) + HNO_3(aq)$$

Explain using equations why extensive use of ammonium nitrate fertilizer can make the soil become acidic.

(14) Although nitrogen is generally unreactive, it readily reacts with burning magnesium ribbon

(a) State why nitrogen is generally inert

(b) Burning magnesium reacts with nitrogen

(i) Give a reason for the reaction

(ii) Write equation for the reaction

(c) Water was added to the product in (b) and a colourless gas T was evolved.

(i) Name T

(ii) write equation for the reaction leading to the formation of T

(iii) Name a laboratory reagent that can be used to dry T

(iv) Describe how T can be identified in the laboratory. Write equation to illustrate your answer.

(15) (a) Describe how a dry sample of ammonia can be prepared.

(b) Name a reagent that can be used to test for ammonia. State what is observed and write the equation for the reaction when the reagent is used

(c) (i) Draw a diagram of apparatus that can be used to show that ammonia can burn in oxygen

(ii) Write equation for the reaction

(d) Dry ammonia was passed over heated copper(II) oxide

(i) State what was observed

(ii) Write equation for the reaction

(16) (a) Write equation for the reaction leading to the formation of ammonia on a large scale

(b) What name is given to the process of industrial manufacture for the industrial manufacture of ammonia

(c) State two conditions for the reaction

(d) Ammonia can react with lead(II) oxide

(i) State the conditions for the reaction

(ii) What would be observed

(iii) Write equation for the reaction

(iv) What property of ammonia is shown in the reaction

(17) (a) (i) Draw a labeled diagram to show that ammonia can burn in air

(ii) Write equation for the reaction

(b) Describe an experiment to demonstrate the high solubility of ammonia in water

(c) How is ammonia converted to nitric acid

(d) Give any other two industrial use of ammonia apart from manufacture of nitric acid and fertilizers

(18) (a) (i) Name the raw materials used for the manufacture of ammonia

(ii) Write equation for the reaction leading to the formation of ammonia

(b) Explain how the formation of ammonia is affected by

(i) Pressure

(ii) Temperature

(c) State another factor that affects the formation of ammonia

(d) Dry ammonia gas was passed over heated copper(II) oxide

(i) State what was observed

(ii) Write equation for the reaction

(iii) Explain your observation in (i) above

(19) Nitrogen reacts with hydrogen to produce ammonia according to the equation

$$N_2(g) \ + \ 3H_2(g) \ \leftrightharpoons \ 2NH_3(g) + heat$$

The table below shows the percentage yield of ammonia at various temperatures and pressure.

Temperature (ºC)	Pressure (atmospheres)		
	10	200	1000
250	30%	75%	95%
500	1%	18%	60%
1000	0%	0.1%	1%

(a) State how the percentage yield of ammonia varies with

(i) Pressure at constant temperature

(ii) Temperature at constant pressure

(b) State the temperature and pressure which give the maximum yield of ammonia

(c) Give two uses of ammonia

(20) (a) (i) Draw a well labeled diagram of the setup of apparatus that can be used to prepare ammonia on the laboratory

(ii) Write equation for the reaction

(b) Aqueous ammonia was added dropwise to until in excess to a solution of copper(II) nitrate

(i) State what was observed

(ii) Explain your observation including equations.

(c) Explain what happens when heated platinum foil is introduced into a gas jar containing a mixture of ammonia and nitrogen

(d) Ammonium sulphate when heated decomposes according to the equation

$$(NH_4)_2SO_4(s) \ \leftrightharpoons \ 2NH_3(g) \ + \ H_2SO_4(aq)$$

Calculate the volume of ammonia at room temperature produced when 1.32g ofammonium sulphate is strongly heated.

(21) Nitrogen forms a series of oxides

(a) Write the formula of the oxides of nitrogen and the class of oxides to why each one belongs

(b) Write equations for the reactions to show how each oxide can be obtained

(c) One of the oxide of nitrogen turns brown when exposed to air

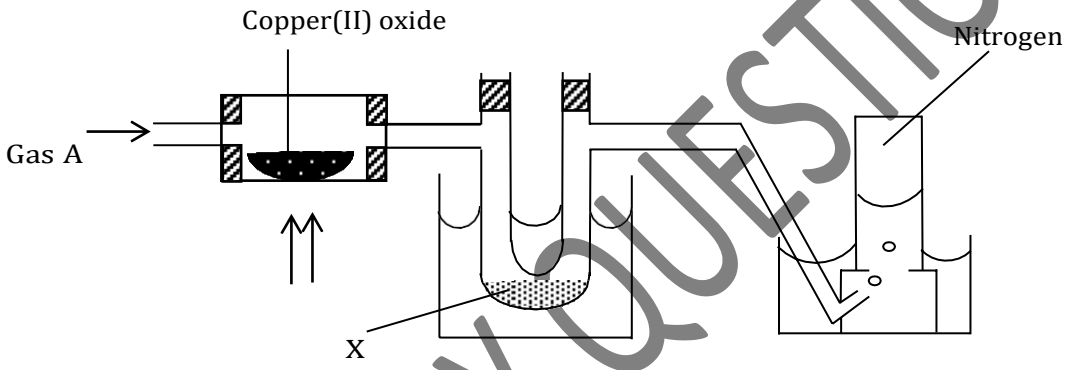
(i) Name the oxide

(ii) Explain why the named oxide turns brown. Include an equation in your answer.

(d) One of the oxides of nitrogen reacts with water
  (i) Name the products of the reaction of the oxide with water
  (ii) Write equation for the reaction that takes place

(e) State what is observed and write equation for the reaction when the following are heated to a constant mass
  (i) Lead(II) nitrate
  (ii) Zinc nitrate
  (iii) Aluminium nitrate
  (iv) Copper(II) nitrate

(21) The diagram below shows the apparatus which can be used to prepare nitrogen in the laboratory



(a) Name gas A

(b) (i) State what would be observed
  (ii) Write equation for the reaction

(c) Name
  (i) Substance X
  (ii) One reagent that can be used to identify X and state the observation

(22) (a) Name the process by which ammonia is obtained on a large scale

(b) One of the main uses of ammonia is the manufacture of fertilizers including ammonium sulphate ($(NH_4)_2SO_4$) and urea ($CO(NH_2)_2$). Calculate the percentage of nitrogen in
  (i) Ammonium sulphate
  (ii) Urea

(c) which one the above fertilizers is a better fertilizer

(d) Aqueous ammonia was added to a solution of calcium hydrogen carbonate.
  (i) State what was observed
  (ii) Write equation for the reaction
  (iii) State the application of the reaction

(23) (a) Draw a well labeled diagram for the preparation of ammonia

(b) Describe an experiment that can be carried out to show that ammonia is an alkaline gas

(c) A copper foil was strongly heated and held over a concentrated solution of ammonia in a beaker

(i) State what was observed

(ii) Explain your observation including equations

(d) Ammonia reacts with lead(II) oxide according to the equation

$$2NH_3(g) \ + \ 3PbO(s) \rightarrow N_2(g) \ + \ 3Pb(s) \ + \ 3H_2O(l)$$

Calculate the volume of ammonia at room temperature that would be required tocompletely react with 2.5g of lead(II) oxide

(24) (a) When a mixture of hydrogen and nitrogen were passed over finely divided iron, gas **R** was produced.

(i). Name **R**

(ii). Write equation leading to the formation of **R**

(b). State what is observed and write equation for the reaction when

(i). A gas jar of R is inverted over a gas jar of hydrogen chloride

(ii). R is passed over heated lead(II) oxide

(25) (a) Describe the industrial preparation of nitric acid from ammonia

(b) Explain what happens when concentrated nitric acid is added to copper

(c) Write equations to show the effect of heat on the following

(i) Potassium nitrate

(ii) Magnesium nitrate

(iii) Silver nitrate

(iv) Ammonium nitrate

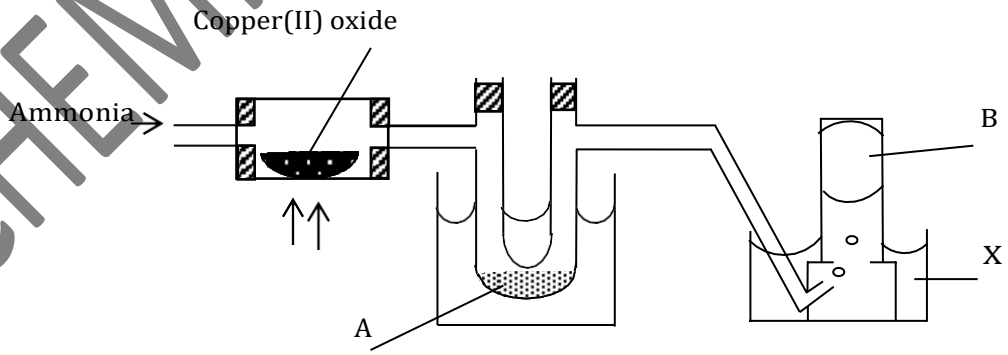
(v) Ammonium nitrite

(vi) Ammonium carbonate

(vii) Ammonium sulphate

(viii) Ammonium chloride

(25) Substances A and B are obtained from a reaction between ammonia gas and copper(II) oxide



(a) Name substances A, B and X

(b) Write equations for the reaction that takes place in the combustion tube

(c) State why it is not possible to collect the excess ammonia in the gas jar

(d) Name one other oxide that can be used instead of copper

26. In the preparation of ammonia in the laboratory, a mixture of ammonium chloride and calcium hydroxide is heated. The gas evolved is passed through a tower packedwith calcium oxide before it is collected by upward delivery.

(a). (i). Write an equation for the reaction that leads to the formation of ammonia (ii). State why ammonia is passed into the power packed with calcium oxide (iii). Give a reason why ammonia is collected by upward delivery method

(b). (i). Name one reagent that can be used to identify ammonia

(ii). State what would be observed if ammonia is treated with the reagent youhave named

(c). Name the catalyst that is used in the oxidation of ammonia during themanufacture of nitric acid

27. (a). State why ammonia is **not** dried using(i). Anhydrous calcium chloride (ii). Concentrated sulphuric acid

(b). Name the substance normally used in the laboratory for drying ammonia(c). Write equation for the reaction that can take place when copper(II) oxide is treated with ammonia.

1 (i) Draw a well labelled diagram of the set-up of apparatus that can be used to prepare a dry sample of carbon dioxide in the laboratory
(ii) Write equation that leads to the formation of carbon dioxide
(b) Burning magnesium was lowered in a gas jar of carbon dioxide
(i) State what was observed
(ii) Write equation for the reaction
(iii) Explain your observation
(c) Water was added to the product in (b) and the resultant mixture tested with litmus. State what was observed and explain your observation
(d) When a solution of sodium hydroxide was exposed to air for a long, a white solid was formed on the surface
(i) Name the white solid
(ii) Write equations leading to the formation of the white solid

2 (a) (i) Draw a labelled diagram to show how a dry sample of carbon dioxide can be prepared in the laboratory
(ii) Write equation leading to the formation of the carbon dioxide
(b) Carbon dioxide was bubbled into a solution of calcium hydroxide for a long time
(i) State what was observed
(ii) Write equations for the reactions that took place
(iii) Explain your observations
(c) Burning magnesium was lowered into a gas jar of carbon dioxide
(i) State what was observed
(ii) Write equation for the reaction
(iii) Explain your observation

3 (a) (i) What are allotropes
(ii) Name one element that shows allotropy apart from carbon
(b) (i) Give the allotropes of carbon
(ii) State two properties of one of the allotropes of carbon
(iii) Explain how the allotrope is used due to its properties you have named

4. (a) Name the element present in pure charcoal
(b) Explain why it is dangerous to use a charcoal stove in a poorly ventilated room
(c) Write equation for the reaction between charcoal and heated iron(III) oxide

5. (a) A solution of sodium carbonate was added to a solution of calcium ions
(i) State what was observed
(ii) Write equation for the reaction
(b) State the application of this reaction
(c) Dilute hydrochloric acid was added to the mixture formed in (a)
(i) State what was observed
(ii) Write equation for the reaction

6. (a) Draw and name the structure adapted by diamond
   (b) State the physical properties of diamond
   (c) What use is made of diamond due to the properties you have named

7. (a) State what is observed when sodium carbonate is added to each of the following solutions
      (i) Aqueous calcium hydroxide
      (ii) Dilute sulphuric acid
   (b) Sodium carbonate crystals were exposed to air for a long time
      (i) State what was observed
      (ii) Explain your observation

8. (a) Name the two crystalline forms of carbon
   (b) State two differences between the allotropes you have named
   (c) Give two uses of each allotrope

9. (a) Sodium carbonate was added dissolved in water and the resultant solution tested with litmus paper
      (i) State what was observed
      (ii) Explain the observation
   (b) Sodium carbonate was added to a solution of magnesium sulphate
      (i) State what was observed
      (ii) Write equation for the reaction that takes place

10. (a) Give a reason why
      (i) Graphite conducts electricity whereas diamond does not
      (ii) Diamond is used as a cutting tool whereas graphite is used to mark paper
   (b) Describe the proof for allotropy
   (c) State conditions and write equations for the reaction between carbon and oxygen

11. (a) Describe the structure of graphite
   (b) State two properties in which graphite differs from diamond
   (c) Graphite was heated in excess air and the gas given off passed through aqueous calcium hydroxide for a long time
      (i) State what was observed
      (ii) Write equations for the reactions
   (d) Carbon monoxide reacts with iron(III) oxide according to the following equation

$$Fe_2O_3(s) + 3CO(g) \rightarrow Fe(s) + 3CO_2(g)$$

   If excess carbon monoxide was passed over 3.5g of hot iron(III) oxide, calculate the volume of carbon dioxide evolved at s.t.p

12. (a) Carbon dioxide was passed through a saturated solution of calcium hydroxide until there was no further change
      (i) State what was observed
      (ii) Write equations for the reactions that took place
   (b) Soap solution was added to the resultant mixture in (a).

(i) State what was observed
(ii) Write equation for the reaction the took place

13. (a) Name a reagent that can be used to distinguish between the CO_3^{2-} ion and the HCO_3^- in solution. State what is observed when the reagent you have named is used

(b) Explain why carbon dioxide cannot be prepared from
(i) Calcium carbonate and sulphuric acid
(ii) Lead(II) carbonate and sulphuric or hydrochloric acids

(c) State what is observed and write equation for the reaction that takes place when the following are heated
(i) Magnesium carbonate
(ii) Calcium carbonate
(iii) Copper(II) carbonate
(iv) Zinc carbonate
(v) Lead(II) carbonate

14. (a) Explain how a pure sample of carbon dioxide can be prepared in the laboratory from calcium carbonate and write the equation for the reaction that takes place. (diagram is not required)

(b). Explain with aid of equations the changes that take place when excess carbon dioxide is bubbled into sodium hydroxide solution

(c). Potassium hydrogencarbonate decomposes when heated according to the following equation

$$2KHCO_3(aq) \rightarrow K_2CO_3(s) \quad + \quad H_2O(l) \quad + \quad CO_2(g)$$

Calculate the mass of carbon dioxide evolved when 8 g of potassium hydrogencarbonate is heated strongly. ($K = 39; H = 1; C = 12; O = 16$)

15. (a) Gas P was passed over heated lead(II) oxide. The gaseous product turned lime water milky
(i) Identify P
(ii) State what was observed when P was passed over heated lead(II) oxide

(b) Write equation for the reaction between
(i) P and lead(II) oxide
(ii) The gaseous product and lime water

(c) State the uses of carbon dioxide

16. (a) Carbon dioxide was bubbled into concentrated sodium hydroxide solution
(i) State what was observed
(ii) Explain your observation
(iii) Write equations for the reactions

(b) Describe the laboratory preparation of the following
(i). Sodium carbonate crystals
(ii). Sodium hydrogen carbonate
(iii). Magnesium carbonate

(c) Carbon monoxide was passed over heated zinc oxide.
(i) State what was observed

(ii) Write equation for the reaction

17. (a). (i). Draw a labelled diagram of the set-up of apparatus that can be used to prepare a dry sample of carbon dioxide

(ii). Write equation for the reaction leading to the formation of carbon dioxide(b). Explain the reason for your choice of the

(i). Drying agent for carbon dioxide

(ii). Method of collecting carbon dioxide as shown in your diagram in (a)(i)(c). Write equation(s) to show the reaction of carbon dioxide with

(i). Water

(ii). Sodium hydroxide(d). State

(i). Why carbon dioxide is used in making fire extinguishers

(ii). The effect of increased concentration of carbon dioxide on the environment

(1) Briefly describe how a dry sample of hydrogen chloride can be prepared in the laboratory

(b) hydrogen chloride was bubbled through a solution of lead(II) nitrate

(i) state what was observed and explain your answer

(ii) write an equation for the reaction that took place

(c) A sample of hydrogen chloride gas was dissolved in water to make 250cm^3 of a solution. 25.0cm^3 of this solution required 46.0cm^3 of 2M sodium hydroxide for complete neutralization. Determine the mass of hydrogen chloride that was dissolved to make 250cm^3 of the solution

(2) (a) Chlorine can be prepared in the laboratory using potassium manganate(VII).

(i) Name one substance that reacts with potassium manganate(VII) to produce chlorine

(ii) State the conditions for the reaction

(iii) Write the equation for the reaction

(b) Damp litmus paper was dropped in a gas jar containing chlorine. State what was observed and explain your observation.

(c) A boiling tube filled with chlorine water was inverted into a beaker containing chlorine water and the mixture exposed to sunlight for some time

(i) State what was observed

(ii) Explain with the aid of equation(s) your observation(s) in c(i)

(d) Write an equation to show how chlorine can react with

(i) Dilute potassium hydroxide solution

(ii) Turpentine $C_{10}H_{16}$.

(e) Briefly describe a test you would carry out to confirm the presence of chloride ion in solution. State what would be observed and write an equation for the reaction that would take place.

(3) (a) Describe how a pure dry sample of chlorine can be prepared in the laboratory from potassium manganate(VII) crystals

(b) State what would be observed if chlorine was bubbled through a

(i) Blue litmus solution

(ii) Potassium bromide solution

(iii) Solution of iron(II) ions

(c) Write equation for the reaction in b(ii) and b(iii)

(d) Write equation for the reaction between chlorine and

(i) Heated iron

(ii) Cold dilute sodium hydroxide solution

(iii) Hot concentrated sodium hydroxide solution

(4) (a) Describe how a pure sample of chlorine can be prepared in the laboratory starting from potassium permanganate

(b) State what would be observed and write equation for the reaction that would occur if

(i) Chlorine was bubbled into aqueous sodium hydroxide solution

(ii) Burning magnesium was lowered into a gas jar of chlorine
(iii) Chlorine was passed through a solution of potassium iodide

(c) State the uses of chlorine

(5) (a) State what would be observed if chlorine was bubbled through
(i) Water
(ii) Potassium bromide solution

(b) Explain your observation in
(i) a(i)
(ii) a(ii)

(c) write equations for the reactions taking place in each case

(6) (a) hydrogen chloride can be prepared from the according to the following equation

$$Cl^{-}(s) \quad + \quad H^{+}(aq) \rightarrow \quad HCl(g)$$

Calculate the mass of sodium chloride required to produce 3.60dm^3 of hydrogen chloride at room temperature

(b) state what would be observed and in each case write an equation for the reaction that would take place when
(i) an aqueous solution of hydrogen chloride is added to s solution containing lead(II) ions
(ii) excess dry hydrogen chloride is passed over strongly heated iron wire

(c) briefly explain the following
(i) anhydrous iron(II) chloride cannot be prepared by direct synthesis using chlorine and iron
(ii) an aqueous solution of hydrogen chloride gives a white precipitate with silver nitrate while a solutionof hydrogenchloride in tetrachloromethane shows no observable change when treated with silver nitrate

(d) write an ionic equation for the reaction between an aqueous solution of iron(II) and ammonia solution

(7) (a) write equation to show how hydrogen chloride can be prepared from sodium chloride

(b) Draw a labeled diagram to show how aqueous hydrogen chloride can be prepared in the laboratory

(c) State what would be observed and write equation for the reaction that would take place when aqueous hydrogen chloride is reacted with
(i) Solid calcium carbonate
(ii) Silver nitrate solution
(iii) Magnesium

(8) (a) (i) Describe with aid of a well labeled diagram how a sample of iron(III) chloride can be prepared from concentrated hydrochloric acid and potassium permanganate

(b) What happens when
(i) Water is added to iron(III) chloride
(ii) Iron(III) chloride is exposed to air

(c) Hydrogen was used to reduce 32.5g of iron(III) chloride

(i) Write equation for the reaction
(ii) Calculate the minimum volume of hydrogen required to react completely with iron(III) chloride

(9) (a) (i) Describe with aid of a labeled diagram how a dry sample of chlorine can be prepared
(ii) Write equation for the reaction that takes place
(iii) State any three uses of chlorine gas
(b) State what was observed and write equation for the reaction that takes place when chlorine is added to
(i) Iron(II) chloride solution
(ii) Potassium iodide solution
(c) Burning sodium was plunged in a gas jar of chlorine
(i) State what was observed
(ii) Write equation for the reaction

(10) (a) A substance X reacts with solid sodium chloride to produce hydrogen chloride
(i) Identify X
(ii) State the conditions for the reaction
(iii) Write the equation for the reaction
(b) (i) Name the substance formed when hydrogen chloride gas is dissolved in water
(ii) Explain why an aqueous solution of hydrogen chloride is an electrolytewhereas a solution of the gas in methylbenzene is a non - electrolyte
(c) An aqueous solution of hydrogen chloride was added drop wise to 4.2g of solid sodium hydrogen carbonate until there was no further change
(i) State what was observed
(ii) Write equation for the reaction(s) between the gas produced and calcium hydroxide
(iii) Calculate the volume of the gas produced at s.t.p

(11) (a) Draw a well labeled diagram of the apparatus that could be used to prepare a dry sample of chlorine in the laboratory using potassium permanganate. Write equation for the reaction that takes place
(b) Chlorine was bubbled through litmus solution. State and explain what was observed.
(c) State what is observed when and write equation for the reaction that takes place when
(i) A piece of yellow phosphorus is lowered in jar of chlorine
(ii) Burning turpentine ($C_{10}H_{16}$) is lowered in a jar of chlorine
(iii) Chlorine is bubbled through potassium bromide solution
(iv) Chlorine is bubbled through iron(II) chloride solution

(12) (a) Chlorine can be prepared in the laboratory from hydrochloric acid
(i) Name the other reagent used
(ii) State the conditions for the reaction
(iii) Write the equation for the reaction

(b) (i) Draw a well labeled diagram for to show the preparation of iron(III) chloride using chlorine

(ii) State what is observed during the reaction

(iii) Write equation for the reaction

(c) (i) State what is observed if aqueous ammonia was added to a solution of iron(III) chloride

(ii) Write an ionic equation for the reaction

13. During the preparation of chlorine in the laboratory, the gas may be passed through water and concentrated sulphuric acid before collection

(a) State the

(i) Use of water

(ii) Use of concentrated sulphuric acid

(iii) Method of collection of dry chlorine gas. Give a reason for your answer.

(b) Chlorine is bleaching agent in the presence of water

(i) Write an equation for the reaction between chlorine and water

(ii) Using equation, explain the bleaching action of chlorine

(c) (i) State what would be observed if chlorine was bubbled through a solution of iron(II) sulphate

(ii) Explain your observation

(iii) Write an ionic equation for the reaction.

(d) Describe the industrial manufacture of chlorine

14. (a). Explain how a dry sample of hydrogen chloride can be prepared from sodium chloride (no diagram is diagram is required)

(b). State what would be observed and write equation for the reaction that would take place if hydrogen chloride was passed.

(i). Over strongly heated iron wire

(ii). Through aqueous silver nitrate

(c). Aqueous hydrogen chloride reacts sodium carbonate solution to produce carbon dioxide according to the following equation

$$Na_2CO_3(aq) + 2HCl(aq) \rightarrow 2NaCl(aq) + H_2O(l) + CO_2(g)$$

Calculate the volume of carbon dioxide that would be produced at room temperature if excess sodium carbonate solution was added to 50.0cm^3 of a solution containing 0.2 moldm^{-3} of hydrogen chloride.
(1 mole of gas occupies 24.0 dm^3 at room temperature)

15. (a). Hydrogen chloride can be produced from potassium chloride

(i). Name another reagent that is used with potassium chloride to produce hydrogen chloride

(ii). State the conditions for the reaction

(iii). Write an equation for the reaction leading the formation of hydrogen chloride

(b). Write an equation for the reaction between hydrogen chloride and

(i). Silver nitrate solution

(ii). Iron in the presence of water

(iii). Lead(II) nitrate solution

16. (a). Dry hydrogen chloride gas can be prepared by reacting potassium chloride with substance **T**. The gas is the passed through concentrated sulphuric acid and the collected.
    (i). Name substance **T**.
    (ii). State the conditions for the reaction.
    (iii). State what is observed during the reaction.
    (iv). Write the equation for the reaction leading to the formation of hydrogen chloride.
    (v). State the role of concentrated sulphuric acid.
    (vi). Name the method of collection of the gas. Give a reason for your answer.
    (vii). Name a reagent that can be used to identify hydrogen chloride in the laboratory, state what is observed and write equation for the reaction.

(b). Give a reason why hydrogen chloride is called a fountain gas.

(c). Explain why a solution of hydrogen chloride in water turns blue litmus red, whilea solution of the gas in chloroform does not.

(d). Describe how you can test for the presence of chloride ions in the laboratory, include an equation for the reaction.

(e). Iron can react with hydrogen chloride.
    (i). State the conditions for the reaction.
    (ii). With equation for the reaction.

(1) Beer or crude ethanol is manufactured by a process called fermentation
   (i) Explain what is meant by the term fermentation
   (ii) Write equation for the reaction that takes place during fermentation
   (iii) Is the process of fermentation endothermic or exothermic? Give a reason for your answer
   (b) Describe briefly how in the homes, alcoholic drinks can be prepared from either ripe bananas or millet flour
   (c) Draw a diagram of apparatus that can be used to concentrate the alcohol produced in (b)
   (d) Write equation to show how ethanol can be converted to ethene and indicate the conditions for the reaction.

(2) (a) A compound Q contains 14.3% hydrogen and the rest being carbon. Calculate the empirical formula of Q
   (b) The relative molecular mass of Q is 28. Determine the molecular formula of Q
   (c) Write equations to show how Q reacts with
      (i) Hydrogen
      (ii) Bromine water

(3) (a) Write the structural formula of ethene
   (b) Ethene can be prepared by reacting ethanol with sulphuric acid. State the conditions for the reaction
   (c) (i) State what would be observed when ethene is reacted with bromine
      (ii) Write equation for the reaction

(4) A hydrocarbon X of formula mass 30, consists of 80% carbon
   (a) Calculate the empirical formula of X
   (b) Determine the molecular formula of X
   (c) Write the structural formula of X

(5) Soap can be prepared by boiling vegetable oil with sodium hydroxide solution and adding a solution of sodium chloride to the reaction mixture
   (a) What name is given to the reaction leading to the formation of soap?
   (b) Name one crop from which oil for making soap can be obtained
   (c) Why is sodium chloride added to the reaction mixture?
   (d) State one advantage and one disadvantage of using detergents instead of soap.

(6) (a) Name two raw materials used to manufacture soap
   (b) Describe how soap is obtained from the raw materials you have named
   (c) State why detergents are commonly used instead of soap in laundry

(7) (a) Ethanol can be prepared by fermentation of sugars. Write equation to show how ethanol can be prepared from glucose ($C_6H_{12}O_6$)

(b) When ethanol is heated with concentrated sulphuric acid at 170°C, a substance W is formed.
   (i) Name W
   (ii) Write equation leading to the formation of W
   (iii) Write the structural formula of W
   (iv) Name one reagent that can be used to identify W. State what is observed and write equation for the reaction that takes place

(8) A compound X consists of 40.0% carbon, 6.7% hydrogen and 53.3% oxygen.
   (a) Calculate the empirical formula of X
   (b) If the formula mass of X is 60. Determine its molecular formula
   (c) When a solution of X was added to sodium carbonate, bubbles of a colourless gas were given off
      (i) State the nature of X
      (ii) Write the ionic equation for the reaction that took place

(9) A compound Y consists of 92.31% carbon and 7.69% hydrogen. The RFM of Y is 26
   (a) Calculate the empirical formula of Y
   (b) Determine the molecular formula of Y
   (c) Write the structural formula of Y

(10) (a) Explain what is meant by the term polymerization
   (b) (i) Name one natural polymer and one synthetic polymer
      (ii) State one use of each polymer you have named
   (c) Soap forms scum when mixed with certain types of water.
      (i) What is the chemical nature of scum?
      (ii) Outline the physical method used to obtain water free from hardness
      (iii) Give two advantages of hard water

(11) (a) (i) State the difference between fats and oils
      (ii) Give one example of each
   (b) Briefly describe how soap can be prepared
   (c) State what would be observed if soap solution was shaken with a solution of magnesium hydrogen carbonate
   (d) Explain your answer
   (e) State what would be observed if a solution of soapless detergent was used instead of soap solution
   (f) Give one disadvantage of using soapless detergents

(12) The molecular mass of gas X is 28 and its empirical formula is CH_2.
   (a) Determine the molecular formula of X
   (b) (i) Write the structural formula of X
      (ii) Write equation for the reaction between X and bromine
   (c) (i) Name one other reagent that can be used to identify X
      (ii) State what would be observed if the reagent is used on X

(13) (a) (i) What is a polymer

(ii) Distinguish between a natural and an artificial polymer and give two examples in each case.

(b) Describe the process of vulcanization of rubber. Your answer should include

(i) The importance of vulcanization of rubber

(ii) The useful items of vulcanized rubber

(14) Sulphuric acid reacts with ethanol to produce a colourless gas that decolourises bromine water

(a) Name the gas produced

(b) State the conditions for the reaction

(c) Write equation for the reaction

(d) Give two large scale uses of the gas produced

(15) (a) Name the ions that cause hardness in water

(b) Explain how the variation in hardness can be demonstrated in the laboratory

(c) State two advantages of hard water.

(16) (a) Name the raw materials used in your locality to make alcohol

(b) Briefly describe how the alcohol can be obtained from the raw materials you have named in (a)

(c) State how the alcohol you have prepared can be concentrated

(d) State one way of determining whether the alcohol is pure or not

(e) Ethene can be prepared from ethanol. Write equation and state conditions for the reaction leading to the formation of ethene

(f) Name any other two uses of ethanol apart from preparing ethene

(17) A compound R of molecular mass 42, contains 85.7% carbon and 14.3% hydrogen

(a) Calculate the empirical formula of R

(b) Determine the molecular formula of R

(c) Write the structural formula of R

(d) To which homologous series does R belong? Give a reason for your answer

(e) Briefly describe how R can be identified in the laboratory

(f) Give one use of R

(18) A hydrocarbon Z of molecular mass 56 consists of 85.7% carbon.

(a) Define the term hydrocarbon

(b) Calculate the empirical formula of Z

(c) Determine the molecular formula of Z

(19) During the manufacture of soap, sodium hydroxide solution is boiled with substance X

(a) Identify substance X

(b) What name is given to the process leading to the formation of soap?

(c) Name a substance that can be used to precipitate the soap from the solution

(d) State what would be observed and write equation for the reaction when soap is reacted with aqueous calcium hydrogen carbonate

(20) (a) (i) Describe how you would obtain a sample of sugar crystals from sugar cane

(ii) State two uses of sugar in the world of the sick

(b) Concentrated sulphuric acid was added to sugar ($C_{12}H_{22}O_{11}$)
  (i) State what was observed
  (ii) What name is given to this process
  (iii) Write equation for the reaction
  (iv) Why is ethanol important to the society

(c) A mass of 3.10g of an organic compound that contains carbon, hydrogen and oxygen atoms only produced 4.40g of carbon dioxide and 2.70g of water on complete combustion. Calculate the empirical formula of the organic compound

(21) (a) (i) State one word which means "formation of soap"
  (ii) Name two sources of vegetable oils that can be used to make soap

(b) Briefly describe how soap can be prepared

(c) Explain the following
  (i) Water containing calcium hydrogen carbonate will not lather easily with soap unless water has been boiled before using the soap
  (ii) Water containing magnesium sulphate will not lather with soap even after boiling

(22) (a) Write the molecular formula and the structural formula of ethene

(b) Bromine water is one of the reagents used to test for the presence of ethene.
  (i) State what is observed during the test
  (ii) Write equation for the reaction that takes place

(c) Name one other reagent that can be used to test for ethene and state what is observed when the reagent is used

(d) Name one compound from which ethene can be prepared

(23) Under suitable laboratory conditions ethene can be converted to a compound with a general formula $(-H_2C-CH_2-)_n$

(a) (i) What name is given to the compound $(-H_2C-CH_2-)_n$
  (ii) What name is given to the change from ethene to $(-H_2C-CH_2-)_n$
  (iii) Write equation leading to the formation of $(-H_2C-CH_2-)_n$
  (iv) State one use of $(-H_2C-CH_2-)_n$

(b) Name one other compound of the category $(-H_2C-CH_2-)_n$ which is
  (i) Man made
  (ii) Not man made

(24) A compound Y of molecular mass 46, consist of 52.2% carbon, 13.0% hydrogen and 34.8% oxygen.

(a) Calculate the empirical formula of Y

(b) Determine the molecular formula of Y

(c) Suggest one possible use of Y

(26) (a) A compound Q of molecular mass 30 consists of 80.0% carbon and 20.0% hydrogen.
  (i) Calculate the empirical formula of Q
  (ii) Determine the molecular formula of Q
  (iii) Write the structural formula of Q

(b) The enthalpy of combustion of Q is 84.7kJmol^{-1}. Calculate the enthalpy change when 2.5g of Q is completely burnt in oxygen.

(27) (a) (i) State the conditions under which sulphuric acid reacts with ethanol
(ii) Write equation for the formation of ethene from ethanol and sulphuric acid
(iii) State the property of sulphuric acid shown in the reaction in (a) (ii) above
(b) Name one reagent, apart from bromine that can be used to distinguish between ethene and ethane. In each case, state what would be observed in the reagent is separately treated with ethane and ethene.
(c) A hydrocarbon T, molecular mass 42 contains 85.7% carbon
(i) Calculate the empirical formula of T
(ii) Determine the molecular formula of T
(iii) Write the structure of T
(d) T was treated with bromine. State what was observed and write the equation for the reaction.

(28) (a) Write the structural formula of ethene
(b) (i) Name two compounds that can be used to prepare ethene in the laboratory
(ii) State the conditions for the formation of ethene form the compounds you have named
(iii) Write equation for the reaction that takes place

(29) (a) State the difference between fats and oils
(b) Fats and oils can be used to make soap
(i) Define the term soap
(ii) Briefly describe how soap can be prepared
(c) (i) Name two substances which when present in water can cause permanent hardness of water
(ii) State one chemical method of removing permanent hardness of water
(iii) Write equation for the reaction involved in c(ii)
(d) Soap was used for washing in hard water
(i) State what was observed
(ii) Write equation for the reaction
(e) A detergent can be used for washing instead of soap. State one advantage and one disadvantage of using a detergent

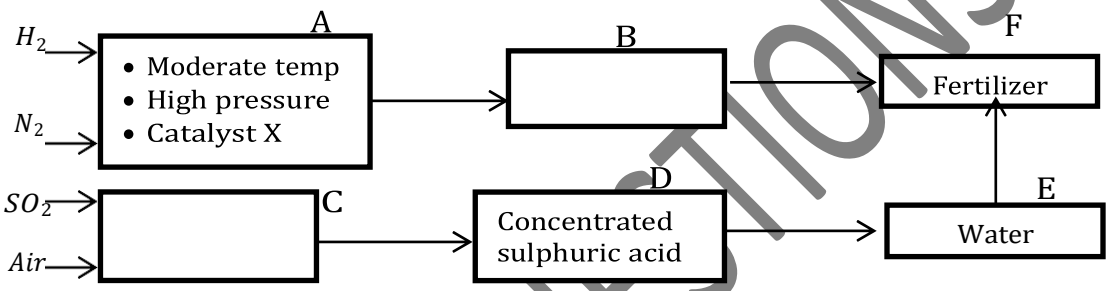
(30) (a) A compound Y contains 52.17% carbon, 13.04% hydrogen and 34.78% oxygen. The molecular mass of Y is 46. Determine the
(i) Empirical formula of Y
(ii) Molecular formula of Y
(b) When Y was heated with excess concentrated sulphuric acid, a colourless gas Z which turned bromine water colourless was evolved. Identify
(i) Y
(ii) Z

(31) The molecular formulae of organic compounds J and M are C_3H_6 and C_3H_8 respectively.
(a) Write the structural formulae and name of J and M
(b) Name one reagent that can be used to distinguish between J and M

(c) State what is observed in each case when the reagent used

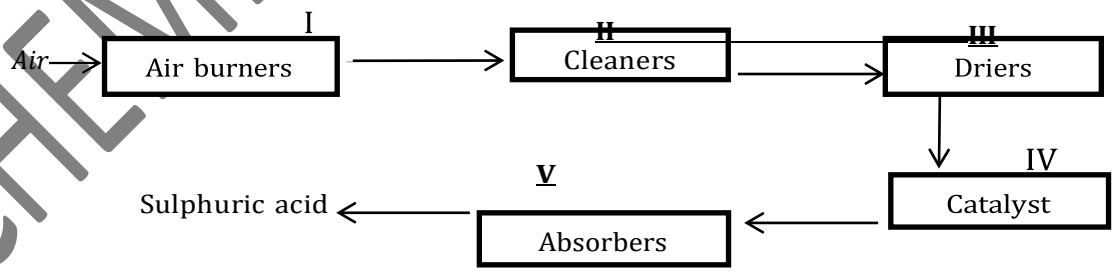
1. Draw a well labelled diagram to show how a dry sample of sulphur dioxide can be prepared in the laboratory.
   (b) Write equation for the reaction that takes place in (a)
   (c) Describe the chemical test for sulphur dioxide
   (d) Excess sulphur dioxide was bubbled through a solution of sodium hydroxide. Write equation for the reaction that takes place.
   (e) 25.0cm^3 of 0.1M sodium hydrogen carbonate reacted completely with 27.8cm^3 of sulphuric acid. Calculate the concentration of sulphuric acid in mole per litre

2. (a) Figure below shows a flow chart for the manufacture of a fertilizer



   (i) Name the catalyst X
   (ii) Write equation for the reaction to show how the product at B is formed
   (iii) State three conditions for the reaction at C
   (iv) Identify the product at C
   (v) Write an equation to show how the product at d is formed
   (vi) Name the product at E
   (vii) What is the use of water at E
   (viii) Write the equation for the reaction that takes place at F
   (ix) Name the fertilizer at F
   (x) Calculate the percentage of nitrogen in the fertilizer

(3) The following chart shows the steps in the manufacture of sulphuric acid by the contact process



   (a) Write an equation for the reaction that takes place in stepI
   (b) Why is step II necessary
   (c) Name the
      (i) Drying agent in step III

(ii) Catalyst in step IV

(d) Describe what takes place in step V in order to produce sulphuric acid

(e) Sulphur dioxide combines with air to form sulphur trioxide

(i) Write equation for the reaction

(ii) State the conditions for the maximum yield of sulphur trioxide

(f) Give the uses of sulphuric acid

(g) $50cm^3$ of 0.5M sulphuric acid was diluted with $200cm^3$ of water. What is the molarity of the resultant solution?

4. (a) Concentrated sulphuric acid was added to sugar

(i) State what was observed

(ii) Write equation for the reaction

(b) State the conditions under which sulphuric acid reacts with copper and write the equations for the reaction

(c) Describe the test that can be carried out to identify the sulphate ions in sulphuric acid

(d) State the use of sulphuric acid

5. (a) Sulphur dioxide can be prepare from hydrochloric acid

(i) Name one substance that can react with sulphuric acid to produce sulphur dioxide

(ii) State the conditions for the reaction

(iii) Name the substance that can be used to dry sulphur dioxide

(iv) Write equation for the reaction leading to the formation of sulphur dioxide

(b) State what would be observed in sulphur dioxide is passed through a solution of

(i) Acidified potassium dichromate

(ii) Acidified potassium permanganate

(iii) A dye

(c) Name the property of sulphur dioxide shown in b(ii) and b(iii)

(d) Describe how sulphur dioxide can be converted into sulphuric acid

6. (a) When dilute hydrochloric acid was added to iron(II) sulphide, a gas was evolved

(i) Identify the gas

(ii) Write an equation for the reaction that took place

(iii) State how the gas can be identified

(iv) Why is the gas usually prepared outside the laboratory

(b) The gas was reacted with sulphur dioxide

(i) State what was observed

(ii) Give a reason for your answer

7. (a) Name one substance that can be reacted with dilute hydrochloric acid to produce sulphur dioxide

(b) State the conditions for the reaction

(c) Write equation for the reaction

(d) A gas jar containing hydrogen sulphide was inverted over a gas jar containing moist sulphur dioxide.

(i) State what was observed

(ii) Write equation for the reaction

8. (a) (i) With aid of a labelled diagram, explain how a pure sample of sulphur dioxide can be prepared in the laboratory using sodium sulphite and sulphuric acid
(ii) Write equation for the reaction
(b) Name one reagent that can be used to confirm the presence of sulphur dioxide, and state what would be observed if the reagent you have named was treated with sulphur dioxide
(c) Write an equation to show how sulphur dioxide reacts with
(i) Water
(ii) Oxygen in the presence of hot platinum
(iii) Hydrogen sulphide
(d) The product of the reaction in c(i) was reacted with water
(i) Write equation for the reaction that took place
(ii) To the resultant mixture above, was added barium chloride solution, state what was observed, write equation for the reaction and explain your observation

9. (a) Sulphur exhibits allotropy
(i) What is meant by the term allotropy
(ii) Name the two crystalline allotropes of sulphur
(iii) State the differences between the two allotropes
(b) State conditions, observations and write equations for the reactions of sulphur with
(i) Oxygen
(ii) Iron
(iii) Nitric acid

10. (a) Describe the laboratory preparation of a dry sample of sulphur dioxide from copper turnings. (*include a labelled diagram for the set up*)
(b) Write equation for the reaction that took place
(c) Give two uses of sulphur dioxide

11. (a) Briefly describe how sulphuric acid is manufacture from sulphur.
(b) Sulphuric acid is the product of the reaction of sulphur trioxide and water.
(i) Write equation for the reaction that takes place
(ii) Explain why sulphuric acid is not manufacture using this method

12. (a) State what is observed and write equation for the reaction that takes place when sulphuric acid is added to
(i) Sugar
(ii) Hydrated copper (II) sulphate crystals and the mixture warmed
(b) Explain each of the observations made in (a)
(c) Write three equations to illustrate the behavior of sulphuric acid acting as an acid. What are the conditions for the reaction?
(d) State conditions and write equations for the reactions between sulphuric acid and the following
(i) Carbon
(ii) Sulphur
(e) What property of sulphuric acid is illustrated in (d)

(f) Copper reacts with sulphuric acid
  (i) State conditions for the reaction
  (ii) State what was observed
  (iii) Write equation for the reaction

13. (a) Describe how a dry sample of hydrogen sulphide can be prepared in the laboratory.
(b) Explain the use of a fume cardboard in the preparation of hydrogen sulphide
(c) Explain why
  (i) Hydrogen sulphide is not dried using sulphuric acid
  (ii) Is considered an air pollutant
(d) State what is observed and write equation for the reaction that takes place whenhydrogen sulphide is mixed with
  (i) Sulphur dioxide
  (ii) Lead(II) nitrate solution
  (iii) Concentrated sulphuric acid

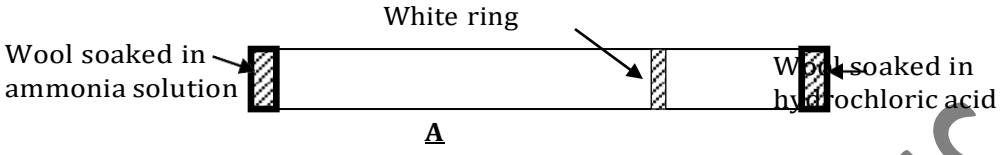
14. (a) A mixture of iron and sulphur was heated
  (i) State what was observed
  (ii) Write equation
(b) Dilute sulphuric acid was added to the produce in (a)
  (i) State what is observed
  (ii) Write equation for the reaction
(c) The gaseous product was bubbled through lead(II) nitrate solution
  (i) State what is observed
  (ii) Write equation for the reaction
(d) State the application of the reaction (c)

15. (a) State the conditions under which sulphuric acid can react with(i). Sucrose ($C_{12}H_{22}O_{11}$)
  (ii). Zinc oxide
  (iii). Magnesium
(b). Write equation for the reaction of sulphuric acid with(i). Sucrose
  (ii). Zinc oxide
  (iii). Magnesium
(c). State the property of sulphuric acid which is shown by its reaction with(i). Sucrose
  (ii). Zinc oxide
  (iii). Magnesium

16. (a) Write equation for the reactions that takes place when the following are heated.
  (i) Copper(II) sulphate-5-water
  (ii) Iron(II) sulphate-7-water
(b) State what is observed in each case
(c) Water was added to anhydrous copper(II) sulphate. State what was observed
(d) Describe the laboratory test for the sulphate ion
(e) Name a reagent that can be used to distinguish between a chloride and a sulphatein a solution

1 Smoke was put in a glass-cell and viewed under a microscope.(i).
State what was observed
(ii). Explain the observation

(b) One piece of cotton wool was soaked in concentrated hydrochloric acid and the other in concentrated ammonia solution. The two pieces of cotton wool were placed in a glass tube as shown below.

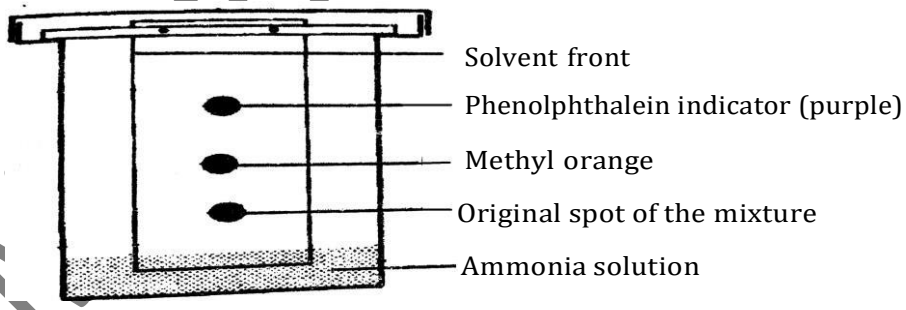


(i). Write the formula of the substance that formed the white ring
(ii). Explain why the white ring formed in position A, not in the middle of the tube

2 (a) Explain how a sample of sulphur can be obtained from a mixture of iron and sulphur
(b) A mixture of sulphur and iron was heated.
(i). State what was observed
(ii). Write equation for the reaction that takes place

3 (a) State two properties of air as a mixture
(b) Name the two main components of air
(c) State the method by which the components of air are separated. Give a reason for your answers

4 (a) A mixture of phenolphthalein and methyl orange was separated as shown in the diagram below.



Name the method of separation
(b) (i). State the colour of methyl orange in this experiment
(ii). Phenolphthalein is usually colourless. Explain why it is purple in this experiment
(c) Give any other two mixtures that can be separated using this method

5 (a) Name one method by which the components of the following mixtures can be separated
(a) Pigments of green leaf
(b) Water and ethanol
(c) Iodine and potassium iodide

(d) Copper(II) sulphate and copper(II) carbonate

6 (a) During an experiment, a beam of light was passed through a dark room and dust particles were seen moveing in all directions. State

(i). Why the dust particles moved in all directions

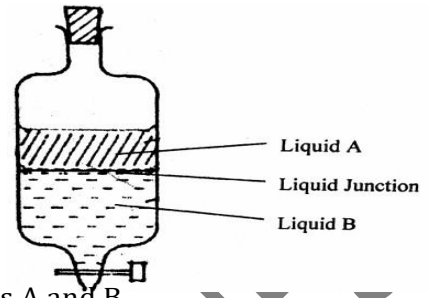
(ii). What the experiment indicated

(b) Temperature of the room was increased.

(i). State what was observed

(ii). Give a reason for your answer

7 (a) Figure below shows the setup of the apparatus that can be used to separate a mixture of water and kerosene.



Identify the liquids A and B

(b) State why

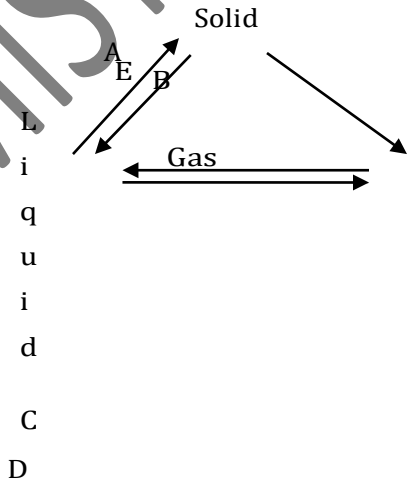
(i). Liquid A forms the upper layer

(ii). The two liquids form a liquid junction

8 (a) Name the method by which a mixture of sodium carbonate and sodium hydrogen carbonate can be separated. Give a reason for your answer

(b) Briefly describe how a dry sample of sodium hydrogen carbonate can be obtained from the solution containing both salts

9 (a) The diagram below shows how states of matter can change under different conditions.



Name the change of states of matter represented by each of the letters A to E

(b) Name two substances that can undergo the change of state represented by E

(c) State two conditions that can bring about the change in D.

10 (a) State what would be observed if a mixture of iron filings and sulphur is warmed with

(i). Carbon disulphide

(ii). Dilute sulphuric acid

(b) A mixture of iron filings and sulphur was heated strongly

(i). Name the substance that was formed

(ii). Write equation for the reaction that took place

11 (a) Duralumin is an alloy containing copper and other metals
(i). Name two other metals present in duralumin
(ii). Arrange the metals present in duralumin in their order of reactivity, starting with the most reactive
(iii). State one use of duralumin
(b) Name
(i). One other alloy that contains copper
(ii). Other metals present in the alloy you have named

12 (a) State how the following mixtures can be separated
(a) Carbon and iron
(b) Ink
(c) Oxygen and nitrogen
(d) Iodine and sodium sulphate
(e) Sodium chloride and sodium carbonate

13 (a) Tea was placed in a cup of hot water and allowed to stand. State
(b) Name the process that occurred
(c) State what the process you have named demonstrated

14 (a) A small amount ethanol was added to a large amount of water and the mixture shaken. State what was observed
(b) In the mixture in (a), state which one of the components is the
(i). Solute
(ii). Solvent
(c) Name the method that you would used to separate the mixture formed
(d) In another experiment; simsim oil was shaken with water.
(i). State what observed
(ii). Give a reason for your answer
(iii). Name the piece of apparatus that can be used to separate the mixture

15 (a) Duralumin is an alloy of aluminium, copper and element D
(i). Identify element D
(ii). State one use of duralumin
(b) Name the elements commonly used to make each of the following alloys and in each case, give one use of the alloy.
(i). Solder
(ii). steel
(c) State two reasons why alloys are commonly used instead of pure metals

16 (a) State one method by which each of the following mixtures can be separated
(i). Iron(II) chloride and iron(II) oxide
(ii). Ammonium chloride and potassium chloride
(iii). Sodium carbonate and sodium hydrogencarbonate
(iv). Components of ink
(b) Give a reason why it is possible to separate the mixtures using the method you havenamed

17 (a) Sea water contains mainly dissolved sodium chloride and traces of potassium bromide. State one practical method that can be used to obtain the following from sea water(i). Chlorine
(ii). Sodium chloride
(iii). Water free from ions

(b) State two reasons why water is considered as a compound and not a mixture

18 (a) What is an alloy

(b) Complete the table below by filling in the composition of the following alloys and two uses of each alloy in each case.

Alloy	Composition	Uses
Brass		
Bronze		
Solder		
Steel		

(c) State two reasons why alloying is important.

19 (a) What do you understand by the terms
(i). Sublimation
(ii). Evaporation

(b) State two substances that undergo sublimation

(c) State two practical applications of(i). Sublimation
(ii). Evaporation

20 (a) State the type of change that takes place when the following substances are
(i). Heated
- Sodium chloride
- Ammonium chloride
- Lead(II) carbonate

(ii). Dissolved in water
- Sodium hydroxide
- Sodium oxide
- Carbon dioxide

(b) Copper(II) sulphate crystals were placed at the bottom of the plastic beaker which was half-filled with water and the setup left to stand for some time
(i). State what was observed
(ii). Name the process taking place

(c) A mixture of sodium sulphate and lead(II) sulphate was added to water, shaken well and filtered
(i). State which one of the substances appeared in the
- Filtrate
- Residue

(ii). Give a reason for your answer in b (i)

QUOTES FOR STUDENTS

- **Never let your today's failure judge your tomorrow success**
- **Rome was not built in one day**
- **Learn from yesterday leave for today and hope for tomorrow**

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