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

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

SIGNATURE ----------

DATE ----------

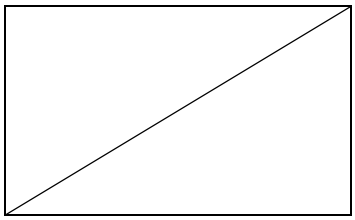
233/1
FORM 4
CHEMISTRY
PAPER 1
PRE MOCK 1 2015
TIME: 2 HOURS

PRE MOCK 1
MARCH 2015

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

$2Cro_4^{2-}{}_{(aq)}$ + $2H^+{}_{(aq)}$ $Cr_2O_7{}^{2-}{}_{(aq)}$ + 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^oC

T_2 = final temperature of solution at neutralization = 19.2^oC

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

233/2
CHEMISTRY PAPER 2
(Theory)
PRE-MOCK 1 - MARCH 2015
TIME: 2 HRS

NAME: ……INDEX:…….

CLASS:…….. DATE:……SIGN:……

INSTRUCTIONS
- ✓ Write your name and index number in the spaces provided.
- ✓ Answer all questions in the spaces provided.
- ✓ Mathematical tables and calculators may be used.
- ✓ All working must be clearly shown.

EXAMINERS USE

QUESTION	MAX SCORE	CANDIDATES SCORE
1	14	
2	15	
3	16	
4	11	
5	05	
6	11	
7	08	
Total	80	

1. (a) Calculate the oxidation number of chromium Cr $(H_2O)_6^{3+}$ (2 mks)

……

……

……

……

……

(b) The table below shows the standard reduction potentials for four half-cell. Study it and answer the questions that follow:

Half reaction	**E^0 (volts)**
$Au^{3+} + 3e \longrightarrow Au_{(s)}$	+1.50
$Cu^{+} + e^{-} \longrightarrow Cu_{(s)}$	-0.52
$Pb^{2+} + 2e^{-} \longrightarrow Pb_{(s)}$	-0.13
$Fe^{2+} + 2e^{-} \longrightarrow Fe_{(s)}$	-0.44
$Cr^{3+} + Cr_{(s)} \longrightarrow Cr_{(s)}$	-0.74
$Al^{3+} + 3e^{-} \longrightarrow Al_{(s)}$	-1.66
$Mg^{2+}\ 2e^{-} \longrightarrow Mg_{(s)}$	-2.37
$Rb^{+} + e^{-} \longrightarrow Rb_{(s)}$	-2.98

(i) Identify the strongest reducing agent. (1 mk)

……

(ii) Write the equation for the redox reaction which takes place between (Cu / Cu^{+}) and (Al/Al^{3+}). (1 mk)

(iii) Draw the cell obtained in (ii) above. (3 mks)

(iv) Calculate the emf for the cell above. (2 mks)

(c) A current of 2.75 A is measured during recharging with an external potential of 2.0 V using $Cd^{2+}_{(aq)}$ solution. After 5 minutes charging, how many moles of Cadnium will be redeposited. Hence calculate the mass redeposited. (Cd = 112, F = 96500C). (3 mks)

……

……

……

……

……

……

……

……

……

(d) State two uses of electrolysis (2 mks)

……

……

……

……

2. Petrol (octane) a long hydrocarbon alkane can be converted to ethane and hydrogen gas mixtures as follows.

$$C_8H_{18\,(l)} \longrightarrow 4\,C_2H_{4\,(g)} + H_{2\,(g)}$$

(a) What do we call the process by which the products are obtained from octane? (1 mk)

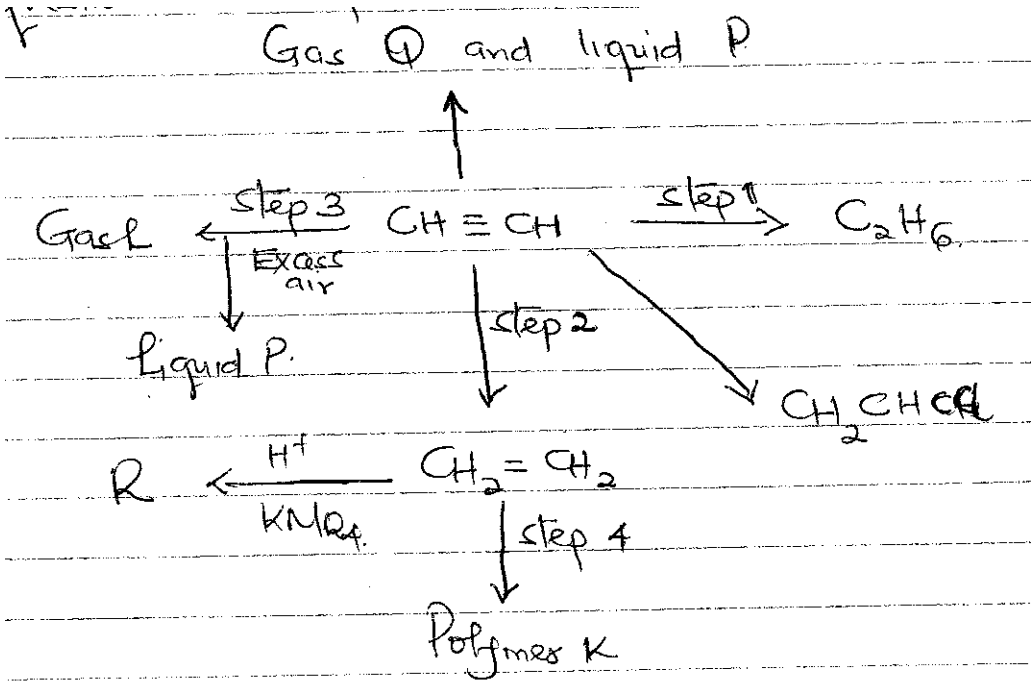
……

(b) Unleaded fuel is now widely used and has to be used in modern cars fitted with catalytic converters. State the merits of unleaded petrol. (1 mk)

……

……

(c) Study the scheme given below and answer the questions that follows:



(i) Name the reagents used in: (4 mks)

Step 1……

Step 2……

Step 3……

Step 4……

(ii) Identify substance. (3 mks)

L……

P……

Q……

N……

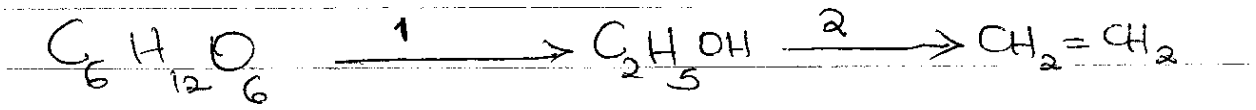
K……

R……

(iii) Draw the structural formula of:
R (1 mk)

K (1 mk)

(d) Ethanol from glucose can be converted to ethane as shown below:



(i) Name the process that takes place in 1. (1 mk)

……..

(ii) Name the reagent used in step 2. (1 mk)

……

(e) Compound A and B have the same molecular formulae $C_3H_6O_2$. Compound A liberates carbon iv oxide on addition of sodium carbonate while compound B doesn't. Compound B has a sweet smell. Draw the possible structures of: (2 mks)
(i) A

(ii) B

3. (i) (a) Write the chemical name for rust. (1 mk)

(b) State any two ways of preventing rusting. (2 mks)

……

……

(c) Give a reason why vehicles based in Mombasa rust faster than those based in Limuru. (1 mk)

……

……

(d) Oxygen to obtained by fractional distillation of liquid air. Name two other gases which are obtained during the distillation. (1 mk)

……

……

(ii) In an experiment to determine the solubility of sodium chloride, $5cm^3$ of a saturated solution of sodium chloride of mass 5.35g were placed in a volumetric flask and diluted to a total of 250 cm^3. 25 cm^3 of the dilute solution reacted completely with $24cm^3$ of 0.1 $moldm^3$ silver nitrate solution. Calculate:

(a) Moles of silver nitrate in $24cm^3$ of solution. (1 mk)

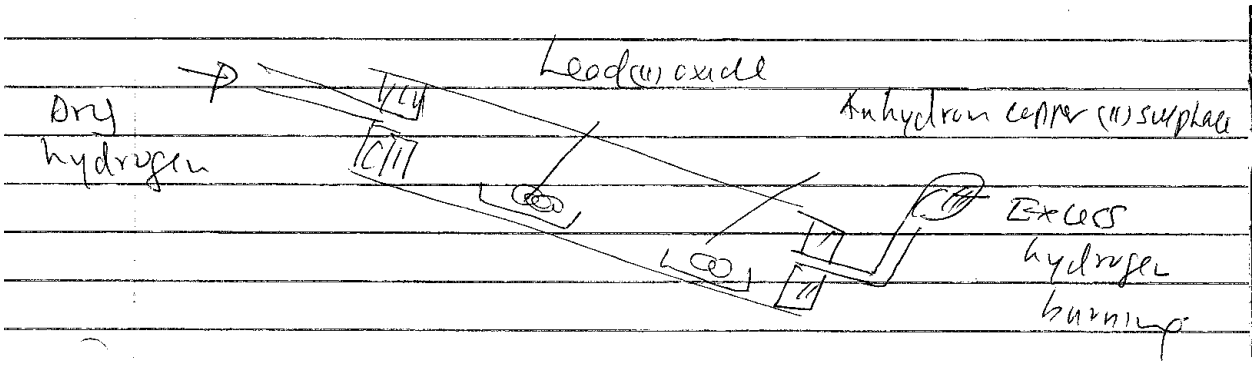
(b) Moles of sodium chloride to $25cm^3$ of solution. (1 mk)

(c) Moles of sodium chloride in 250 cm^3 of solution. (1 mk)

(d) Mass of sodium chloride in 5 cm^3 of the original saturated sodium chloride solution (1 mk)

(e) Solubility of sodium chloride. (1 mk)

(iii) The apparatus below was used to investigate the effect of dry hydrogen gas on hot lead (II) oxide.



(a) What is observed in the combustion tube at the end of the experiment? (2 mks)

……

……

……

……

(b) Write an equation for the reaction between hydrogen gas and lead (II) oxide. (1 mk)

(c) Why should the tube be slanting? (1 mk)

……

……

(d) State any 2 precautions to be observed when doing this experiment. (2 mks)

……

……

……

……

4. The table below shows volumes of nitrogen (IV) oxide gas produced when different volumes of 1M nitric (V) acid were reacted with 2.07g of lead at room temperature.

Volume of 1M nutirc (V) acid	Volume of nitrogen (IV) oxide gas (cm^3)
5	60
15	180
25	300
35	420
45	480
55	480

(a) Give a reason why nitric (IV) is not used to prepare hydrogen gas. (1 mk)

……

……

(b) On the grid provided plot a graph of the volume of the gas produced against the volume of the gas produced against the volume of the acid. (3 mks)

(c) Use your graphs to determine:

(i) Volume of nitrogen (IV) oxide produced when 30 cm^3 of 1M nitric (V) acid were reacted with 2.07g of lead. (1 mk)

(ii) Volume of 1M nitric (V) acid that would react completely with one mole of lead. (1 mk)

(d) Calculate the number of moles of:

(i) 1M nitric (V) acid that reacted with one mole of lead. (1 mk)

(ii) Nitrogen (IV) oxide produced when one mole of lead reacted with excess nitric (V) acid. (Molar gas volume = 2400 cm) (1 mk)

(e) Use the answers to d above and write the equation for the reaction between lead and nitric(V) acid. (1 mk)

(f) Explain how the rate of the reaction between lead and nitric (V) acid would be affected if the temperature of the reaction mixture was raised. (2 mks)

……

……

……

……

5. (a) When ammonia gas is passed through copper (II) sulphate solution a blue precipitate is formed which dissolves to give a deep blue solution. Write an ionic equation for the formation of:

(i) The blue precipitate (1 mk)

(ii) the deep blue precipitate. (1 mk)

(b) Aluminum oxide is amphoteric.

(a) Explain the term amphoteric. (1 mk)

……

……

(b) Name and give the formula of other two amphorteric oxides. (2 mks)

……

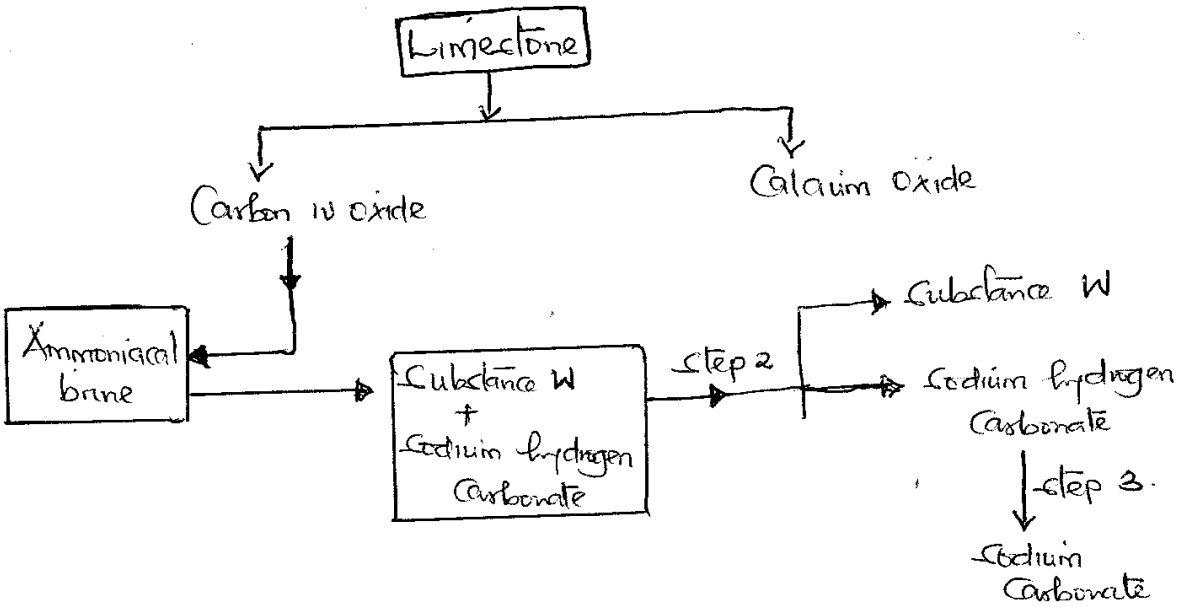
……

……

……

6.

6.



(a) What is the chemical name for limestone. (1 mk)

……

(b) Identify substances: (2 mks)

(i) X - ……

(ii) W - ……

(c) Name the process taking place in: (2 mks)

(i) Step II……

(ii) Step III……..

(d) Write a chemical equation for the reaction of:

(i) Leading to formation of substances W and sodium hydrogen carbonate. (1 mk)

(ii) Taking place in step (III). (1 mk)

(e) Carbon (V) oxide and ammonia are required during the solvay process. Write equation to show how ammonia is recycled. (1 mk)

(f) Name the other product of solvay process and state one use of it. (1 mk)

……

(g) State two uses of sodium carbonate. (2 mks)

……

……

……

……

7. The grid below represents past of the periodic table. Study it and answer the questions.

				B			C	
K	F		D			E	A	Y
	G							

(a) Identify the family name to which element F and G belong. (1 mk)

……

……

(b) Name the type of bond formed when C and F react. (1 mk)

……

(c) Write the formulae of the oxide formed when D reacts with oxygen. (1 mk)

(d) What type of oxide is formed in (c) above. (1 mk)

……

(e) Compare the atomic radii of F and D. Explain. (2 mks)

……

……

……

……

(f) Element F burns in air to form two products. Write 2 equations for the two products formed.

(g) State two uses of element K and its compounds. (2 mks)

……

……

……

……

233/3
CHEMISTRY
PAPER 3
PRE- MOCK – MARCH 2015
TIME: $2\frac{1}{4}$HOURS

Name……..Class ….……

Index Number ……..…… **Adm Number……**

1. ***You are provided with:***

- 4.5g of solid **P** in a boiling tube
- Solution **Q**, 0.2M sodium hydroxide
- Phenophthalein indicator.

You are required to determine:

i) The solubility of solid **P** at different temperatures

ii) The value of **n** in the formula $(HX)_n \bullet 2H_2O$ of solid **P.**

PROCEDURE I

i) a) Fill the burette with distilled water. Using the burette, add 4.0cm^3 of distilled water to solid **P**. in a boiling tube. Heat the mixture in a water bath while stirring with a thermometer to about 70^0C until all the solid dissolves.

b) Allow the solution to cool while stirring with the thermometer and note the temperature at which crystals of solid **P** start to appear. Record this temperature in table **1**.

c) Using the burette, add 2.0cm^3 of distilled water to the contents of the boiling tube. Heat the mixture while stirring with the thermometer until all the solid dissolves while in the water bath.

d) Allow the mixture to cool while stirring and note the temperature at which crystals of solid **P** start to appear.

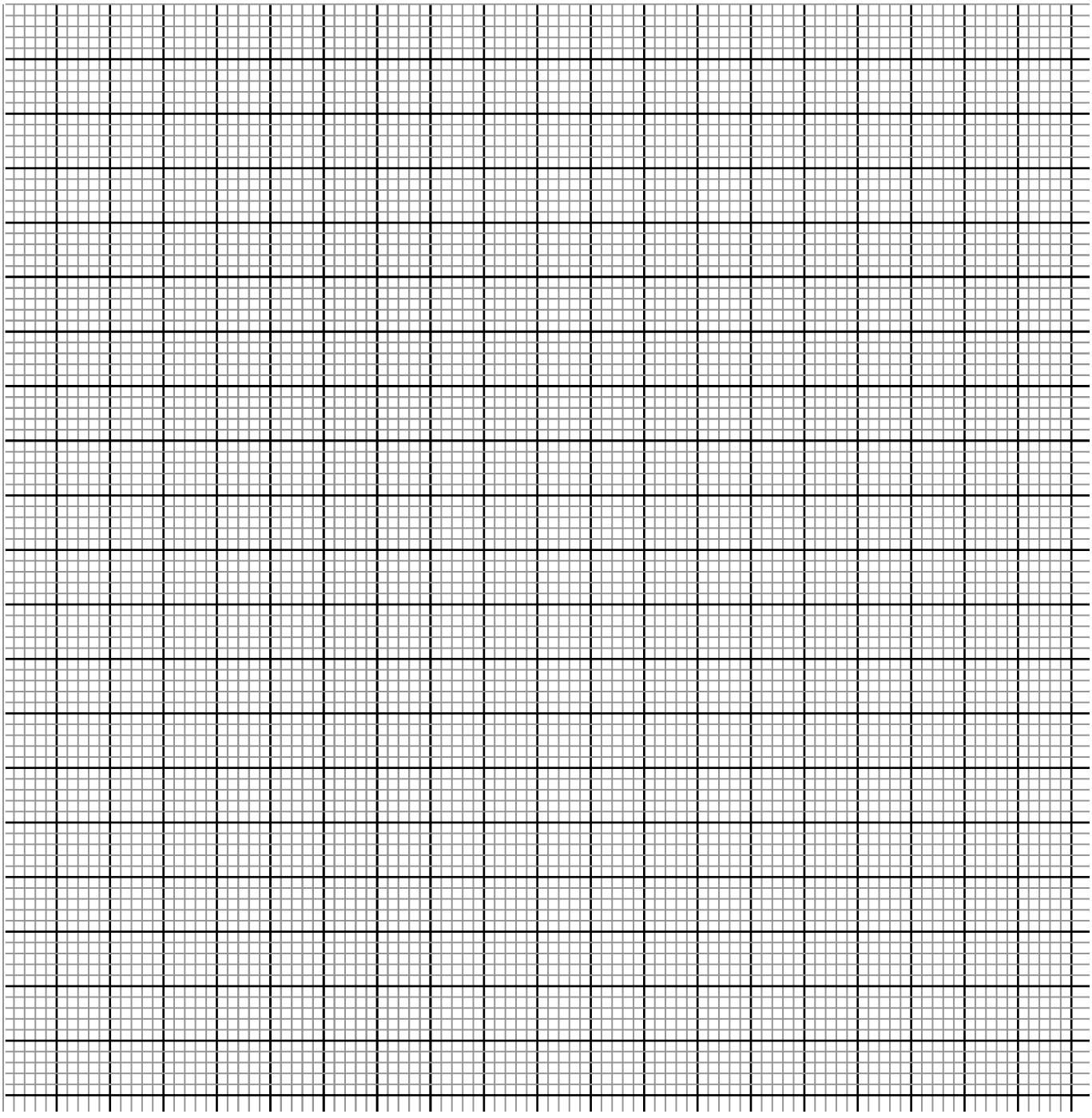
e) Repeat the procedure (c) and (d) four more times, heating the solution in a water bath and record the temperature in the table. ***Retain the contents of the boiling tube for use in procedure II***.

ii) Complete the table by calculating the solubility of solid **P** at the different temperatures. (the solubility of a substance is the mass of that substance that dissolves in $100cm^3$(100g) of water at a particular temperature. (6 mks)

Table I

Volume of water in the boiling tube (cm^3)	**Temperature at which crystals of solid P first appear (^0C)**	**Solubility of solid P (g/100g) of water**
4		
6		
8		
10		
12		

i) On the grid provided plot a graph of the solubility of solid **P** against temperature.(3mks)



ii) Using your graph determine the temperature at which 100g of solid **P** would dissolve in $100cm^3$ of water. (1mk)

iii) Determine the solubility of solid **P** at 55^0C (1mk)

iv) Other than temperatures give two other factors which affect solubility. (2mks)

PROCEDURE II

1. Transfer the contents of the boiling tube into a 250ml volumetric flask. Rinse the boiling tube and the thermometer with distilled water and add to the volumetric flask. Add more distilled water to make up to the mark. Label this solution **P**.
   Fill the burette with solution **P**. using a pipette and pipette filler place 25.0cm^3 of solution **Q** into a conical flask. Titrate solution **Q** with solution **P**. Using phenolphthaline indicator.

Table II

	I	**II**	**III**
Final burette reading cm^3			
Initial burette reading cm^3			
Volume of solution **P** used cm^3			

(4mks)

Calculate the;

i) Average volume of solution **P** used in the experiment. (1mk)

ii) Number of moles of sodium hydroxide used in solution **Q**. (2mks)

iii) Number of moles of solution **P** reacted with the sodium hydroxide given that the relative formula mass of **P**, $(HX)_n \bullet 2H_2O$ is 126. (3mks)

iv) The number of moles of sodium hydroxide required to react with one mole of **P**. Hence find the value of **n** in the formula $(HX)_n \bullet 2H_2O$ (3mks)

2 a) You are provided with solid **M** carry out the tests below and record your observations and inferences.

Place a spatula of solid **M** in a boiling tube, add 10 cm^3 of distilled water and shake well until all the solid dissolves.

Observations	Inference
1mk	1 mk

i) To about 1 cm^3 of the solution add 2 M sodium hydroxide drop wise until in excess.

Observations	Inference
1mk	1 mk

ii) Place 1cm^3 of the solution in a test tube and add 2 to 3 drops of 2 M sulphuric (VI) acid.

Observations	Inference
1mk	1 mk

iii) To about 1 cm^3 of the solution add 4-5 drops of lead (II) nitrate solution.

Observations	Inference
1mk	1 mk

b) You are provided with solid **N**. Carry out the test in (a) and (b)and fill the table below.

i) Place one third of **N** in a metallic spatula and burn in a non- luminous flame.

Observations	Inference
1mk	1 mk

ii) Dissolve all of the remaining **N** in about 10 cm^3 distilled water in a boiling tube.

a) Place 2cm^3 of solution in a test tube and add 2 drops of acidified potassium manganate (VII)

Observations	Inference
1mk	1 mk

b) To 2 cm^3 of the solution, add all the solid sodium hydrogen carbonate.

Observations	Inference
1mk	1 mk