NAME----------CLASS ----------

ADM NO ----------

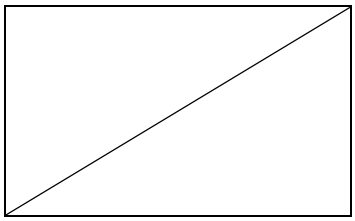
SIGNATURE ----------

DATE ----------

233/1
FORM 4
CHEMISTRY
PAPER 1
TIME: 2 HOURS
INSTRUCTIONS

- Answer all the questions in the spaces provided
- Mathematical tables and silent electronic calculators may be used
- All working must b e clearly shown where necessary

For examiners use only



1. The figure below shows the cooling curve for water is gaseous state.

i) Using the same axis draw a curve obtained if the water used in the experiment was impure.

(1mk)

ii) Name the process taking place between

S and T (1mk)

U and V (1mk)

2. On addition of a few drops of aqeous sodium hydroxide to solution M a white precipitate forms which dissolves on a addition of excess sodium hydroxide. A white precipitate forms when solution M is reacted with sodium chloride solution. Suggest the identity of the cation present and explain. (2mks)

3. 1g of sodium hydroxide is added to $30cm^3$ of 1M HCl. How many cm^3 of 0.1M KOH solution will be needed to neutralize the excess acid. (3mks)

4. Describe how you can prepare crystals of magnesium chloride starting with $50cm^3$ of 2M magnesium hydroxide. (3mks)

5.Use the following information to answer the questions that follow

$\Delta H_{lattice}$ $Mgcl_2$ = -2489 KJ/ mol $^{-1}$

$\Delta H_{hydration}$ Mg^{2+} = - 1891 kJ/ mol

$\Delta H_{hydration}\ Cl^{-} = -384\ kJ/mol$

a) Calculate the heat of solution of magnesium chloride. (2mks)

b)Draw an energy level diagram for the dissolving of magnesium chloride. (2mks)

6.The reaction between hydrochloric acid and potassium dichromate can be used to demonstrate a reversible reaction. The ionic equation is given below

$2CrO_4^{2-}{}_{(aq)} + 2H^{+}{}_{(aq)} \quad Cr_2O_7^{2-}{}_{(aq)} + H_20\ (l)$

Yellow orange

Explain the observation that would be made when dilute hydrochloride acid is added to the equilibrium mixture. (2mks)

7.The table below gives the rate of decay for a sample of a radioactive element P

Mass of P (g)	number of days
48	0
18	90
6	180

a)Determine its half-life (2mks)

b)Complete the following nuclear equation. (1mk)

$$^{233}_{91}Pa + {}^{0}_{-1}e \longrightarrow$$

8. Study the following flow chart. Use it to answer the question that follow

a)Identify (3mks)

i) Solid A

ii)Solid B

iii)Gas E

b)Name the reagents used in step (2mks)

i) I

ii) II

9.i)Name two salts responsible for permanent hardness of water. (2mks)

ii)Explain the precipitation method used to remove water hardness. (1mk)

10. When steam was passed over heated charcoal as shown in the diagram, below, hydrogen and carbon (II) oxide gases were formed.

a)Write the equation for the reaction which takes place. (1mk)

b)Name two uses of carbon (II) oxide gas which are also uses of hydrogen gas. (2mks)

11.a) State and explain the observations made when a few drops of concentrated Sulphuric (vi) acid is added to sucrose (C_{12}, O_{22},O_{11}) (2mks)

b)Using an equation show how the above reaction takes place. (1mk)

12.Students from Sunshine Secondary School suspected that some water contained either sulphate or sulphite cons. Explain how the ion present can be determined. (3mks)

13.A mixture of ethane, oxygen and nitrogen are ignited. On cooling the residual gas occupied 58 cm^3 when shaken with aqeous alkali, the volume was reduced to32 cm^3. A further 18 cm^3 of the product was absorbed by alkaline pyrogallo. Calculate the composition of the original mixture. (C = 12, H = 1, N = 14, O = 16 and molar volume at r.t.p = 24dm3. (4mks)

14.0.24g of a divalent metal x dissolves in 50 cm^3 of 0.25 M sulphuric acid. The resulting solution required 5.0 cm^3 of 1.0 M sodium hydroxide solution to neutralize the excess acid. What is the reactive atomic mass of x.

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

a)Identify liquid x (1mk)

b)Write an equation for the reaction that occurs in the flask. (1mk)

c)Describe the confirmatory test for oxygen gas. (1mk)

16.When zinc metal is reacted with a solution of hydrogen chloride gas in water there is effervescence. When the experiment is repeated with a solution of hydrogen chloride gas in methylbenzene there is no observable change. Explain this observations. (3mks)

17. Compare the rate of diffusion of carbon dioxide (CO_2) & ozone (O_3) at the same temperature. (C = 12, O = 16) (3mks)

18. Starting with Lead metal describe how to prepare a solid sample of Lead (II) Sulphate salt. (3mks)

19.Given the following reaction

$HCN_{(aq)} + NaOH_{(aq)} \longrightarrow NaCN_{(aq)} + H_2O_{(l)}$

T_1 = initial temperature of solutions before additions = 18.0°C

T_2 = final temperature of solution at neutralization = 19.2°C

50 cm^3 1M HCN

50 cm^3 1M NaOH

Calculate Molar enthalpy of neutralization of hydrogen cyanide (3mks)

20.Compound K reacts with sodium hydroxide as shown

a)What type of reaction is represented by the equation. (1mk)

b)To what class of organic compounds does K belong. (1mk)

c)How is M separated from aqueous mixture of L and M. (1mk)

21.Draw a diagram to show how an aluminium spoon can be electroplated with pure copper.

(2mks)

22.An ion of element Z can be represented as shown below,

Use the information to answer the questions that follow

a)Identify the period in which the element belong. (½mk)

b)Write the electron configuration of the ion of Z (½mk)

c)What would be the nature of the solution of the chloride of Z if dissolved in water. (1mk)

23. What is P^H scale (1mk)

ii) State whether the values of the following solution are strong or weak acids and bases.

P^H = 8 (½mk)

P^H = 5 (½ mk)

P^H = 2 (½ mk)

P^H = 13 (½mk)

24.Draw the structure of;

a) i) Hydroxonium ion H_3O^+ (1mk)

ii) Aluminium oxide (Al = 13, 0 = 8) (1mk)

b) Aluminium chloride has a melting point of 120^{o}C while Aluminium oxide has a melting point of 2977^{o}C. In terms of structure and bonding explain how the differences come about. (2mks)

25.State the use of the following laboratory apparatus

i)

ii)

26.The diagram below shows heating of Lead nitrate

i)State the observations made in the above experiment (2mks)

ii) Write an equation for the reaction that takes place. (1mk)

27.Give two differences between nuclear reactions and chemical reactions. (2mks)

28. 3.1 g of an organic compound containing carbon, hydrogen and oxygen only produced 4.4 g of carbon oxide and 2.0 g of water on complete combustion:

a)Calculate its empirical formulae (2mks)

b)Calculate its molecular formulae if its formulae mass is 62. (2mks)

29. Two cleansing agents are represented below

i) $R - COO^-Na$ and ii) $R - OSO_3^-Na^+$

a) Name the detergents (2mks)

i)

ii)

b) Select one of the detergents that would be suitable for washing in water containing magnesium chloride. Explain. (2mks)

30.Use the data below to calculate the enthalpy change for the reaction below

$CH_{4(g)} + 2O_{2(g)} \longrightarrow CO_{2(g)} + 2H_20_{(l)}$ (3mks)

Bond	**Energy (KJ)**
C – H	314
O = O	296
C = O	149
H – O	283