

CHEMISTRY PAPER 3

EXPECTED QUESTIONS IN KCSE

**Comprises 6 KCSE prediction set exams
(Class of KCSE March 2022).**

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**For More e-learning resources contact Kenya
Educators via the contacts above.**

PREDICTION 1

CONFIDENTIAL

CHEMISTRY - PAPER 3

1.0M hydrochloric acid, solution Y
0.5M sodium hydroxide solution Z
Solid X 1g sodium carbonate
Solid L Hydrated aluminium sulphate
Solid M paraffin wax
2 boiling tubes
Thermometer
Stopwatch
Tripod stand
250ml glass beaker
6 test tubes
Test tube rack
Test tube holder
Spatula
PH chart
Blue litmus paper
Red litmus paper
Burette
Pipette
100cm³ measuring cylinder
100cm³ beaker
Solid S: Malleic acid
Burette stand

Access

2M sodium hydroxide
0.5M lead (II) nitrate
Aqueous sodium sulphate
Bromine water
Source of heat
Phenolphthalein indicator
Universal indicator

PREDICTION 1

Name: Adm. No.....Index No:

School:.....Candidate's Sign.....

Date:

233/3

CHEMISTRY

Paper 3

FORM 4 2021

[PRACTICAL]

Time: 2 Hours

Instructions to candidates:

- Write your name and Index Number in the spaces provided above.
- Sign and write date of examination in the spaces provided above.
- Answer **ALL** questions in the spaces provided in the question paper.
- You are not allowed to start working with the apparatus for the first 15 minutes of the 2 ¼ hours allowed for this paper. This time is to enable you to read the question paper and make sure you have all the chemicals and apparatus that you may need.
- All workings **MUST** be clearly shown where necessary.
- Mathematical tables and silent electronic calculators may be used.

For Examiners use only.

Question	Maximum Score	Candidate's Score
1	14	
2	09	
3	17	
Total marks	40	

1. You are provided with the following:

- 1.0M Hydrochloric acid; solution Y
- 0.5M Sodium hydroxide; solution Z

Anhydrous sodium carbonate of unknown mass; solid X

You are required to determine the mass of sodium carbonate that was used in the reaction.

Procedure

Using a measuring cylinder, measure 60cm^3 of 1M hydrochloric acid, solution Y and transfer into 100cm^3 beaker. Add all sodium carbonate (solid X) and stir gently until there is no effervescence. Transfer the solution into a clean 100ml measuring cylinder and add distilled water to make 100cm^3 of the solution. Transfer the solution onto 250cm^3 beaker and shake. Label this solution F.

Fill the burette with solution Z. Pipette 25.0cm^3 of solution F and transfer to a conical flask. Add 3 drops of Phenolphthalein indicator and titrate with solution Z. Record your results in the table 1 below. Repeat the procedure to complete the table.

(a).Table 1.

(4 marks)

Final burette readings (cm^3)	I	II	III
Initial burette reading (cm^3)			
Volume of solution Z (cm^3)			

(i). Determine the average volume of solution Z.

(1 mark)

(ii). Calculate the number of moles of sodium hydroxide (solution Z) used.

(1 mark)

(iii). Find the number of moles of hydrochloric acid in 25.00cm^3 of solution F

(2 marks)

(iv). Determine the number of moles of hydrochloric acid in 100cm^3 of solution F (2 marks)

Calculate the number of moles of hydrochloric acid in the original 60cm^3 of solution Y. (1 mark)

(v). Calculate the number of moles of hydrochloric acid in the original 60cm^3 of solution Y.
(1 mark)

(vi). Calculate the number of moles of hydrochloric acid that reacted with sodium carbonate.
(1 mark)

(vii). Determine the mass of sodium carbonate that reacted with the acid (Na=23, C=12, O=16)
(2 marks)

2. A. You are provided with

- Solid M
- A thermometer
- A test tube

You are required to determine the melting point of solid M

PROCEDURE

- Place 150cm^3 of tap water in a 200 ml or 250 ml beaker
- Heat the water to near boiling.
- Insert a thermometer in the test tube containing solid M and take its temperature then record it in the table below under time 0.
- Using a test-tube holder, immerse the test-tube containing solid M into the hot water

(Ensure that half of the test-tube is immersed) and immediately start a stop Watch/clock and record the temperature of the contents of the test-tube after every Half-minute and complete the table.

e). Dip the thermometer into the hot bath to clean it then wipe it with tissue paper (4 marks)

Time (Min)	0	$\frac{1}{2}$	1	$1\frac{1}{2}$	2	$2\frac{1}{2}$	3	$3\frac{1}{2}$
Temperature ($^{\circ}\text{C}$)								

(i). On the grid provided, plot a graph of time, (Horizontal axis) against temperature. (3 marks)



(ii). From the graph, determine the melting point of solid M. (1 mark)

(iii). Name the type of heat change at the melting point. (1 mark)

(i). Heat gently then strongly half of solid L in a clean dry test tube, test any gas produced using red and blue litmus papers

Take the remainder of solid L and put into a boiling tube. Add about 10cm³ of distilled water and shake. Divide the solution into 3 portions.

iii). To the second portion, add about 5cm³ of aqueous sodium sulphate.

(iv). To the third portion, add about 2cm³ of lead (II) nitrate.

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Page 5 of 7

[1 mark]	[1 marks]

3.(b). You are provided with solid S perform the following tests and record your observations and inferences in the spaces provided.

(a). Put half of the solid on a clean METALLIC SPATULA ignite it in a non-luminous flame.

Observations	Inferences
[$\frac{1}{2}$ mark]	[$\frac{1}{2}$ mark]

(b). Put the remaining solid in a clean boiling tube, add water and shake thoroughly. (Retain this mixture for test bi-biii)

Observations	Inferences
[1 mark]	[1 mark]

(b).(i). In about 2cm³ of the mixture add 2 drops of bromine water.

Observations	Inferences
[1 mark]	[1 mark]

(ii). in about 5cm³ of the mixture add both blue and red litmus paper.

Observations	Inferences
--------------	------------

[1 mark]	[1 mark]

(iii). use the remaining mixture to determine the pH of the mixture.

observations	Inferences
[1 mark]	[1 mark]

PREDICTION 2

233/3
CHEMISTRY
(PRACTICAL)
PAPER 3

CONFIDENTIAL

Per Student

1. Solution A (100ml)
2. Solution B (100ml)
3. Phenolphthalein indicator
4. 3 conical flasks
5. Funnel
6. Burette
7. Pipette
8. Clamp
9. Stand
10. CBI (g) – $\text{NaHCO}_{3(s)}$
11. Clean spatula
12. Test- tubes (5)
13. Litmus papers (2 blue and 2 red)
14. Distilled water
15. Solid Q – 1g $(\text{NH}_4)_2 \text{SO}_4 \cdot \text{FeSO}_4 \cdot 6\text{H}_2\text{O}$ and NaCl (ration 1:1)
16. 1 boiling tube

Access to;

17. 2M ammonia solution
 18. 2M Sodium hydroxide solution
 19. Source of heat
 20. Silver nitrate solution (0.05M)
 21. Dilute nitric acid (0.1M)
 22. Dilute hydrochloric acid (0.1M)
 23. Dilute Barium nitrate solution (0.1M)
 24. Conc. Nitric acid in dropper bottles
 25. White tile
 26. Test tube holder
- Solution A is prepared by dissolving 6.3g of $\text{H}_2\text{C}_2\text{O}_4 \cdot 2\text{H}_2\text{O}$ in 400cm^3 of water and topped upto one litre of solution.
 - Solution B is prepared by dissolving 4g of Sodium hydroxide in 400cm^3 of water and topped upto one litre of solution.

PREDICTION 2

NAME DATE

INDEX NO. SIGNATURE

233/3
CHEMISTRY
PRACTICAL
PAPER 3
TIME: 2¼ HOURS.

Kenya Certificate of Secondary Education

INSTRUCTIONS TO CANDIDATES

- Write your name and index number in the spaces provided above.
- Answer **ALL** the questions in the spaces provided.
- You are not allowed to start working with the apparatus for the first 15 minutes of the 2¼ hours allowed time for the paper.
- Use the 15 minutes to read through the question paper and note the chemicals you require
- Mathematical tables and electronic calculators may be used.
- All working **MUST** be clearly shown where necessary.

FOR EXAMINER'S USE ONLY.

Question	Maximum score	Candidate's score
1	17	
2	8	
3	15	
Total score	40	

This paper consists of 6 printed pages.

Candidates should check to ensure that all pages are printed as indicated and no questions are missing

1. Solution A is prepared by dissolving 6.3g of the organic acid $\text{H}_2\text{C}_2\text{O}_4 \cdot n\text{H}_2\text{O}$ in water to make a litre of the solution.
Solution B: 0.1M NaOH solution
Phenolphthalein indicator
Clamp and stand
Burette and pipette.

Turn over

You are required to determine the value of n in the organic acid $\text{H}_2\text{C}_2\text{O}_4 \cdot n\text{H}_2\text{O}$

Procedure.

Fill the burette with solution A and adjust the volume to zero mark.

Add 2 to 3 drops of phenolphthalein indicator and titrate solution A against solution B until the colour just permanently changes. Record your results in the table below. Repeat the procedure two more times to obtain concordant results.

a)

Titration	1	2	3
Final burette reading (cm^3)			
Initial burette reading (cm^3)			
Volume of solution A used (cm^3)			

4marks

b) Calculate the average volume of solution A used.

1mark

c) Calculate the moles of sodium hydroxide in the volume of solution B used.

2marks

d) Given that solution B - Sodium hydroxide and solution A organic acid react in the ratio of 2:1, calculate the number of moles of the organic acid –solution A used?

2marks

f) Calculate the relative formula masses of the organic acid solution A

g) Calculate the value of n in $\text{H}_2\text{C}_2\text{O}_4 \cdot n\text{H}_2\text{O}$ (H=1, C=12, O=16)

2. You are provided with CBI. Carry out the test below. Write your observation and inferences in the spaces provided.

- a) Using a clean spatula, heat about one third of the solid CBI in a non- luminous Bunsen burner flame.

3 | Page

c) Put 2cm³ of dilute hydrochloric acid into a test tube. Add ¼ endful of CBI into the test tube. Test for any gas procedure.

3. You are provided with solid Q, carry out the test below. Record your observations and inferences in the table. Identify any gas (es) evolved.

Place all the solid Q provided into boiling tube and add distilled water until the tube is $\frac{1}{4}$ full. Divide it into five portions.

- | Observation | Inferences |
|--------------|--------------|
| 1mark | 1mark |

ii) Warm the preserved mixture from b (i) above

c) i) To the 3rd portion add silver nitrate solution. Preserve the mixture for the next test.

5 | Page

d) To the 4th portion add dilute Barium nitrate solution followed by dilute nitric acid.

e) To the 5th portion add 2-3 drops of conc. Nitric acid.
Warm the mixture and allow to cool. Add sodium hydroxide solution dropwise until in excess.

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PREDICTION 3

233/3

CHEMISTRY PAPER 3

CONFIDENTIAL

FORM 4

KCSE PREDICTION

KENYA CERTIFICATE OF SECONDARY EDUCATION (KCSE)

CONFIDENTIAL

Each candidate requires

1. Solution A, 60cm³ of 2M HCl.
2. Solution B, 100cm³ of 0.05M NaOH
3. Solid C, 10cm magnesium ribbon.
4. 10ml measuring cylinder
5. 25ml pipette
6. 50ml Burette
7. Complete stand
8. Stopwatch
9. 2 labels
10. Distilled water
11. 6 test tubes.
12. 0.5g sodium hydrogen carbonate.
13. 5cm³ ethanol.
14. 1 – 14 PH chart.
15. Solid R, 1g Oxalic acid.
16. Solid Q, Mixture of (NH₄)₂SO₄ and Al(SO₄)₃ (ratio 1:1)
17. Pipette filler
18. Phenolphthalein indicator
19. 250ml conical flask (2)
20. 250ml volumetric flask
21. 1 boiling tube
22. 1 spatula

ACCESS TO:

23. Universal indicator solution
24. Acidified potassium manganate (VII) solution
25. Bromine water
26. Conc. Sulphuric (VII) acid with a dropper.
27. Means of heating.
28. 2M Lead (II) nitrate solution.

29. 2M dilute nitric (V) acid solution
30. 0.5m Barium nitrate solution
31. 2M sodium hydroxide solution.
32. 2M Aqueous ammonia.
33. 2M Hydrochloric acid.

PREDICTION 3

NAME: INDEX.NO:

SCHOOL: CANDIDATES SIGN:

DATE:

233/3

CHEMISTRY PAPER 3
PRACTICAL

KCSE PREDICTION 3

KENYA CERTIFICATE OF SECONDARY EDUCATION (KCSE)

Instructions to candidates

1. Write your name, index number and school in the spaces provided above.
2. Sign and write the date of examination in the spaces provided above.
3. Answer **ALL** the questions in section in the spaces provided.
4. **ALL** working **MUST** be clearly shown.

FOR EXAMINERS USE ONLY

QUESTION	MAXIMUM SCORE	CANDIDATE SCORE
1	18	
2	12 $\frac{1}{2}$	
3	9 $\frac{1}{2}$	
TOTAL	40	

1. You are provided with:

- Solution A, Dilute hydrochloric acid

- Solution B, made by dissolving 0.5g of sodium hydroxide in water and made to 250cm³ of solution
- Solid C, Magnesium ribbon
- Phenolphthalein in indicator

You are required to:

- Standardize solution A
- Determine the rate of reaction between solution A and magnesium

PROCEDURE

- Measure exactly 10cm³ of solution A using a burette and transfer into a 250ml volumetric flask. Top up to the mark using distilled water. Label this solution D.
- Drain the remaining solution A in the burette, rinse the burette thoroughly and fill the burette with solution D.
- Pipette 25cm³ of solution B into a conical flask. Add three drops of phenolphthalein indicator
- Titrate solution D with solution B. Record your results in the table below. Repeat procedure (i) to (iv) to complete the table. (3 marks)

	1	2	3
Final burette reading (cm ³)			
Initial burette reading (cm ³)			
Volume of solution D used (cm ³)			

- Calculate the average volume of solution D used (1 mark)

(b) Calculate:

- Number of moles of solution B used (1½ marks)

- Number of moles of solution D in 250cm³ of solution (1½ marks)

- Molarity of solution A (1 mark)

PROCEDURE II

- (i) Cut solid C into equal pieces, each 2cm long.
- (ii) Using a burette, measure 12cm³ of solution A, into a clean boiling tube.
- (iii) Drop one piece of solid C into the boiling tube containing solution A and start stopwatch immediately. Stop the stopwatch when all solid C has just reacted. Record your results in the table below.
- (iv) Repeat steps (ii) and (iii) above using 10cm³, 8cm³, 6cm³ and 4cm³ of solution A. Top up each with distilled water to make 12cm³ of solution and complete the table below. (4 marks)

Volume of solution A (cm ³)	Volume of distilled water (cm ³)	Concentration of solution a (moles/l	Time(s)	$\frac{I}{t} (s^{-1})$
12	0			
10	2			
8	4			
6	6			
4	8			

- (a) Plot a graph of $\frac{I}{t}$ (y – axis) against the concentration of solution A (3 marks)
- (b) From the graph, determine the time taken for the reaction to reach completion when 1.5 moles of solution A are used (2 marks)
- (c) Comment on the shape of the graph (1 mark)
2. You are provided with solid Q. Carry out the tests below and record your observations and inferences in the spaces provided.

- (a) Strongly heat a spatula-end full of solid Q in a dry test tube (1 mark)

Observation	Inference

- (b) (i) Place the remaining solid Q in a boiling tube. Add 10cm³ of distilled water. Divide the solution into five portions. (2 marks)

Observation	Inference

- (ii) To the first portion, add aqueous lead (II) nitrate solution (1 mark)

Observation	Inference

- (iii) To the second portion add dilute nitric (V) acid, followed by barium nitrate solution (2marks)

Observation	inference

- (iv) To the third portion add a few drops of sodium hydroxide until excess observation (2marks)

Observation	Inference

- (v) To the fourth portion, add a few drops of aqueous ammonia until is excess. (2 marks)

Observation	Inference

- (vi) To the fifth portion, add a few drops of hydrochloric acid (1½ marks)
Warm the contents.

Observation	Inference

3. You are provided with solid R. carry out the tests below and record your observations and inferences.

- (a) Place a spatula-end full of solid R in a dry boiling tube and add about 10cm³ of distilled water. Shake thoroughly and heat to boil. Divide the solution into five portions. (1½ marks)

Observation	Inference

- (b) (i) Test the first portion with the universal indicator solution provided. (1½ marks)

Observation	Inference

- (ii) To the second portion, add a few drops of acidified potassium manganate (VII) solution (2 marks)

Observation	Inference

- (iii) To the third portion, add a few drops of bromine water (2 marks)

Observation	Inference

- (iv) To the fourth portion, add half spatula of sodium hydrogen carbonate (1 mark)

Observation	Inference

- (v) To the fifth portion in a boiling tube, add 5cm³ of ethanol followed by a few drops of concentrated sulphuric (VI) acid. Warm the mixture. (1 ½ Marks)

Observation	Inference

PREDICTION 4

Name : Index No :

School : Venue Adm no : Class :

Candidate's Signature :

Date :

233/3

CHEMISTRY PRACTICAL

Paper 3

2021

TIME: 2 $\frac{1}{4}$ HOURS

KCSE PREDICTION 4

Kenya Certificate of Secondary Education (K.C.S.E)

INSTRUCTIONS TO CANDIDATES:

- Answer all the questions in the spaces provided in the question paper.
- You are **NOT** allowed to start working within the first 15 minutes of the 2 $\frac{1}{4}$ hours allowed for this paper. This time is to enable you read the question paper and make sure you have all the chemicals and apparatus that you may need.
- All working **MUST** be clearly shown.
- Mathematical tables and silent scientific calculators may be used.
- This paper consists of **7 printed** pages.
- Candidates should check to ascertain that all papers are printed as indicated and that no questions are Missing

For Examiner's Use Only:

Question	Maximum score	Candidate's score	Examiner's initials
1	22		
2	11		
3	7		
Total score	40		

1. You are provided with:
 - **5.0g of solid X** in a boiling tube

- **Solution Y**, which is acidified Potassium manganate (VII) containing **9.0g** of Potassium manganate (VII), KMnO_4 , in 1000cm^3 of solution.

You are required to determine:

- The solubility of solid X at different temperatures
- The number of moles of water of crystallization in solid X

Procedure

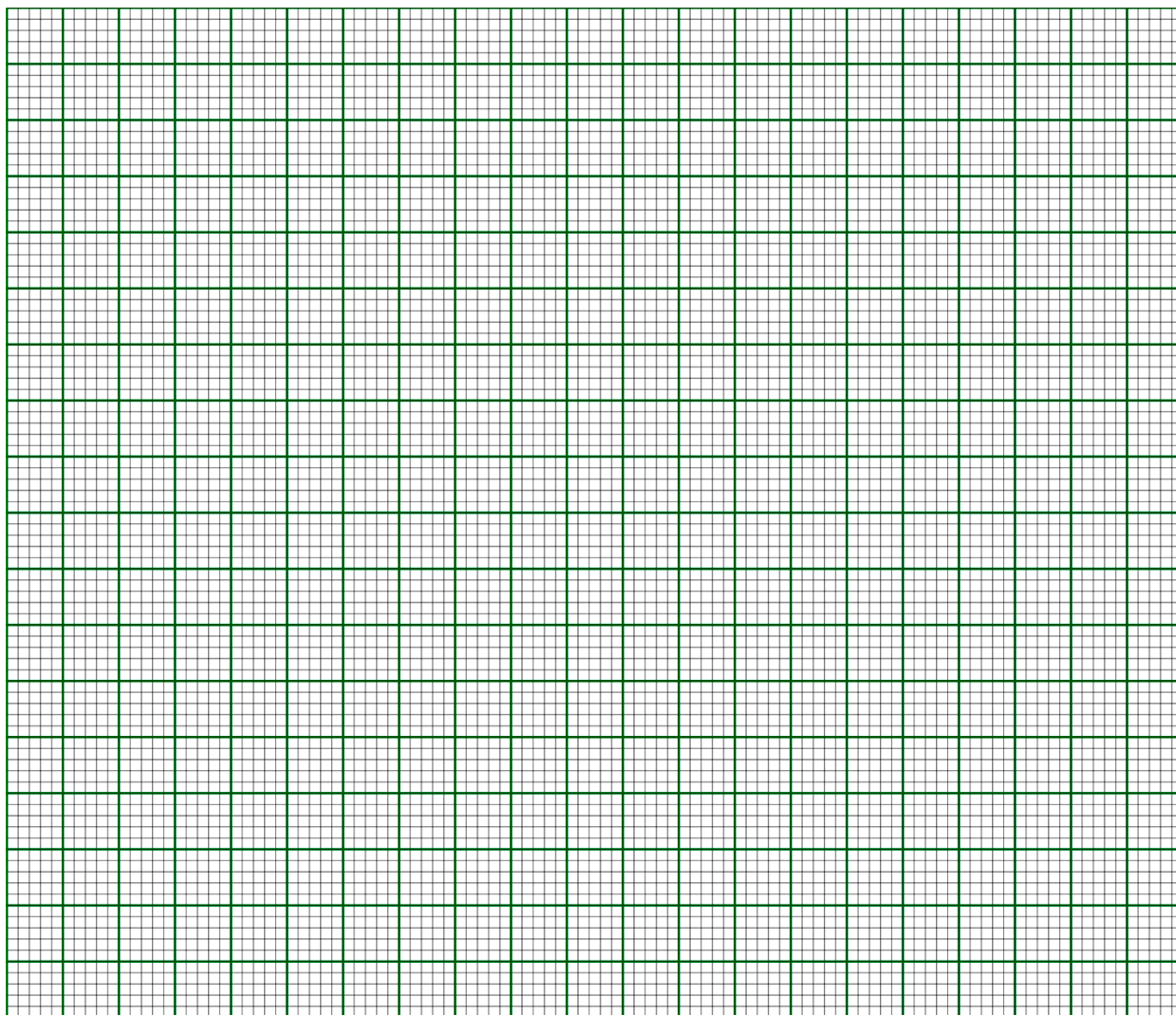
- Using a 10 cm^3 measuring cylinder add 4cm^3 of distilled water to solid X in the boiling tube. Heat the mixture while stirring with the thermometer to **about 85°C** . When **all** the solid has dissolved allow the solution to cool while stirring with the thermometer. (You can occasionally immerse the boiling tube in a beaker of tap water). Note the temperature at which crystals of solid X first appear. Record this temperature in table 1.
- Add 2cm^3 of distilled water to the contents of the boiling tube warm the mixture while stirring with the thermometer until **all** the solid dissolves. Allow the mixture to cool while stirring. Note and record the temperature at which crystals of solid X first appear.
- Repeat procedure (ii) **three** more times and record the temperature in the table 1. **Retain the contents of the boiling tube** for use in the procedure (v).
- a). Complete table 1 by calculating the solubility of solid X at different temperatures.

Table 1

Volume of water (cm^3)	Temperature at which crystals ($^\circ\text{C}$)	Solubility of solid X (g/100g of water)
4		
6		
8		
10		
12		

(6 marks)

- On the grid provided, plot a graph of solubility of solid X (vertical axis) against temperature. (3 marks)



c). Using your graph, determine the temperature at which 100g of solid **X** would dissolve in 100cm³ of water.
(1 mark)

Procedure II

v) a). Transfer the contents of the boiling tube into a 250ml volumetric flask, rinse both 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 **X**. Fill a burette with solution **Y**.

Using the pipette and pipette filler, place 25.0cm³ of solution **X** into a conical flask. Warm the mixture to about 60°C. Titrate the hot solution **X** with solution **Y** until a permanent pink colour persists. Continuously shake the mixture during the titration. Record your readings in table 2.

Repeat the titration two more times and complete the table 2.

Table 2

Titration	I	II	III
Final burette reading (cm ³)			

Initial burette reading (cm ³)			
Volume of solution Y used (cm ³)			

(4 marks)

b). Calculate the:

I. average volume of solution Y used

(1 mark)

II. Number of moles of Solution Y, Potassium manganate (VII) used
(K=39, Mn=55, O=16) (2 marks)

III. Number of moles of X in 25cm³ of solution X given that 2 moles of potassium manganate (VII) react completely with 5 moles of X

(1 mark)

IV. Number of moles of X in 250cm³ of solution

(1 mark)

V. Relative formula mass of X,

(1 mark)

c). The formula of **X** has the form **X.nH₂O**. Determine the value of n in the formula given that the relative mass of **X** is 90.0

(O=16.0, H=1.0) (2 marks)

2. You have been provided with **solid R**. Carry out the tests below

Divide the filtrate into **three** portions

Observations	Inferences
(1 mark)	(1/2 mark)

Observations	Inferences
(1 mark)	(1 mark)

Procedure	Expected observation
(1 mark)	(1 mark)

Observations	Inferences
(1/2 mark)	(1/2 mark)

Divide the resultant solution into **two** portions

(1 mark)	(1 mark)
----------	----------

- b). Dissolve the remaining portion of **solid H** by adding about 6cm³ of distilled water and divide the solution into **3 portions**.

i) To the first portion, add two drops of acidified potassium manganate (VII) solution

Observations	Inferences
(1 mark)	(1 mark)

ii) To the second portion, add two drops of bromine water

Observations	Inferences
(1 mark)	(1 mark)

iii) Determine the pH of the third portion using universal indicator paper

Observations	Inferences
(1/2 mark)	(1/2 mark)

PREDICTION 5

CHEMISTRY 233/3 PRACTICAL

Each candidate will require

1. Solution A 100cm^3
2. Solution B 150 cm^3
3. Solution C 100cm^3
4. Burette
5. 25ml pipette
6. 2 conical flasks
7. Retort stand
8. Filter funnel
9. Pipette filler
10. 100ml of distilled water
11. Thermometer
12. 1 Spatula – full of solid D
13. About 10ml liquid E
14. 4g solid F (weighed exactly)
15. 2 boiling tubes
16. Six test tubes in a rack
17. Test tube holder
18. Metallic spatula

ACCESS TO

- 1M NaOH
- 1M NH_4OH
- 0.1M NaCl
- Acidified $\text{K}_2\text{Cr}_2\text{O}_7$
- KMnO_4 - use some amount of solution B
- Source of heating

NOTES

1. **Solid A**
Dissolve 7.0g Ferrous Sulphate ($\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$) in 50ml of $1\text{M H}_2\text{SO}_4$, dilute to 1dm^3 with water. (Should be prepared in the morning of the exam day)
2. **Solution B**
Dissolve 0.8g of KMnO_4 in 50cm^3 of $1\text{M H}_2\text{SO}_4$. Dilute to 1 dm^3 with water.
3. **Solution C**
Measure 3cm^3 of 20vol. H_2O_2
Dissolve in 1dm^3 of solution.
4. **1M H_2SO_4**
Measure 55cm^3 of conc. H_2SO_4 add to about 200cm^3 of water, stir, dilute to 1 dm^3
5. **Solid D**
Aluminium Nitrate
6. **Solid F**
Potassium Chlorate (KClO_3)
7. **Acidified $\text{K}_2\text{Cr}_2\text{O}_7$**
Dissolve 0.3g of $\text{K}_2\text{Cr}_2\text{O}_7$ in 50cm^3 of $1\text{M H}_2\text{SO}_4$. Dilute to 1 dm^3 with water.
8. **Liquid E**
Ethanol.

PREDICTION 5

NAME DATE

INDEX NO. SIGNATURE

233/3
CHEMISTRY
PRACTICAL
PAPER 3
TIME: 2¼ HOURS.

KCSE PREDICTION 5

Kenya Certificate of Secondary Education.

233/3
CHEMISTRY
PAPER 3
PRACTICAL
TIME: 2¼ HOURS.

INSTRUCTIONS TO CANDIDATES.

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FOR EXAMINER'S USE ONLY.

Question	Maximum score	Candidate's score
1	13	
2	14	
3	13	
Total score	40	

1. You are provided with;
- Solution A containing 6.95g of Iron II Sulphate heptahydrate R.F.M = 278 in 250cm³ of solution
 - Solution B of potassium manganate (VII)
 - Solution C of hydrogen peroxide.

You are required to

- (a) Standardize the potassium manganate (VII) solution C
- (b) Determine the concentration of hydrogen peroxide solution C.

PROCEDURE I

Pipette 25cm³ of solution A into a conical flask.

Fill the burette with solution B. Titrate this solution against solution A until the first permanent pink colour appears. Record your results in table I and repeat the procedure to fill the table 1 below.

Table 1

II	I	II	III
Final burette reading (cm ³)			
Initial burette reading (cm ³)			
Volume of solution B used (cm ³)			

(4 marks)

- (i) Calculate the average volume of solution B used

(1 marks)

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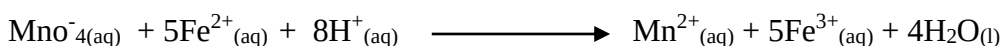
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- (ii) Given that the equation for the reaction is



Calculate

- a) The number of moles of Iron II sulphate solution A used

(1mark)

.....

.....

- b) The number of moles of solution B that reacted.

(1mark)

.....

.....

- c) The concentration of the potassium manganate (VII) solution B in moles per litre. (1mark)

.....

PROCEDURE II

Pipette 25cm³ of hydrogen peroxide, solution C into a conical flask. Fill the burette with solution B. Titrate this solution against solution C until the first permanent pink colour appears. Record results in table II.

TABLE II

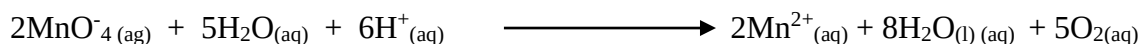
Titre number	I	II	III
Final burette reading cm ³			
Initial burette reading cm ³			
Volume solution B used cm ³			

(4marks)

- (i) Work out average volume of potassium manganate (VII) solution B used. (1mark)

.....

- (ii) Given that the equation for the reaction is



Calculate

- a) The number of moles of Potassium Manganate (VII) solution B that reacted. (1mark)

.....

- b) The number of moles of hydrogen peroxide solution C that reacted. (1mark)

.....

- c) The concentration of hydrogen peroxide solution C in moles per dm³ (mol dm⁻³) (1mk)

.....

2. You are provided with 4g of Solid F.

You are required to determine the solubility of solid F at different temperatures.

PROCEDURE

- a) Carefully transfer all solid F in a clean boiling test tube and using a burette, add 15cm³ of distilled water. Heat the mixture while stirring with a thermometer to about 85°C. when all the solid has dissolved, allow the solution to cool while stirring with the thermometer. Note the temperature at which the crystals of solid F first appear. Record this temperature in Table III.

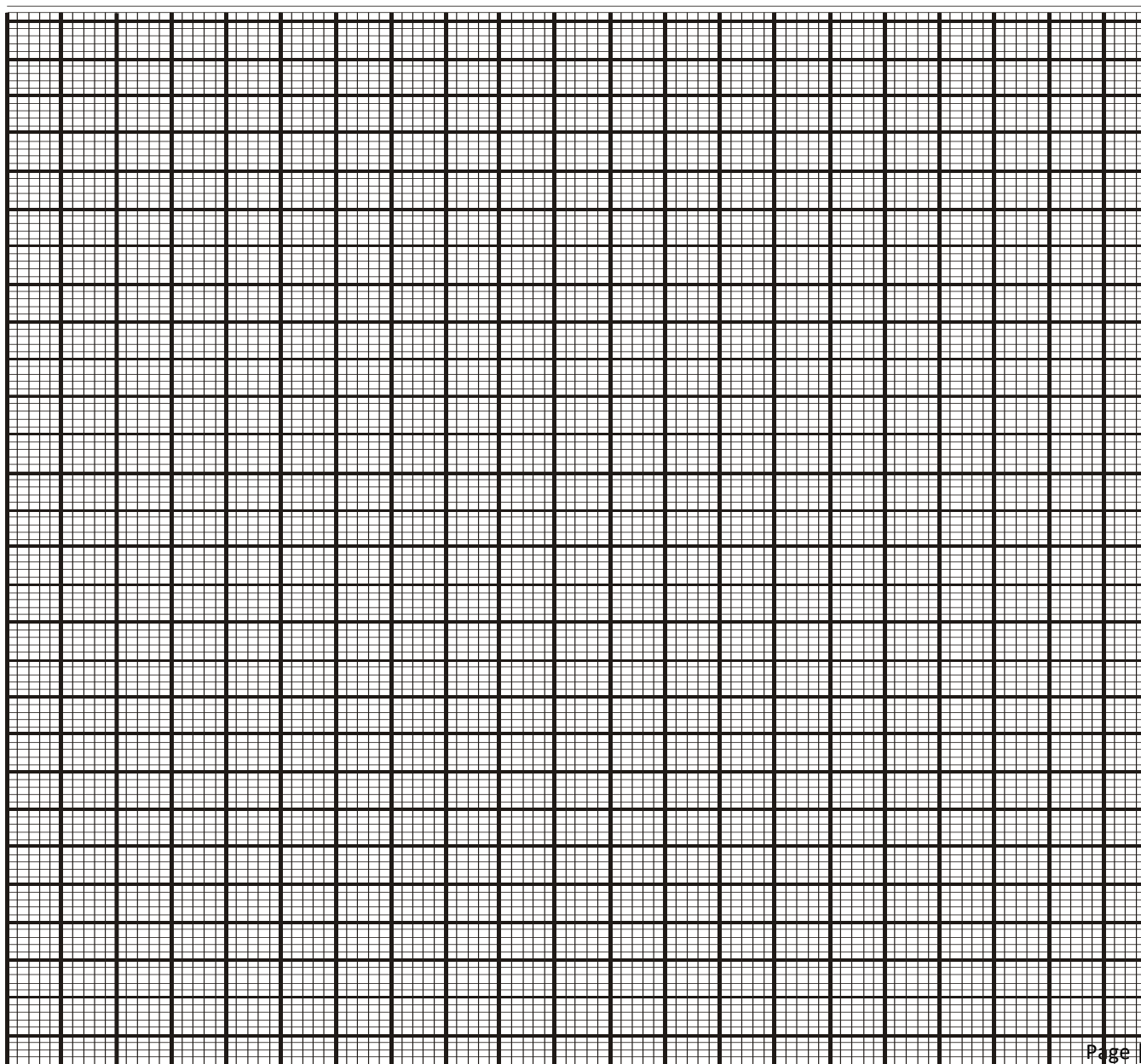
- b) Transfer 5cm^3 of distilled water to the contents in the boiling tube. Warm the mixture while stirring with the thermometer until the solid dissolve. Allow the mixture to cool while stirring. Note and record the temperature at which crystals first appear.
- c) Repeat procedure (b) two or more times and record the temperatures in table III.
- d) Complete table III by calculating the solubility of solid F at the different temperatures.

TABLE III

Volume of water in the boiling tube (cm^3)	Temperature at which crystals of solid F first appear.	Solubility of solid F in g / 100g of water.
15		
20		
25		
35		
40		

(6marks)

- (i) On the grid provided plot a graph of solubility of solid F (vertical axis) against temperature (horizontal axis). (3marks)



- (ii) Using your graph, determine the temperature at which 15g of solid F, would dissolve in 100cm³ of water. (1mark)

.....

.....

.....

.....

.....

3. **You are provided with solid D. carry out the following tests and write down all the observations and inferences.**

- a) Place half spatula end full of solid D in a dry test tube. Heat gently then strongly until there is no further change.

Observations	inferences
(1mark)	(1mark)

- b) Place the remaining solid D in a test tube, add about 10cm³ of distilled water and shake vigorously. Divide the mixture into four portions.

- i. To the 1st portion, add 2M sodium hydroxide solution drop wise until in excess.

Observations	inferences
(1mark)	(1mark)

- ii. To the 2nd portion, add ammonia solution drop wise till in excess.

Observations	inferences
(1mark)	(1mark)

iii. To the fourth portion add 4 drops of sodium chloride.

Observations	inferences
(1mark)	(1mark)

II. You are provided with liquid E, Carry out the following tests on it.

a) Place about one spatula end full of liquid E on a metallic spatula and ignite it in a Bunsen burner flame.

Observations	inferences
(1mark)	(1mark)

b) To 2cm³ of liquid E add 3 drops of acidified KMnO₄. Solution B.

Observations	inferences
(1mark)	(1mark)

c) To 2cm³ of liquid E add 3 drops of acidified K₂Cr₂O₇.

Observations	References
(1mark)	(1mark)

PREDICTION 6

CHEMISTRY PP3 CONFIDENTIAL

In addition to the fittings and Chemical found in the lab each candidate will require the following.

1. Solid A. 17cm long magnesium ribbon
2. 80cm³ of solution B
3. 120cm³ of solution C
4. 1g of solid E in a container
5. 0.5g of solid F in a container
6. About 500cm³ of distilled water.
7. One 25ml pipette
8. One 50ml burette
9. One 100ml plastic beaker
10. Thermometer (-10⁰c to 110⁰c)
11. Stop watch
12. Two 250ml conical flask
13. One 250ml volumetric flasks
14. 6 dry test tubes in rack
15. Two boiling tubes
16. One metallic spatualla
17. One piece each of red and blue litimus paper
18. Piece of universal indicator paper
19. Label
20. About one cm² Aluminum foil.

Access to

1. Phenolphthalein indicator supplied with a dropper.
2. Bunsen burner
3. Universal indicator and PH chart
4. 2M sodium hydroxide supplied with a dropper
5. Barium Nitrate supplied with a dropper
6. Acidified potassium magnate (vii) supplied with a dropper
7. Freshly prepared bromine water supplied with a dropper
8. 0. 5M sodium sulphate supplied with a dropper
9. 0.5M sodium Chloride supplied with a dropper.
10. 0.5M lead (ii) Nitrate

Preparations

1. Solid A is 0.4g of Mg exactly 17cm long. Mg ribbon
2. Hydrochloric acid solution B is prepared by adding 172cm³ of concentrated hydrochloric acid of specific gravity 1.18gcm⁻⁰ to 500cm³ of distilled water in one litter volumetric flask then adding distilled water to the mark. Label this as solution B.
3. Solution C made of adding 12g of NaOH pellet in 200cc of distilled water, stir then top it up in 1000ml volumetric flask.
4. Acidify potassium mangate (vii) prepared by dissolving 3.2g of potassium manganate vii in 200cm³ of 2M sulphuric acid in 1L volumetric flask then adding water to the mark.
5. Barium Nitrate prepared by dissolving 26g of barium Nitrate in 800cm³ of distilled water then topping up to 1L.
6. Solid E is about 1g of barium Nitrate.
7. Solid F is 0.5g Malleic acid.

PREDICTION 6

Name Index No.

School Candidate's signature

Date

233/3

CHEMISTRY
PAPER 3
PRACTICAL
TIME: 2¼ HOURS

KCSE PREDICTION 6
Kenya Certificate of Secondary Education
CHEMISTRY
Paper - 233/3
Time: 2¼ hours

INSTRUCTIONS TO CANDIDATES

- Write your name and index number in the spaces provided.
- Sign and write the date of examination in the spaces provided on the question paper.
- Answer ALL the questions in the spaces provided in the question paper.
- You are NOT allowed to start working with the apparatus for the first 15 minutes of the 2¼ hours allowed for this paper. This time is to enable you to read the question paper and make sure you have all the chemicals and apparatus you need.
- Mathematical tables and silent electronic calculators' may be used.
- All working must be clearly shown where necessary.

FOR EXAMINER'S USE ONLY

Question	Maximum marks	Candidate's score
1	20	
2	11	
3	9	
Total score	40	

This paper consists of 8 printed pages. Candidates should check the question paper to ascertain that all pages are printed as indicated and that no pages are missing.

1. You are provided with;
 - Solid A magnesium ribbon
 - Solution B 2MHCL
 - Solution C, 0.3MNaOH
 - Distilled water

You are required to determine the:

- i. Temperature change when magnesium reacts with excess hydrochloric acid
- ii. Number of moles of hydrochloric acid that remains unreacted
- iii. Number of moles of magnesium that reacted
- iv. Molar heat of reaction between magnesium and hydrochloric acid

Procedure 1

Using a burette, measure 50cm of solution B and place it in 100ml beaker. Measure the temperature of solution B in 100ml beaker after every 10 seconds. At 30th seconds add magnesium ribbon to solution B and continue recording the temperature. Stir the mixture continuous with a thermometer making sure that the magnesium ribbon remains in the solution as it reacts. Measure the temperature after ever 10 seconds and record values at the table below. Continue stirring and measure the temperature to complete table 1 below.

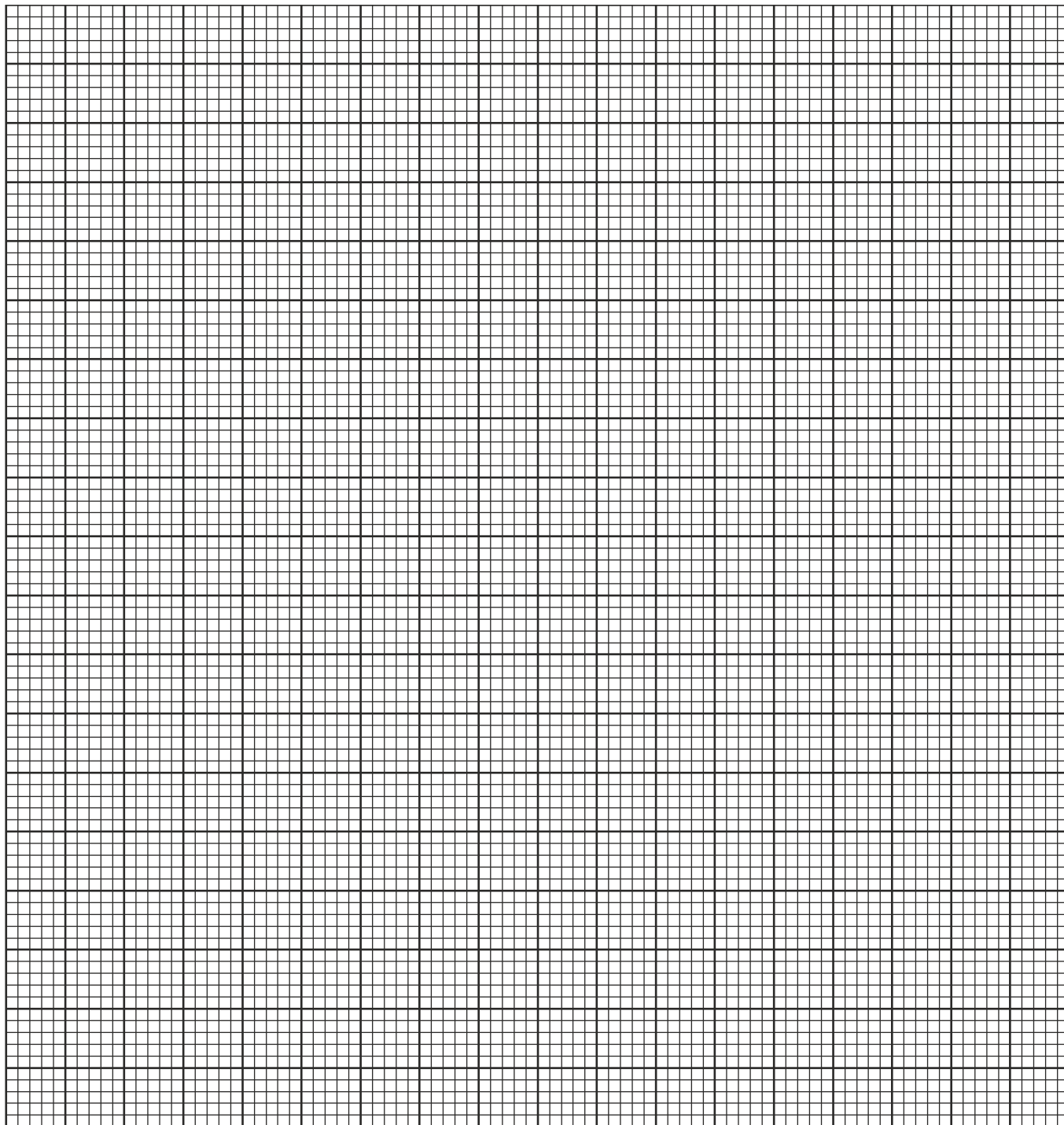
Keep the resulting solution for use in procedure 2.

Table 1

a)

Time (sec)	0	10	20	30	40	50	60	70	80	90	100	110	120	130
Temperature (°C)				X										

- i) Plot graph of temperature against time on the grid provided. (3mks)



ii) On the graph, show the maximum change in temperature ΔT and determine its value.

Procedure 2

Transfer all the solution obtained in procedure 1 into 250ml volumetric flask. Top up with distilled water to 250ml mark. Label it with solution D. Empty the burette and fill it with solution C. Pipette 25ml of solution D and place it in 250ml conical flask. Add drops of phenolphthelene indicator and titrate solution C against solution D. Record the results in table 2. Repeat the titration of solution C against solution D and complete table 2.

Table 2

b)

	I	II	III
Find burette reading			
Initial burette reading			
Volume of solution C (cm ³)			

(4mks)

i) Calculate average volume of solution C used. (1mk)

ii) Calculate the number of moles of:

I 0.3M NaOH (1mk)

II Hydrochloric acid in 25cm³ of solution D. (1mk)

III Hydrochloric acid in 250cm³ of solution D. (1mk)

IV Hydrochloric acid in 50cm³ of solution B. (1mk)

V Hydrochloric acid that reacted with magnesium. (1mk)

VI Magnesium that reacted. (1mk)

c).Using your answer in iv above, determine molar heat of reaction between magnesium and hydrochloric acid. Assume the heat capacity of solution is $4.2\text{Jg}^{-1}\text{k}^{-1}$ and density of solution 1g/cm^3 . (2mks)

2. You are provided with solid E. Carry out the experiments below. Write your observation and inferences in the space provided.

a) Place all solid E in a boiling tube. Add about 20cm^3 distilled water and shake until all the solid dissolves label this solution E. use solution E for experiments (i) and (ii)

i) To 2cm^3 of solution E in a test tube in each of experiments I,II,III and IV add:

I Two drops of aqueous sodium sulphate;

Observations	Inferences
(1mk)	(1mk)

II Five drops of aqueous sodium chloride;

Observations	Inferences
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(1mk)	(1mk)
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III Two drops of barium Nitrate;

Observations	Inferences
(1mk)	(1mk)

IV Two drops of lead (ii) Nitrate

Observations	Inferences
(1mk)	(1mk)

ii) To 2cm³ of solution E in a test tube add 5 drops of aqueous sodium hydroxide. Add a piece of Aluminium foil provided to the mixture and shake. Warm the mixture and test any gas produced with the and read litmus papers.

Observations	Inferences
(2mk)	(1mk)

3. You are provided with solid F. Carry out the following tests and record the observations and inference in the space provided.

a) Place about one third of the solid F on a clean metallic spatula and burn it in a Bunsen burner flame.

Observations	Inferences
(1mk)	(1mk)

b) Place the remaining amount of solid F in a boiling tube. Add about 10cm³ of distilled water and shake use the mixture for tests (i) to (ii)

Observations	Inferences
(½mk)	(½mk)

i) Using about 2cm³ of the mixture in a test tube determine the PH Using universal indicator paper and chart.

PH	Inferences
(1mk)	(1mk)

ii) To about 2cm³ of the mixture in a test tube add three drops of acidified potassium manganese vii.

Observations	Inferences
(1mk)	(1mk)

iii) To about 2cm³ of the mixture in a test tube add two or three drops of bromine water.

Observations	Inferences
(1mk)	(1mk)

