Name_____ Index_____

233/3

CHEMISTRY   Candidate's Signature_____

Paper 3   Date_____

PRACTICAL

Mar/April, 2014

$2\frac{1}{4}$ hours

MINI- MOCK EXAMINATIONS :Kenya Certificate of Secondary Education

Instructions to Candidates

(a) Write your name and index number in the spaces provided above, sign and date.

(b) Answer ALL the questions in the spaces provided in the question paper

(c) Spend the first 15 minutes of time allowed for this paper reading the question paper and make sure you have all the chemicals and apparatus needed.

(d) All working must be clearly shown where necessary. Write answers in good English.

(e) Electronic calculators may be used

(f) This paper consists of **7** printed pages. Candidates should check that all the pages are printed as indicated and that no questions are missing.

For Examiners use only

Question	Maximum Score	Candidate's Score
1(a)	11	
1(b)	$8\frac{1}{2}$	
2	$9\frac{1}{2}$	
3	11	
Total Score:	40	

30

1. You are provided with

- Magnesium powder, solid A

- Hydrochloric acid, solution B

- 0.25 M sodium hydroxide solution D

You are required:

(a) Determine moles of magnesium used in a reaction between magnesium and hydrochloric acid

(b) Make a solution using the unreacted acid and find its concentration

Procedure I

Using a burette, place 50.0cm³ solution B in a 100ml beaker. Measure the temperature of the solution and record it.

Temperature of the solution_____ (½ mark)

Add all solid A provided to the acid and start a stop watch immediately. Stir the mixture gently with the thermometer and record the temperature of the mixture after every minute in table 1.

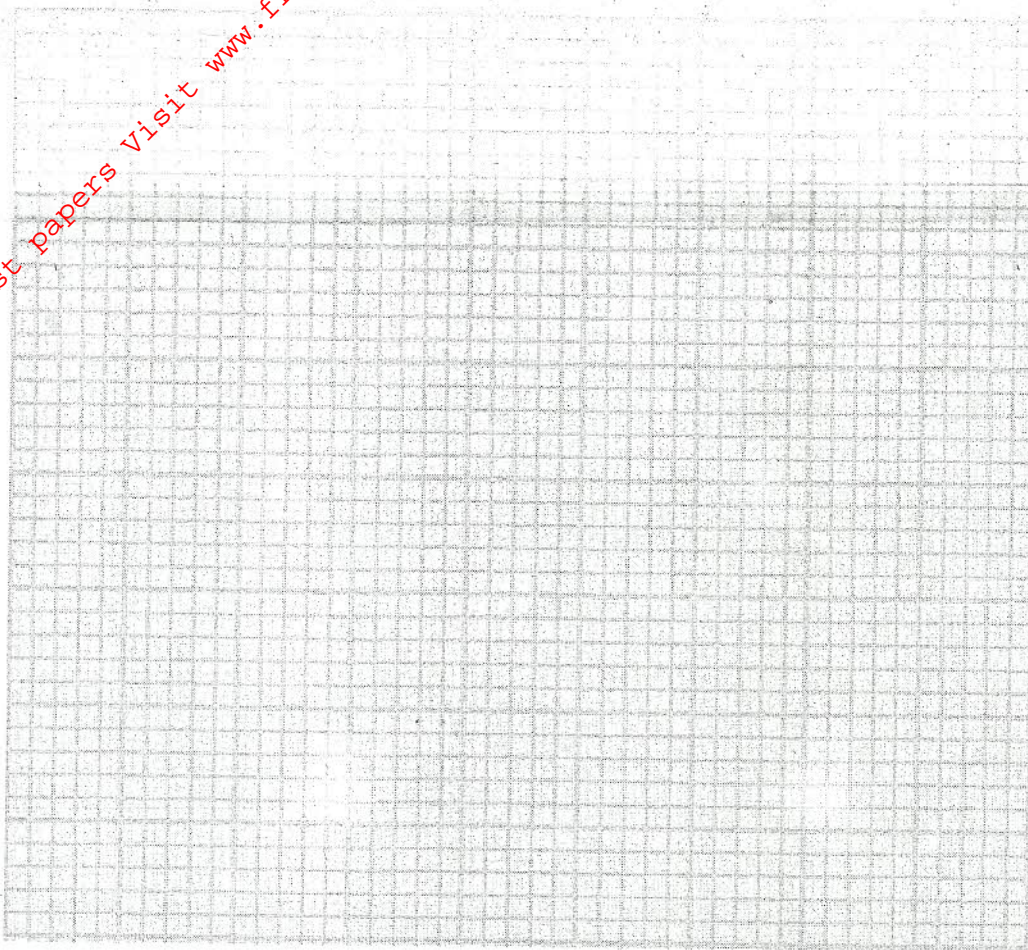Retain the mixture for use in procedure II

Table 1

Time (min)	1	2	3	4	5	6
Temperature(⁰C)						

(3marks)

(a) Plot a graph of temperature (vertical axis) against time in the grid provided   (3 marks)

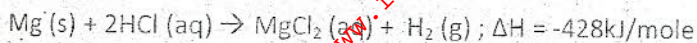(a) From the graph determine the highest change in temperature, ΔT ($1\frac{1}{2}$ marks)

(b) Calculate the heat change for the reaction in kJ using $-\Delta H = mc\Delta T$

(specific heat capacity of solution is 4.2Jg⁻K⁻; density of the solution is 1gcm⁻³).   (2 marks)

(c) The thermochemical equation for the reaction is

$Mg(s) + 2HCl(aq) \rightarrow MgCl_2(aq) + H_2(g)$; $\Delta H = -428kJ/mole$

Find the moles of the metal which reacted with the acid   (1 mark)

Procedure II

Put the mixture obtained in procedure I into a 250ml volumetric flask. Add distilled water to make 250.0 cm³. Label the solution obtained as solution C. Fill a burette with solution C. Pipette 25cm³ of solution D into a conical flask and add 3 drops of phenolphthalein indicator.

Titrate solution C against solution D till the mixture becomes colourless. Repeat the titration and record your results in the table II below.

Experiment	1	2	3
Final burette reading			
Initial burette reading			
Volume of solution C used (cm³)			

(4 marks)

(a) Determine the average volume of solution C used   (½ mark)
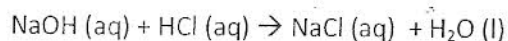

(b) Calculate the number of moles of solution D used.   (1 mark)

(c) Calculate the number of moles of hydrochloric acid in 250cm³ of solution C.   (2marks)

$NaOH(aq) + HCl(aq) \rightarrow NaCl(aq) + H_2O(l)$

(d) Find the molarity of solution C   (1mark)

33

2. You are provided with sodium carbonate, solid E. You are to determine the solubility of sodium carbonate.

Procedure III

(i) Put all solid E in 100ml beaker and add about 30 cm³ of distilled water and stir the mixture gently with a thermometer for about one minute. Record the temperature of the mixture.

Temperature of the mixture_____ ($\frac{1}{2}$ mark)

(ii) Filter the mixture into a 10ml measuring cylinder. When exactly 10cm³ of the filtrate is collected, transfer it into a conical flask and add 2 drops of phenolphthalein indicator to it. Fill the burette with 2M hydrochloric acid. Titrate the acid against the filtrate till the indicator turns colorless. Record the volume of acid used. Continue adding the acid till effervescence in the conical flask stops. Record the second burette reading.

Refill the burette and repeat the procedure with another 10cm³ of the filtrate.

Table II

| Experiment	1	2
Reading when effervescence stops		
Reading when phenolphthalein turns colourless		
Initial burette reading	0.0	0.0

(3 marks)

(a) (i) Find the average of the volume of acid used when effervescence stops ($\frac{1}{2}$ mark)

(ii) Find the average volume of acid used when phenolphthalein turns colourless ($\frac{1}{2}$ mark)

(b) Equation for the overall reaction is

Na_2CO_3 (aq) + 2HCl (aq) → 2NaCl (aq) + CO_2(g) + H_2O (l)
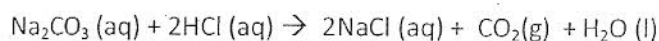
Calculate the number of moles of

(i) hydrochloric acid used (1 mark)

34

(ii) sodium carbonate reacted (1mark)

(c) Calculate the mass of sodium carbonate in 10 cm³ of the filtrate. (RMM of sodium carbonate = 286)

(1mark)

(d) The mass of the 10 cm³ of the filtrate was 14.86g, determine the solubility of sodium carbonate in g/100 g of water. (2 marks)

3. You are provided with solid F. Carry out the following tests and write your observations and inferences in the spaces provided.

(a) (i) Put about 10cm³ of 2M hydrochloric acid in a boiling tube and.add half a spatula of solid F.

Heat the mixture and shake the boiling tube for about 1 minute. Filter the mixture into a clean test tube and divide the filtrate into 3 portions, about 1cm³each.

Observation	Inferences

(2marks)

(ii) To the first portion of the filtrate add a few drops of sodium hydroxide then excess (about 3 cm³)

Observation	Inferences

(2 marks)

35

(iii) To the second portion of the filtrate add a few drops of hydrogen peroxide and shake. Then add excess sodium hydroxide solution (about 3cm³). Shake the mixture.

Observation	Inferences

(2 marks)

(b) (i) Add about 5cm³ distilled water to solid G in the test tube and shake.

Observation	Inferences

(2 marks)

(ii) Add 2 drops of $Ba(NO_3)_2$ solution then about 1cm³ HCl (aq) to the mixture and shake.

Observation	Inferences

(3 marks)

Requirements

1. Magnesium powder

2. About 130cm^3 of hydrochloric acid, solution D

3. About 100cm^3 of 0.25M sodium hydroxide solution, solution D

4. Thermometer, -10 to 110^{0}C

5. A 50ml burette

6. Two conical flasks

7. Phenolphthalein indicator

8. Two 100ml glass beakers

9. Two measuring cylinders, 100ml and 10ml

9. 6 clean test tubes in a rack

10. Distilled water, 500ml in a wash bottle

11. Stop-watch

12. Sodium carbonate about 15g

13. About 0.3 g of solid G each in solid container

14. Two filter papers and funnel

15. Spatula

Reagents

16. 2M sodium hydroxide solution

17. Hydrogen peroxide solution

18. 2M Barium nitrate solution with a dropper

19. 2M HCl acid solution with a dropper