# THE KENYA NATIONAL EXAMINATIONS COUNCIL Kenya Certificate of Secondary Education

233/3 -

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# CHEMISTRY (PRACTICAL)

- Paper 3

Nov. 2018 - 21/4 hours

Na	meIndex Number
Ca	ndidate's Signature Date
ins	tructions to candidates 2018 2018 2018 2018 2018 2018 2018 2018
(a)	Write your name and The number in the spaces provided above 2018 2018 2018 2018 2018 2018 2018 2018
(b)	Sign and write the date of examination in the spaces provided above
(c)	Answer ALL the questions in the spaces provided in the question paper.
(d)	You are <b>NOT</b> allowed to start working with the apparatus for the first 15 minutes of the 2½ 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 2018 2018 2018 2018 2018
(e)	All working MUST be clearly shown where necessary 2018 2018 2018 2018 2018
<i>(f)</i>	KNEC mathematical tagges and รูปยู่กู้เรียงtronic เลือนในสาดาร may be นิธิยน.
(g)	This paper consists of 8 printed pages. 2
(h)	Condidates about about 12018 2018
	and that no questions are missing 2018 2018 2018 2018 2018 2018 2018 2018
(i)	Candidates should answer the questions in English, 2
1	2018 2018 2018 2018 2018 2018 2018 2018

For Examiner's Use Only

Question	Maximum Score	Candidate's Score
1	20	
2	11	
3	09	
Total Score	40	



#### 1. You are provided with:

- 0.30 g solid A, magnesium metal
- Hydrochloric acid, solution B
- 0.15 sodium carbonate, solution C
- Methyl orange indicator

You are required to determine the:

- Enthalpy change,  $\Delta H$  per mole, of the reaction between magnesium metal and excess hydrocholoric acid.
- Concentration in moles per litre of hydrochloric acid, solution B.

# PROCEDURE I

120

- Using a burette, measure 50.0 cm<sup>3</sup> of solution B and place it in a 100 ml plastic beaker. (i) (ii)
- Measure the temperature of solution B in the beaker after every 30 seconds and record it
- At the 90th second, add all of the solid A provided into the beaker, stir with the (iii) thermometer and continue measuring and recording the temperature after every 30 seconds. Complete Table 1. Retain the mixture in the beaker for use in procedure II.

Table 1

Time (seconds)	0	30	60	90	120	150	180	210	240	270
Temperature (°C)	21-0		9	X		·		+		

(3 marks)

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

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(b)	Determine the change in temperature, $\Delta T$ , for the reaction. Show the working on the graph.
	$\Delta T = \dots (1 \text{ mark})$
(c)	Calculate the heat change, in joules, for the reaction. Assume that for the solution, specific heat capacity is $4.2 \mathrm{J}\mathrm{g}^{-1}\mathrm{K}^{-1}$ and density is $1.0 \mathrm{g}\mathrm{cm}^{-3}$ . (2 marks)

(d)	The relative atomic mass of n the reaction per mole of magr	nesium. Indicate	the sign of $\Delta H$ .	el n
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PRO	CEDURE II			
(i)	Fill a clean burette with the 0.	15M sodium carl	conste solution C	
(ii)	Place all of the mixture in the l	beaker from <b>proc</b>	cedure Linto a 250 n	nl volumetric flask
(iii)	Add distilled water to the mark Using a pipette filler, pipette 23	Cand shake thoro	mohly I shel the mix	turo no colordia.
` ,	bipette Zi	J.O CHIE OF SOMITIO	10 11 1010 a 750 ml co	ا المواسم
	2 grobs of memyl orange indic	ator.		
(iv)	Titrate solution <b>D</b> in the conica	ator.		
(iv) (v)	Titrate solution D in the conicathe readings in Table 2.	ator. al flask with the s	sodium carbonate, so	
, ,	Titrate solution D in the conicathe readings in Table 2. Repeat steps (iii) and (iv) and conicather the readings in Table 2.	ator. al flask with the s	sodium carbonate, so	
(v)	Titrate solution D in the conicathe readings in Table 2. Repeat steps (iii) and (iv) and conicather the readings in Table 2.	ator.  al flask with the s  complete <b>Table 2</b>	sodium carbonate, so	lution C and reco
(v)	Titrate solution D in the conicathe readings in Table 2. Repeat steps (iii) and (iv) and conicather the readings in Table 2.	ator. al flask with the s	sodium carbonate, so	
(v)	Titrate solution D in the conicathe readings in Table 2. Repeat steps (iii) and (iv) and conicather the readings in Table 2.	ator.  al flask with the s  complete <b>Table 2</b>	sodium carbonate, so	lution C and reco
(v) Table	Titrate solution D in the conicathe readings in Table 2. Repeat steps (iii) and (iv) and conicathe readings in Table 2.  Description of inethyl orange indication in the conicather readings in Table 2.  Description of inethyl orange indication in the conicather reading in the co	ator.  al flask with the s  complete <b>Table 2</b>	sodium carbonate, so	lution C and reco
(v) Table	Titrate solution D in the conicathe readings in Table 2. Repeat steps (iii) and (iv) and c	ator.  al flask with the s  complete <b>Table 2</b>	sodium carbonate, so	lution C and reco
(v) Table Final	Titrate solution D in the conicathe readings in Table 2. Repeat steps (iii) and (iv) and conicathe readings in Table 2.  Description of inethyl orange indication in the conicather readings in Table 2.  Description of inethyl orange indication in the conicather reading in the co	ator.  al flask with the s  complete <b>Table 2</b>	sodium carbonate, so	lution C and reco
(v) Table Final	Titrate solution D in the conicathe readings in Table 2. Repeat steps (iii) and (iv) and conicathe readings in Table 2.  Burette reading	ator.  al flask with the s  complete <b>Table 2</b>	sodium carbonate, so	lution C and reco
(v)  Table  Final  Initia  Volum	Titrate solution D in the conicathe readings in Table 2. Repeat steps (iii) and (iv) and conicathe readings in Table 2.  Burette reading  I burette reading  The conication D is the conication of the conication	ator. al flask with the s complete <b>Table 2</b> I	odium carbonate, so	III  (3 mark
(v) Table Final	Titrate solution D in the conicathe readings in Table 2. Repeat steps (iii) and (iv) and conicathe readings in Table 2.  Burette reading	ator. al flask with the s complete <b>Table 2</b> I	odium carbonate, so	III  (3 mark
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(v)  Table  Final  Initia  Volum	Titrate solution D in the conicathe readings in Table 2. Repeat steps (iii) and (iv) and conicathe readings in Table 2.  Burette reading  I burette reading  The conication D is the conication of the conication	ator. al flask with the s complete <b>Table 2</b> I	odium carbonate, so	III  (3 mark
(v)  Table  Final  Initia  Volum	Titrate solution D in the conicathe readings in Table 2. Repeat steps (iii) and (iv) and conicathe readings in Table 2.  Burette reading  I burette reading  The conication D is the conication of the conication	ator. al flask with the s complete <b>Table 2</b> I	odium carbonate, so	III  (3 markion C, used.

(b)	Calc	culate the number of moles of:	
	(i)	sodium carbonate used.	(1 mark)
			<u>2</u>
	(ii)	hydrochloric acid in the 25.0 cm <sup>3</sup> of solution <b>D</b> .	(1 mark)
			 මු
	(iii)	hydrochloric acid in the 250 cm <sup>3</sup> of <b>solution D</b> .	(1 mark)
	(iv)	hydrochloric acid that reacted with magnesium metal.	(1 mark)
	(v)	total number of moles of hydrochloric acid in the 50.0 cm <sup>3</sup> , solution B.	(1 mark)



(c)	Determine the concentration of hydrochloric	e acid in moles per litre, in <b>solution B</b> .
You are inference	provided with <b>solid E</b> . Carry out the followers in the spaces provided.	ing tests and record the observations and
(a) I	Place about one-third of <b>solid E</b> in a <b>dry</b> test gas with both blue and red litmus papers.	-tube. Heat the solid strongly and test any
	Observations	Inferences
-		
	(2 marks)	(1 mark)
(b) P:	ace the remaining amount of <b>solid</b> E in a boater and shake. Divide the mixture into <b>four</b>	iling tube. Add about 15 cm <sup>3</sup> of distilled test tubes each containing about 2 cm <sup>3</sup> .
(i)	To the first portion, add three or four d	cops of dilute hydrochloric acid.
	Observations	Inferences

	Observations	Inferences
	(½ mark)	(½ mark)
(iii)	To the third portion, add aqueous sodi	um hydroxide dropwise until in exces
	Observations	Inferences
	(1 mark)	(1 mark)
(iv)	To the fourth portion, add aqueous amn	nonia dropwise until in excess.
	Observations	Inferences
		• —
	(1 mark)	(1 mark)
3. You are provi	ded with <b>solid F</b> . Carry out the following the spaces provided.	tests and record the observations and
(a) Place a burner	about one-third of <b>solid F</b> on a <b>clean</b> meta flame.	allic spatula and burn it in a Bunsen
	Observations	Inferences
	Observations	Inferences

Observations	Inferences
(½ mark)	(½ mark)

(i) Using about 2 cm<sup>3</sup> of the mixture in a test-tube, determine the pH using universal indicator paper and chart.

pН	Inferences
(1 mark)	(1 mark)

(ii) To about 2 cm<sup>3</sup> of the mixture in a test tube, add two or three drops of acidified potassium manganate(VII).

Observations	Inferences
(1 mark)	(1 mark)

(iii) To about 2 cm<sup>3</sup> of the mixture in a test-tube add two or three drops of bromine water.

Observations	Inferences
(1 mark)	(1 mark)

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## **PREPARATIONS**

- 1. 0.3 g of solid A weighed accurately.
- 2. Hydrochloric acid, solution B. This is prepared by adding 172.0 cm<sup>3</sup> of concentrated hydrochloric acid of specific gravity 1.18 g cm<sup>-3</sup>, to 500 cm<sup>3</sup> of distilled water in a one litre volumetric flask, then adding distilled water to the mark. Label this as solution B.
- Sodium carbonate, solution C. This is prepared by placing 15.9 g of anhydrous sodium carbonate in a one litre volumetric flask, adding 800 cm<sup>3</sup> of distilled water and shaking to dissolve all the solid, then adding distilled water to the mark. Label this as solution C.
- 4. Aqueous barium nitrate. This is prepared by dissolving 26.0 g of barium nitrate in a 800 cm<sup>3</sup> distilled water in a one litre volumetric flask, then adding distilled water to the mark. Label this as aqueous barium nitrate.
- 5. Aqueous lead(II) nitrate. This is prepared by dissolving 33.0 g of lead(II) nitrate in 800 cm<sup>3</sup> of distilled water in a one litre volumetric flask, then adding distilled water to the mark. Label this as aqueous lead(II) nitrate.
- 6. Acidified potassium manganate(VII). This is prepared by dissolving 3.2 g of potassium manganate(VII) in 200 cm³ of 2M sulphuric acid in a one litre volumetric flask, then adding distilled water to the mark. Label this as aqueous potassium manganate(VII).

## NOTE:

Solids A, E and F will be supplied by the Kenya National Examinations Council.

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