THE KENYA NATIONAL EXAMINATIONS COUNCIL Kenya Certificate of Secondary Education

Ser Far

233/3	-	CHEMISTRY	-	Paper 3
		(PRACTICAL)		
		Nov. 2017 – 2¼ hours		

Name	Index Number		and the second
Candidate's Signature	Date	2 17 14 14 14 14 14 14 14	

Instructions to candidates

- (a) Write your name and index number in the spaces provided above.
- (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 **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 that you may need.
- (e) All working **MUST** be clearly shown where necessary.
- (f) KNEC mathematical tables and silent electronic calculators may be used.
- (g) This paper consists of 8 printed pages.
- (h) Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.
- Candidates should answer the questions in English.

For Exa	For Examiner's Use Only				
Question	Maximum Score	Candidate's Score			
1	19				
2	12				
3	9				
Total Score	40				



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- 1. You are provided with:
 - Solution A, 0.5 M copper(II) sulphate
 - Solid B₁, metal B₁ powder
 - Solid B₂, Iron powder
 - Solution C, 0.02 M acidified potassium manganate(VII)

You are required to determine the:

- Enthalpy change for the displacement reaction between metal B₁ and copper(II) sulphate.
- Mass of iron that reacts with copper(II) sulphate in the displacement reaction.

PROCEDURE I

(a) (i) Using a pipette and a pipette filler, place 25.0 cm^3 of solution A into a 100 m plastic beaker. Allow to stand for about 1 minute and then measure the temperature of the solution. Record the reading in Table 1 as the initial temperature. Add all of solid B₁ to the solution. Stir the mixture carefully with the thermometer and measure the highest temperature reached. This will take about 5 minutes. Record the reading in Table 1 as maximum temperature reached.

Table 1

Maximum temperature reached (°C)	F Ø. ()
Initial temperature (°C)	20 . 0
Change in temperature, ΔT_1 (°C)	10.0
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(3 marks

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II	enthalpy change for the reaction of sulphate.	metal \mathbf{B}_1 with one mole of	f copper(I
	(Assume that for the mixture, speci = 1.0 g cm^{-3})	fic heat capacity = 4.2 Jg^{-1}	K ⁻¹ and c
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	<u> </u>		•••••
The max	rocedure I, (a) (i) with all of metal E imum temperature is reached after ab in Table 2. Retain the mixture for u	out 8 minutes. Record the	
The max readings Table 2	imum temperature is reached after ab	out 8 minutes. Record the	
The max readings Table 2 Maximu	imum temperature is reached after ab in Table 2 . Retain the mixture for u	out 8 minutes. Record the	
The max readings Table 2 Maximu Initial te	imum temperature is reached after ab in Table 2 . Retain the mixture for u um temperature reached (°C)	out 8 minutes. Record the	temperatu
The max readings Table 2 Maximu Initial te Change	imum temperature is reached after ab- in Table 2 . Retain the mixture for u um temperature reached (°C) emperature (°C) in temperature, ΔT_2 (°C)	out 8 minutes. Record the see in PROCEDURE II.	(3
The max readings Table 2 Maximu Initial te Change	imum temperature is reached after ab in Table 2 . Retain the mixture for u um temperature reached (°C) emperature (°C)	out 8 minutes. Record the see in PROCEDURE II.	(3
The max readings Table 2 Maximu Initial te Change	imum temperature is reached after ab- in Table 2 . Retain the mixture for u um temperature reached (°C) emperature (°C) in temperature, ΔT_2 (°C)	out 8 minutes. Record the see in PROCEDURE II.	temperatu (3 ifference
The max readings Table 2 Maximu Initial te Change	imum temperature is reached after ab- in Table 2 . Retain the mixture for u um temperature reached (°C) emperature (°C) in temperature, ΔT_2 (°C)	out 8 minutes. Record the see in PROCEDURE II.	temperatu (3 ifference

I number of moles of copper(II) sulphate used.

Calculate the:

(ii)

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(1 mark)

PROCEDURE II

- (i) Fill a burette with solution C.
- (ii) Filter the mixture obtained in **procedure I (b)** into a 250 ml volumetric flask. Wash the residue with distilled water and add into the flask. Add more distilled water to make up to the mark. Label this as **solution B**₂.
- (iii) Using a pipette and a pipette filler, place 25.0 cm^3 of solution B_2 into a 250 ml conical flask. Titrate solution B_2 with solution C until a permanent pink colour just appears. Record the readings in Table 3.

Repeat step (iii) and complete Table 3.

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(d) Table 3

	ON I	П	III
Final burette reading	0.5.7	5.8	6.7
Initial burette reading	\$ 0.0	0.0	0.0
Volume of solution C used, cm ³	6.7	6.8	6.7

(4 marks)

(e)	Calculate the average volume of solution C used.	(1 mark)
		· · · ·
	A.P.	



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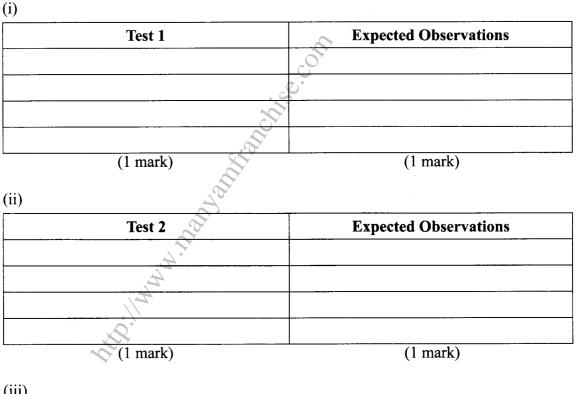
(f)	The equation for the reaction between manganate(VII) and iron(II) ions is:
	$MnO_{4}^{-}(aq) + 5Fe^{2+}(aq) + 8H^{+}(aq) \longrightarrow Mn^{2+}(aq) + 5Fe^{3+}(aq) + 4H_{2}O(aq)$
	Calculate the number of moles of:
	(i) potassium manganate(VII) used. (1 mark)
	(ii) iron (II) ions in 25.0 cm ³ solution B (1 mark)
	(iii) iron that reacted with copper(II) sulphate. (1 mark)
	<u> </u>
(g)	Determine the mass of iron that reacted. (RAM of $Fe = 55.8$) (1 mark)

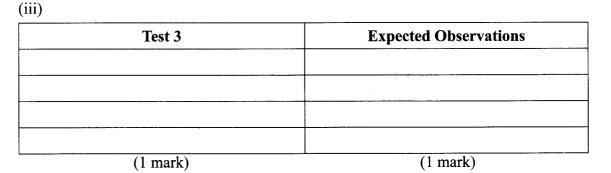
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- 2. You are provided with:
 - Solid K
 - Aqueous ammonia
 - Aqueous sodium sulphate
 - Dilute nitric(V) acid
 - Wooden splint

Solid K is suspected to be lead(II) carbonate.

(a) From the reagents provided, select and describe **three** tests that could be carried out **consecutively** to confirm if **solid** K is lead(II) carbonate. Write the tests and expected observations in the places provided.





(b) Carry out the tests described in (a) using **solid K** and record the observations and inferences in the spaces provided.

(ii (ii

(i)

Test 1

		Observations	Inferences
		(½ mark)	(½ mark)
)	Test 2		
		Observations	Inferences
			S.
		Ċ	
		(1 mark)	(2 marks)
i)	Test 3		
		Observations	Inferences
		E.	
		(1 mark)	(1 mark)

- 3. You are provided with an organic compound **solid M**. Carry out the following tests. Record the observations and inferences in the spaces provided.
 - (a) Place **all** of **solid M** in a boiling tube. Add about 10 cm³ of distilled water and shake. Retain the solution for use in procedure (b) (i), (ii) and (iii).

Observations	Inferences
(1 mark)	(1 mark)

- (b) Use about 2 cm³ portions of the mixture in a test tube for tests (i), (ii) and (iii).
 - (i) To the first portion, add all the solid sodium carbonate provided.

	0^y	T. C
Observations	0	Inferences
		-
	27	
(1 1)	<u></u>	(1 mark)
(1 mark)		

(ii) To the second portion, add two drops of acidified potassium manganate(VII) and warm the mixture.

Observations	Inferences
El j	
.Q.	
(1 mark)	(2 marks)

(iii) To the third portion, add about 2 cm³ of acidified potassium dichromate(VI).
Heat the mixture to boiling and allow to stand for about 2 minutes.

Observations	Inferences
	(1 mark)
(1 mark)	(1)

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