WAHSK CHEMISTRY DEPARTMENT

UGANDA CERTIFICATE OF EDUCATION

SEMINAR QUESTIONS 2020

MIXTURES

1. a) Name one process by which the components of the following mixtures can be separated

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

ii) Sodium chloride and sodium chlorate

iii) Oil from sunflower seeds

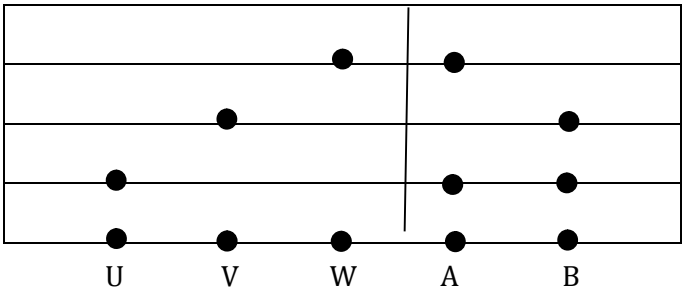
iv) Two amino acids in solution

v) Cream from milk

b) Describe how a solid mixture of sodium chloride, ammonium chloride and lead(II) chloride can be separated into its solid components.

c) State the principle on which each of the following methods of separating mixtures works.

(i) Chromatography
(ii) Fractional Crystallization



d) The diagram above shows the results of a chromatography on two substances **A** and **B**. State the different substances (dyes) in;

(i) A
(ii) B

OXYGEN

2. (a) State the condition(s) under which sodium can react with oxygen to form sodium peroxide.

(b) Write equation for the reaction

i) leading to the formation of sodium peroxide under the condition(s) which you have stated in (a).
ii) between sodium peroxide and water.

(c) State the practical application of the reaction in b(ii)

(d) Describe an experiment to determine the percentage of oxygen in air. Show how the percentage can be calculated from the results.

3. (a) Lumps of solid **X** in a flask were mixed with hydrogen peroxide solution. A colourless gas that relights a glowing splint was observed.

(i) Identify **X**

(ii) Write down the equation for the reaction

(b) Substance **X** in (a) above was isolated into a flask and mixed with concentrated hydrochloric acid and then heated.

(i) State what was observed

(ii) Write down the equation for the reaction between **X** and concentrated hydrochloric acid

4. (a) Name three elements which form neutral oxides

(b) Some oxides react with both acids and alkalis.

i) Write the formulae of three such oxides
ii) What makes them to react with both acids and alkalis?

(c) Iron equipments were protected from rusting as described below.

Galvanized, tin plated, painted, silver plated.

(i) Which method of protection was done by electrolysis?

(ii) Which method would cause rusting

- Not to occur if the coating is scratched
- To occur more intensely if the coating is scratched

(iii) Give a reason for your answer in c) (iii) above.

(d) Describe an experiment to show that rust contains water.

(e) When exposed to moist air iron rusts, whereas aluminium does not. Give a reason why aluminium does not rust.

(f) State three factors that increases the rusting process.

HYDROGEN AND WATER

5. (a) In the laboratory preparation of hydrogen, copper(II) sulphate solution was added to the reaction mixture.

i) Identify the components of the reaction mixture.
ii) State why copper(II) sulphate solution was added to the reaction mixture.

(b) Explain why the following substances are unsuitable in the preparation of hydrogen

(i) Nitric acid

(ii) Ethanoic acid

(iii) Sodium metal

(c) i) Write equation for the combustion of hydrogen.

ii) State **one** way by which purity of the product of the reaction in b(i) can be ascertained.

(d) Dry hydrogen gas was passed over strongly heated copper(II) oxide.

i) State what was observed.

ii) Write equation for the reaction that took place.

6. (a) Steam was passed over heated magnesium ribbon in a test tube.

(i) State what was observed in the test tube.

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

(b) The gaseous product from (a) was dried and passed over heated lead(II) oxide in a combustion tube.

(i) State what was observed

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

7. (a) Compare the reactions of potassium and sodium with water by stating

(i) Two similarities

(ii) One difference

(b) Using ionic equations show how aqueous sodium carbonate removes hardness in water.

ACIDS, BASES AND SALTS

8. a) Write ionic equations for the reaction between

i) Zinc sulphate and sodium carbonate.

ii) Dilute sulphuric acid and barium nitrate solution.

iii) Dilute hydrochloric acid and potassium hydrogen carbonate solution.

iv) Chlorine and iron(II) chloride solution.

b) Ammonium nitrate is a normal salt.

i) What is meant by a normal salt?

ii) Explain why soil on which ammonium nitrate is used as a fertilizer becomes acidic after sometime.

9. (a) Describe how a dry sample of lead(II) sulphate can be prepared in the laboratory using lead(II) nitrate as one of the starting materials.

(b) Calculate the volume in cm^3, of 0.5M solution of lead(II) nitrate that must be used in (b) to produce 3.03g of lead(II) sulphate. [Pb = 207, S = 32, O = 16]

(c) Name two other salts that can be prepared by the same method as described for lead(II) sulphate.

10. When magnesium sulphate solution was added to a solution of a sodium salt, X, no apparent change took place in the cold; but on heating the resultant mixture, a white precipitate appeared.

a) Identify X.

b) Write ionic equation for the reaction that took place; if any, when

i) magnesium sulphate solution was added to cold solution of X.

ii) the resultant mixture in b(i) was heated.

c) State;

i) **One** practical application of the procedures describe in b(i) and (ii).

ii) the industrial application of the reaction in b(ii)

11. (a) (i) Define the term solubility of a salt and give its units.

(ii) State two factors that can determine the solubility of a salt

(b) 15g of potassium nitrate solution saturated at room temperature was carefully evaporated to dryness. 3g of potassium nitrate was left. Calculate the solubility of potassium nitrate.

(c) The solubilities of potassium nitrate at certain temperatures are shown in the table below.

Temperature /^oC	0	11	15	30	40	50	57
Solubility of potassium nitrate per 100g of water.	14.0	21.5	25.0	43.0	63.0	84.0	102.0

(i) Plot a graph of solubilities of potassium nitrate against temperature.

(ii) From the graphs, determine the solubilities of potassium nitrate at 60^oC and 20^oC.

(iii) State two uses of solubility curves.

(d) If a saturated solution of potassium nitrate was cooled from 60^oC to 20 ^oC. Calculate the number of moles of the salt crystal formed. (K = 39, N = 14, O = 16)

(e) Using the kinetic theory, explain why solubility of

(i) Most solids increases with temperature

(ii) Gases decreases with temperature.

14. The solubilities of salt **Y** at 80°C and 50°C are 40g/100g of water and 12g/100g of water respectively. Calculate the mass of **Y** that crystallizes when 70g of a saturated solution of **Y** is cooled from 80°C to 50°C.

ATOMIC STRUCTURE

15. (a) The atomic number of elements W, X and Y are 6, 12, 17 respectively

(i) Write the electronic configurations of W, X and Y.

(ii) Using the outermost shell electrons only, draw a diagram to show how **W** and **Y** form a compound.

(iii) State the type of bond between

- **X** and **Y**
- **W** and **Y**

(iv) Identify the element that exists as a diatomic molecule.

b) i) Draw a diagram to show bonding in phosphine molecule, PH_3. [Atomic number of P = 15, H = 1]

ii) Explain how phosphine molecule forms a dative bond with a hydrogen ion, H^+?

16. a) An ion $\mathbf{Q^{3+}}$ has an electronic configuration of 2:8

i) What is the atomic number of Q

ii) To which group and period of the periodic table does Q belong.

iii) Give the formula of the oxide of Q and state its basic – acidic character.

17. The table below shows some elements in the periodic table. The letters used are not the usual symbols of the elements.

	I	II		III	IV	V	VI	VII	VIII
2	X								
3		R		W				Y	
4	U								

(a) Write the electronic configuration of;

(i) Atoms of X.

(ii) The most stable ion formed by W.

(b) The relative atomic mass of Y is 35. Determine the number of neutrons in the nucleus of Y.

(c) Write an equation of reaction between U and cold water.

(d) (i) Write the formula of the nitrate of R.
(ii) State the type of bond formed between R and Y

18. The diagram below shows part of the periodic table with letters Q, T, R, V, R. H and G in positions of some elements although the letters are not the usual symbols of the elements.

I	II			III	IV	V	VI	VII	VIII
					R	H			
Q	T			V				G	

(a) Identify which one of the elements will react;
(i) to form an ion having two charges.
(ii) most violently with water to displace hydrogen gas.
(b) Write the formula of the compound that would be formed if element G reacted with element:
(i) R
(ii) V
(c) State which one of the two compounds in (b) would be an electrolyte.

CARBON AND ITS COMPOUNDS

19. A colourless gas **Y** burns in air with a blue flame to produce gas **Z** that forms a white precipitate with calcium hydroxide solution.
(a) Name gas;
(i) Y
(ii) Z
(b) Write equation for the;
(i) combustion of gas **Y** in air.
(ii) reaction between **Z** and calcium hydroxide solution.
(c) Calcium hydrogen carbonate can be converted to calcium carbonate according to the equation:

$$Ca(HCO_3)_{2(aq)} \rightarrow CaCO_{3(s)} + H_2O_{(l)} + CO_{2(g)}$$

State;
(i) The condition for the reaction.
(ii) One practical application of the reaction.
(d) Calculate the maximum mass of calcium carbonate that can be obtained from $100cm^3$ of 0.5M calcium hydrogen carbonate solution. [Ca = 40, C = 12, O = 16]

20. (a) State the property of carbon that makes it suitable for use in;
(i) Pencil lids

(ii) Brown sugar

(b) State the property of carbon dioxide that makes it suitable for use in

(i) Fire extinguishers

(ii) Refrigeration

(iii) Soda/Fizzy drinks

(c) Using equations, briefly describe what happens when;

(i) burning magnesium is lowered into a gas jar of carbon dioxide.

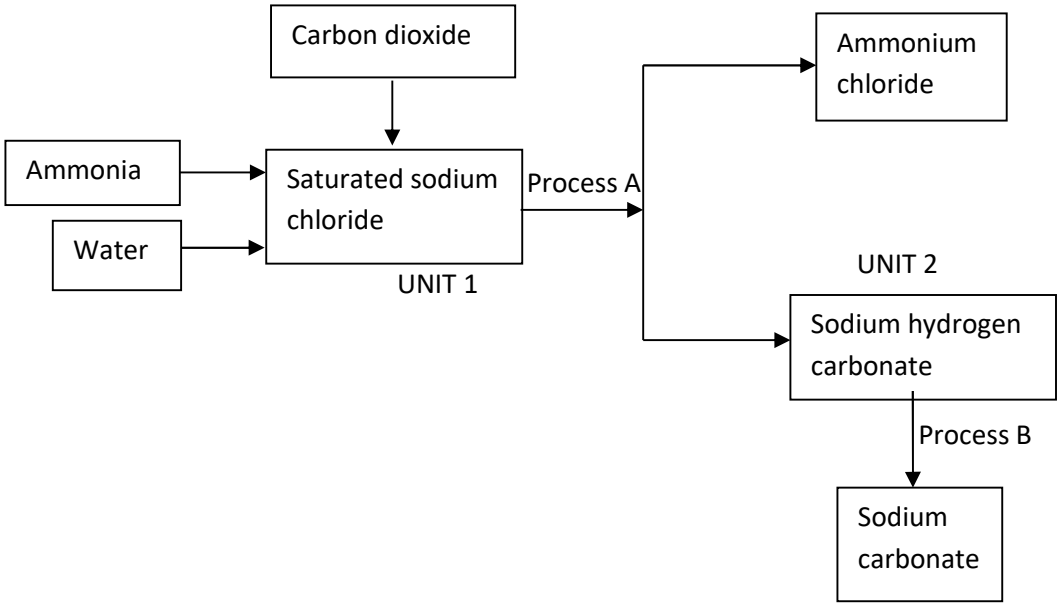
(ii) excess carbon dioxide is passed into a solution of calcium hydroxide and then heated.

21. (a) Carbon dioxide is used in the industrial manufacture of sodium carbonate by the **solvary** process.

(i) Name the raw material that supplies carbon dioxide in the solvary process.

(ii) Write the equation for the reaction leading to the formation of carbon dioxide from the raw material named in a) (i) above.

(b) The schematic diagram below shows part of the Solvary process.



(i) Write the equation for the reaction that occurs in UNIT 1.

(ii) State how each of the processes A and B are carried out.

(iii) Name the recycled substances in the above process.

(c) Mention two uses of sodium carbonate.

(d) Sodium carbonate is also obtained from thermal decomposition of trona Na_2CO_3. $NaHCO_3.2H_2O$. Write a balanced equation for this decomposition.

MOLE CONCEPT

22. A hydrated salt Q, consists of 20.2% iron, 11.5% sulphur, 23% oxygen and 45.3% water of crystallization.

a) Calculate the empirical formula of Q. (Fe=56, S=32, O=16, H=1)

b) Deduce the molecular formula of Q. (relative formula mass of Q = 278)

c) Write equation for the reaction between a solution of Q and chlorine

25. a) Hydrated sodium sulphide $Na_2S.nH_2O$ contains 67.7% by mass of water. Determine its formula. (Na = 23, S = 32, O = 16, H =1)

b) A certain solid oxide **MO_3** contains 60% of oxygen. Calculate the atomic mass of M. [O=16]

26. On heating 12.5g of hydrated copper(II) sulphate, $CuSO_4.nH_2O$, 8.0g of anhydrous copper(II) sulphate remained. Determine the formula of the hydrated salt. [Cu = 64, O = 16, S = 16, H = 1]

27. $20cm^3$ of 0.15M sodium hydroxide solution was neutralized by $20cm^3$ of a solution containing 7.35g per litre of an acid having formula H_2X.

(a) Write equation for the reaction.

(b) Calculate;

(i) the molarity of the acid solution.

(ii) the molecular mass of the acid

28. $50.0cm^3$ of a 4M sulphuric acid was measured out into a volumetric flask. Distilled water was then added to the acid until the total volume of the dilute solution was $250cm^3$. Calculate;

a) the concentration of the dilute sulphuric acid solution in $moldm^{-3}$

b) Determine the number of moles of hydrogen ions that are contained in $1dm^3$ of the diluted sulphuric acid.

29. Sulphur dioxide can be prepared by burning iron pyrites, FeS_2, in air according to the following equation.

$$4FeS_{2(s)} + 11O_{2(g)} \longrightarrow 2Fe_2O_{3(s)} + 8SO_{2(g)}$$

Calculate the volume of sulphur dioxide evolved at room temperature when 9.60g of iron pyrites is reacted with excess oxygen.

(Fe = 56, S = 32; 1 mole of a gas occupies 24 dm³ at room temperature)

30. When excess hydrogen was passed over 1.660g of a strongly heated oxide of a metal **Z**, 1.18g of solid residue remained.

a) Calculate the formula of the oxide of Z. (O=16, Z=59).

b) Write the equation for the reaction of reduction if Z by hydrogen.

31. 40 cm^3 of dry hydrogen chloride gas was passed over heated Iron filings at s.t.p.

a) State what was observed.

b) Write the equation for the reaction that took place.

c) Calculate the mass of the solid product formed.

(Fe = 56, Cl = 35.5, I mole of gas at s.t.p occupies 22.4dm^3).

32. 4g of an alloy of copper and zinc when reacted with excess hydrochloric acid gave 840 cm^3 of hydrogen gas measured at s.t.p [Zn=65]

(a) Name the alloy

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

(c) Calculate the mass of copper in the alloy.

(d) State one use of the alloy in (a) above.

ELECTROLYSIS.

33. Copper(II) sulphate solution was electrolyzed between graphite electrodes

(a) State what was observed at the;

i) Anode

ii) cathode

(b) Write an equation for the reaction that took place at the anode,

(c) State the effect of the above electrolysis on;

(i) colour of the solution

(ii) pH of the electrolyte.

(d) Dilute copper (II) sulphate solution was electrolyzed using copper electrodes. Explain the changes on the size of the electrodes.

34. a) What is the significance of electroplating?

b) State three conditions necessary for electroplating.

c) Draw a diagram to show how an iron spoon can be electroplated with silver metal
d) Write an equation that leads to electroplating of the iron spoon.
e) Apart from silver, state three other metals that are commonly used for electroplating.

35. a) What is electrolysis?

b) (i) Draw a labelled diagram of an experimental set up used to electrolyze lead(II) bromide.

(ii) Explain why heating is necessary during this electrolytic process.

(iii) State what is observed at each electrode.

(iv) Write an equation to show electrode reaction that represents a

- ❖ reduction reaction
- ❖ oxidation reaction

(v)Why should the experiment be performed in a fume cupboard?

36. The cell convention for an electrochemical cell is shown below;

$Zn_{(s)} / Zn^{2+}{}_{(aq)} II Pb^{2+}{}_{(aq)} / Pb_{(s)}$

(a) Name two substances that could be used as electrolytes.

(b) State which one of the electrodes is the cathode.

(c) Write the equation for the reaction at

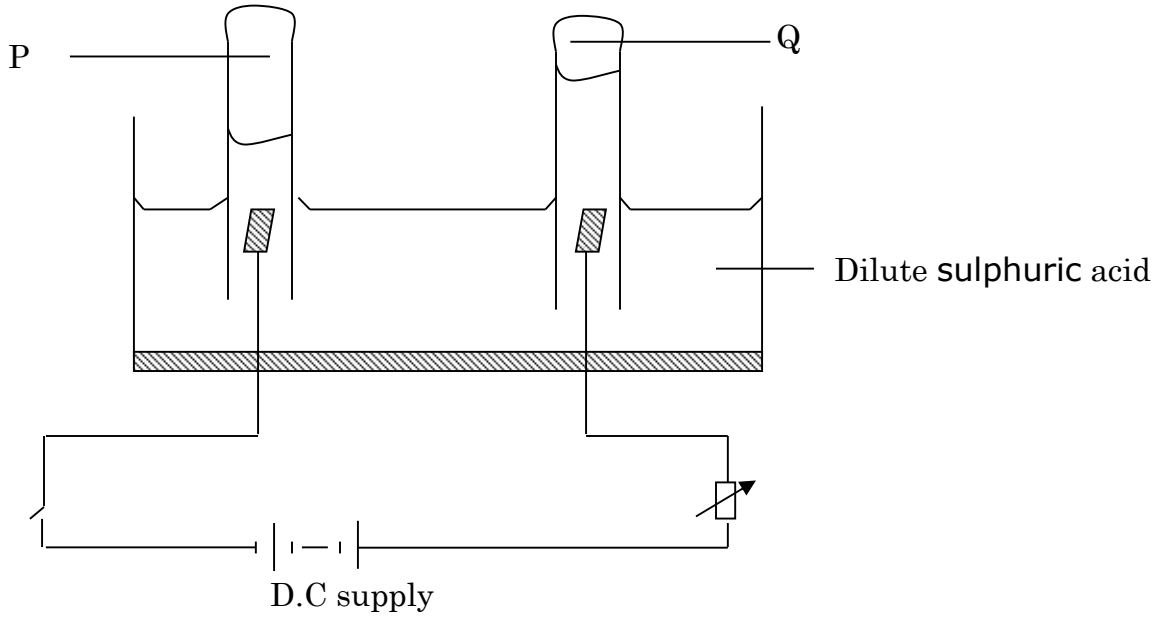
(i) Cathode

(ii) Anode

(d) Write the equation for the overall cell reaction

(e) Explain why sodium sulphate is not appropriate for use in the salt bridge in the above electrochemical cell.

37. a) The diagram in the figure below shows an electrolytic cell in which electrolysis of dilute sulphuric acid occurs.



i) Name the gas P and Q that are evolved during electrolysis

ii) Write equation for the reaction occurring at the
- anode.
- cathode

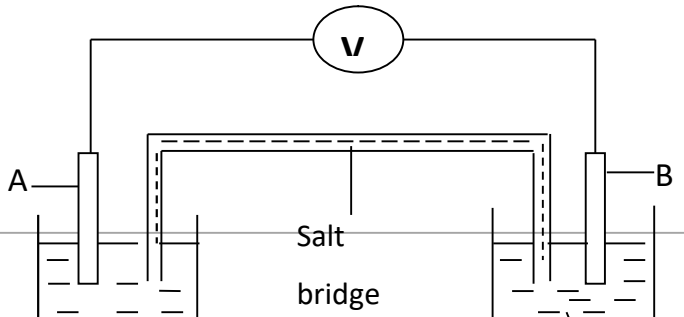
iii) Write the overall cell reaction

b) Write balanced equations for the conversion of each of the following.

Indicate clearly where oxidation and reduction takes place.

i) Aluminium ion to aluminium atom
ii) Hydrogen gas to hydrogen ions
iii) Chlorine gas to chloride ions
iv) Iron(II) ions to iron(III) ions
v) Oxygen ions to oxygen gas

38. The diagram below shows an electrochemical cell that was made to compare the reactivities of iron and copper.



a) Name the metal strip
(i) A
(ii) B
b) Identify the possible chemical solutions
(i) X
(ii)Y
c) State the function of the salt bridge.
d) Write the overall cell reaction equation

SULPHUR AND ITS COMPOUNDS

39. a) State what would be observed if a mixture of Iron and Sulphur was shaken with;
i) Warm Carbon disulphide
ii) Warm dilute Sulphuric acid

b) A portion of the Sulphur-iron mixture in (a) was strongly heated, cooled and the cool residue shaken with warm dilute sulphuric acid.
i) State what was observed
ii) Write equation for the reaction that took place in b (i).

c) State what would be observed and write ionic equation for the reaction that would take place, if dilute sulphuric acid was added to barium chloride solution.

40. (a) Powdered sulphur was put in methylbenzene and the mixture stirred and filtered. The filtrate was evaporated slowly and crystals formed.
(i) Name the allotrope of sulphur formed.
(ii) What was the shape of the crystals.
(iii) Describe how the other crystalline allotrope of sulphur is prepared.
b) What is the function of the following in the Frasch process?
(i) Superheated water
(ii) Hot compressed air

41. a) State the conditions under which Sulphur dioxide can be produced from

i) Sulphur
ii) Sulphuric acid
iii) Sodium sulphite

b) Write equations for the reaction leading to the formation of Sulphur dioxide in each case.

c) State the application of the reaction in (a) (i) and that in (a) (iii).

d) State what would be observed and in each case, give a reason for your observation if

i) Sulphur dioxide was bubbled through an acidified potassium dichromate(VI) solution.

ii) A blue coloured flower was dropped into a wet gas jar containing Sulphur dioxide.

42. (a) Write an equation for the reaction for the formation of hydrogen sulphide gas from iron(II) sulphide.

(b) State what is observed when hydrogen sulphide gas is bubbled through each of the following solutions.

(i) Iron(III) chloride solution

(ii) Lead(II) ethanoate solution

(iii) Concentrated nitric acid solution

(c) Explain the observation made in (b) (i)

(d) Write an ionic equation for the reaction in b(ii) above

CHLORINE AND ITS COMPOUNDS

43. (a) Chlorine gas was bubbled through aqueous solutions of

(i) dilute sodium hydroxide

(ii) Potassium iodide

State what was observed in each case and write the equation for the reaction.

(b) Explain using equations why the resulting solution in b(i) has a bleaching action.

(c) Write an equation to show that chlorine reacts differently with hot concentrated sodium hydroxide.

(d) A test tube filled with chlorine water was inverted into a beaker containing water and left exposed to sunlight for some time.

(i) State what was observed

(ii) Using equation(s), explain your observation(s) in d(i) above

e) Blue litmus paper was placed into chlorine water. State what was observed

44. (a) A pure dry sample of hydrogen chloride was prepared in the laboratory by adding concentrated sulphuric acid onto a crystalline solid, **Q**, in a flask and then warming the mixture. The gas evolved was passed through a liquid, **Z**, before it was collected;

i) Identify Q

ii) Name **one** suitable piece of apparatus by means of which concentrated sulphuric acid was added onto Q.

iii) Name **Z**, and state its role.

iv) Give a reason why **Z** was preferred for its role, which you have stated in (iii)

v) State the method by which hydrogen chloride was collected; and give a reason.

vi) Write equation for the reaction, which led to the formation of hydrogen chloride.

b) State;

i) What an aqueous hydrogen chloride is called.

ii) A suitable procedure for preparing a sample of aqueous hydrogen chloride in the laboratory.

c) Two equal masses of magnesium powder were added separately to solutions of hydrogen chloride in water and methylbenzene, respectively. State what was observed in each case; and give a reason for each observation that you have stated.

d) Dry hydrogen chloride was bubbled into silver nitrate solution that was acidified with nitric acid. Write ionic equation for the reaction that took place.

45. (a) A mixture of manganese(IV) oxide and a concentrated hydrogen chloride solution was heated.

i) Write equation for the reaction that took place.

ii) State the practical application of the reaction in e(i).

b) i) Write equation for the reaction that can take place between iron and chlorine.

ii) Give a reason why the reaction in (d) (i) is regarded as oxidation.

c) Both chlorine and sulphur(IV) oxide gases in presence of water have bleaching properties. Explain using equations how each gas bleaches and state one difference between their bleaching actions.

NITROGEN AND ITS COMPOUNDS

46. (a) How does the structure of nitrogen molecules contribute to its great abundance in air?

(b) Write the formulae of the oxides of nitrogen.

(c) State the chemical nature of each of the oxides of nitrogen

(d) Name one oxide of nitrogen which forms two acids when reacted with water.

(e) Write the equation for the reaction that takes place in (c) above.

(f) Name the oxide of nitrogen which;

(i) re-lights a glowing splint

(ii) forms a pale yellow liquid on cooling.

47. a) Red hot platinum was suspended in a flask containing ammonia and oxygen gas allowed to pass through the flask.

(i) State what was observed

(ii) Write equations of reaction in (a) above.

(iii) State the role of red hot platinum wire in this experiment.

b) During a laboratory preparation of ammonia, ammonium chloride was treated with a Powderly solid R. Write;

i) the name of R.

ii) equation for the reaction that led to the formation of ammonia, and state the condition(s) for the reaction.

c) Concentrated sulphuric acid, fused calcium chloride and calcium oxide are compounds commonly used as drying agents in the laboratory.

i) State which one of the compounds is used as a drying agent for ammonia.

ii) Explain why the other two compounds are **not** suitable for drying ammonia.

d) Write an ionic equation to show the reaction that would take place if;

i) A few bubbles of ammonia were passed into copper(II) sulphate solution.

ii) A lot more bubbles of ammonia were passed into the resultant mixture in (d).

e) State what was observed in (d) above.

f) State one application of precipitation reactions of aqueous ammonia.

48. a) Describe the effect of heat on the nitrates of copper and silver, illustrating your answers with equations.

b) Potassium nitrate can be used in the preparation of nitric acid.

(i) State the conditions and write equation for the reaction that leads to the formation of nitric acid.

(ii) Explain why nitric acid prepared by this method is yellow in colour.

(iii) Draw a labeled diagram of the set up of apparatus used in the laboratory preparation of nitric acid.

(iv) During laboratory preparation of nitric acid, all the apparatus used are made of glass. Give a reason for this precaution.

c) Write equation for the reaction of nitric acid with sulphur.

d) Explain why concentrated nitric acid is not used in removing oxides from metal surfaces (pickling).

ORGANIC CHEMISTRY

49. (a) What is a polymer?

(b) Under suitable conditions ethene molecules $H_2C = CH_2$, react forming a polymer.

i) Write the equation for the formation of the polymer.

ii) Give one use of the polymer in b (i) above

iii) Differentiate between thermosoftening and thermosetting plastics.

iv) State one disadvantage of using plastics

(c) State one disadvantage of burning plastics as a method of disposal

(d) State one use of the following;

i) PVC

ii) Polystyrene

50. Ethanol obtained from glucose can be converted to ethene as shown below.

$$C_6H_{12}O_6 \xrightarrow{\text{STEP I}} C_2H_5OH \xrightarrow{\text{STEP II}} C_2H_4$$

a) Name the process that takes place in

(i) Step I.

(ii) Step II

b) State
(i) One other product formed together with ethanol in step I
(ii) the enzyme used in step I
(iii) the conditions for the conversion in step II

c) A liquid, L was produced when bromine solution in tetrachloromethane was added to ethene.
(i) Name L.
(ii) State the appearance of L.

d) Ethene can be converted to a polymer **J** of relative molecular mass 16,800.
(i) Write the structural formula of **J**.
(ii) Calculate the number of moles of ethene that make up **J**.

51. (a) Describe briefly how local people in Uganda obtain crude ethanol from
(i) Millet
(ii) Bananas

(b) Explain how the purity of the crude ethanol obtained above is increased

RATES OF REACTION

52. a) What is meant by rate of a chemical reaction?

b) State how the following factors affect the rate of a chemical reaction:
(i) Temperature
(ii) Concentration

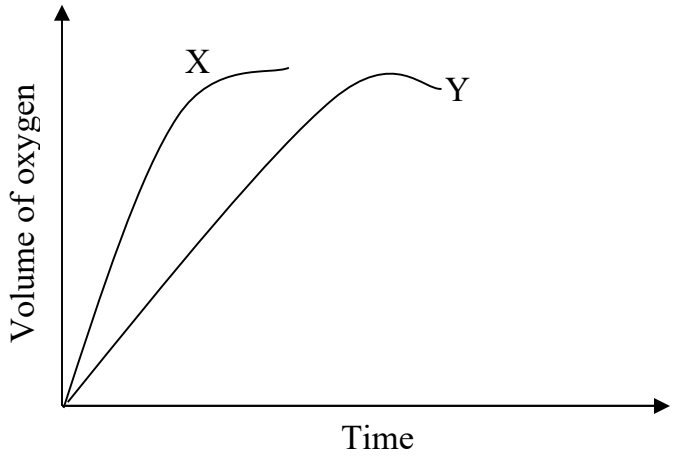
c) The table below shows the time taken for the reaction of a certain substance **W** to go to completion when different concentrations of **W** were used.

Concentration of **W** mol dm^{-3}	0.1	0.3	0.4	0.6	0.8
Time, t, for completion of reaction	120	40	30	20	10
Reciprocal of time $\frac{1}{t}$ (s^{-1})					

(i) Complete the table by filling in the values of $\frac{1}{t}$ for each time.
(ii) Plot a graph of $\frac{1}{t}$ against concentration of **W**.
(iii) Deduce from the graph how the rate of reaction varies with concentration of W.

d) From the graph, determine the time taken for completion of reaction when the concentration of **W** is increased to 0.9 mol dm^{-3}.

e) The figure below shows graphs of volume of oxygen evolved against time when $50cm^3$ of 2M hydrogen peroxide was decomposed in the presence and in the absence of manganese (IV) oxide at 30°C.



i) State which curve represents the graph of volume of oxygen evolved in the;
- ❖ absence of manganese(IV) oxide.
- ❖ presence of manganese(IV) oxide

ii) Sketch on the same axes in (e) a graph that would be obtained if $50cm^3$ of 2M hydrogen peroxide was decomposed in the absence of manganese (IV) oxide at 20°C.

THERMO CHEMISTRY

53. 2.0g of ammonium nitrate was dissolved in $100cm^3$ of water and the temperature of the water dropped from 25.0 ^{0}C to 21.0 ^{0}C.

a) Give a reason why there was a drop in the temperature of the water.

b) Calculate the molar enthalpy of solution of ammonium nitrate.

➢ ***(H = 1, N = 14, O = 16, density of water is $1gcm^{-3}$ and the specific heat capacity of water = 4.2 Jg^{-1} $^oC^{-1}$)***

54. When $40cm^3$ of 2M nitric acid was mixed with $40cm^3$ of 2M sodium hydroxide solution at an initial temperature of 25.8°C, the temperature of the solution rose to T°C. Calculate the value of T

Note: = specific Heat capacity of water is 4.2$Jg^{-1}C^{-1}$

= density of solution is 1gcm^{-3}

= Enthalpy of neutralization of nitric acid by sodium hydroxide is $56.5KJmol^{-1}$

55. (a) (i) Define the term enthalpy of combustion.

(ii) When $448cm^3$ of ethane measured at standard temperature and pressure is completely burnt in oxygen the heat produced raises the temperature of 100g of water by 12^oC. (Specific heat capacity of water = $4.2Jg^{-1}\ ^oC$, 1 mole of a gas occupies 22.4l at s.t.p) Calculate the heat of combustion of ethane.

(b) The enthalpy of combustion of carbon is $-390KJmol^{-1}$.

(i) Write the equation for the complete combustion of carbon.

(ii) 40g of charcoal cost 2,000/=. Calculate the cost of charcoal required to produce 16250KJ of heat. (C = 12)

(c) State three factors considered when choosing a source of fuel

56. (a) When 0.91g of zinc was added to 50.0 cm^3 of solution containing 0.25 moles of copper(II) sulphate per dm^3, the temperature of the solution rose up by $12.9\ ^oC$

(a) Determine the number of moles of zinc which did not react.

(b) Calculate the enthalpy of the reaction in KJ mol^{-1} ***[Heat capacity of solution = 4.2 J/g/°C ; Density of the solution = 1.0 gcm^{-1} Zn = 65]***

57. 14g of solid potassium hydroxide were reacted with 400 cm^3 of 0.5M hydrochloric acid. The temperature of the solution rose by 6.8^oC.

a) Determine the reagent that was in excess.

b) Calculate the enthalpy change for the reaction.

[K = 39, O = 16, H = 1, S.H.C of solution =4.2J/g/°C]

APPLIED CHEMISTRY

58. (a) Name **two** substances that can be used to prepare soap

(b) Describe briefly how soap is obtained from the substances named (a) above.

(c) Briefly describe how soap cleans dirt from fabrics.

(d) Detergents are commonly used in laundry instead of soap. State one

i) Advantage of using detergents

ii) Disadvantage of using detergents

59. (a) Explain the term cracking.

(b) State two reasons why cracking is important

(c) Distinguish between thermal cracking and catalytic cracking.

(d) What is a fibre?

(e) Give two examples of each of the following
   i) Natural fibres
   ii) Synthetic fibres

60. (a) What is meant by water pollution?

(b) Name any four substances that cause water pollution and explain how the substances pollute the water.

(c) Describe the process of treatment of polluted water.

(d) Suggest any two ways of controlling water pollution.

QUALITATIVE ANALYSIS

61. (a) Name one reagent that can be used to distinguish between each of the following pairs of ions. In each case state what would be observed if the reagent is separately reacted with each member of a pair.

(i) Cl^- and I^- ions
(ii) Al^{3+} and Zn^{2+} ions
(iii) Pb^{2+} and Mg^{2+} ions
(iv) SO_3^{2-} and SO_4^{2-} ions
(v) Ca^{2+} and Mg^{2+} ions
(vi) CO_3^{2-} and HCO_3^- ions

(b) State what is observed when the silver chloride precipitate is added to;
   (i) Excess ammonia solution
   (ii) Dilute nitric acid

62. (a) Name a reagent that can be used to confirm the presence of the following ions in solution. In each case, state what would be observed when the reagent is used.

(i) NH_4^+
(ii) I^-
(iii) Cl^-
(iv) SO_4^{2-}

(b) Write an ionic equation for the reaction between zinc hydroxide precipitate and excess
   (i) Sodium hydroxide solution
   (ii) Ammonia solution.

63. (a) Dilute ammonia solution was added drop-wise until in excess to a solution containing aluminium ions. Write an ionic equation for the reaction that took place.

(b) To the mixture in (a) was added excess dilute sodium hydroxide solution and the resultant solution shaken well.
   (i) State what was observed
   (ii) Write the formula of the ionic species in the resultant mixture.

(iii) Name one metal ion that would behave in a similar way as aluminum ion

END…!!!!!