Name..... Index No...../.....

233/3
CHEMISTRY
Paper 3
PRACTICAL
Oct./Nov. 2013
$2\frac{1}{4}$ hours

Candidate's Signature.....

Date.....

THE KENYA NATIONAL EXAMINATIONS COUNCIL
Kenya Certificate of Secondary Education
CHEMISTRY
Paper 3
PRACTICAL
$2\frac{1}{4}$ hours

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 $2\frac{1}{4}$ 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) Mathematical tables and silent electronic calculators may be used.
*(g) **This paper consists of 7 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.***
*(i) **Candidates should answer all the questions in English.***

For Examiner's use only

Question	Maximum Score	Candidate's Score
1	19	
2	12	
3	09	
Total Score		

2013

KNEC 02321002 KCSE

1 You are provided with:

- solution **A**, aqueous copper (II) sulphate;
- solid **B**, iron powder;
- 0.02 M acidified potassium manganate (VII), solution **C**.

You are required to determine the molar heat of displacement of copper by iron.

Procedure I

Using a burette, place 50.0 cm^3 of solution **A** in a 100 ml beaker. Measure the temperature of the solution and record it in table **1** below. Add **all** of solid **B** provided at once and start a stop watch. Stir the mixture **thoroughly** with the thermometer and record the temperature of the mixture after every one minute in the table. **Retain** the mixture for use in procedure **II** below.

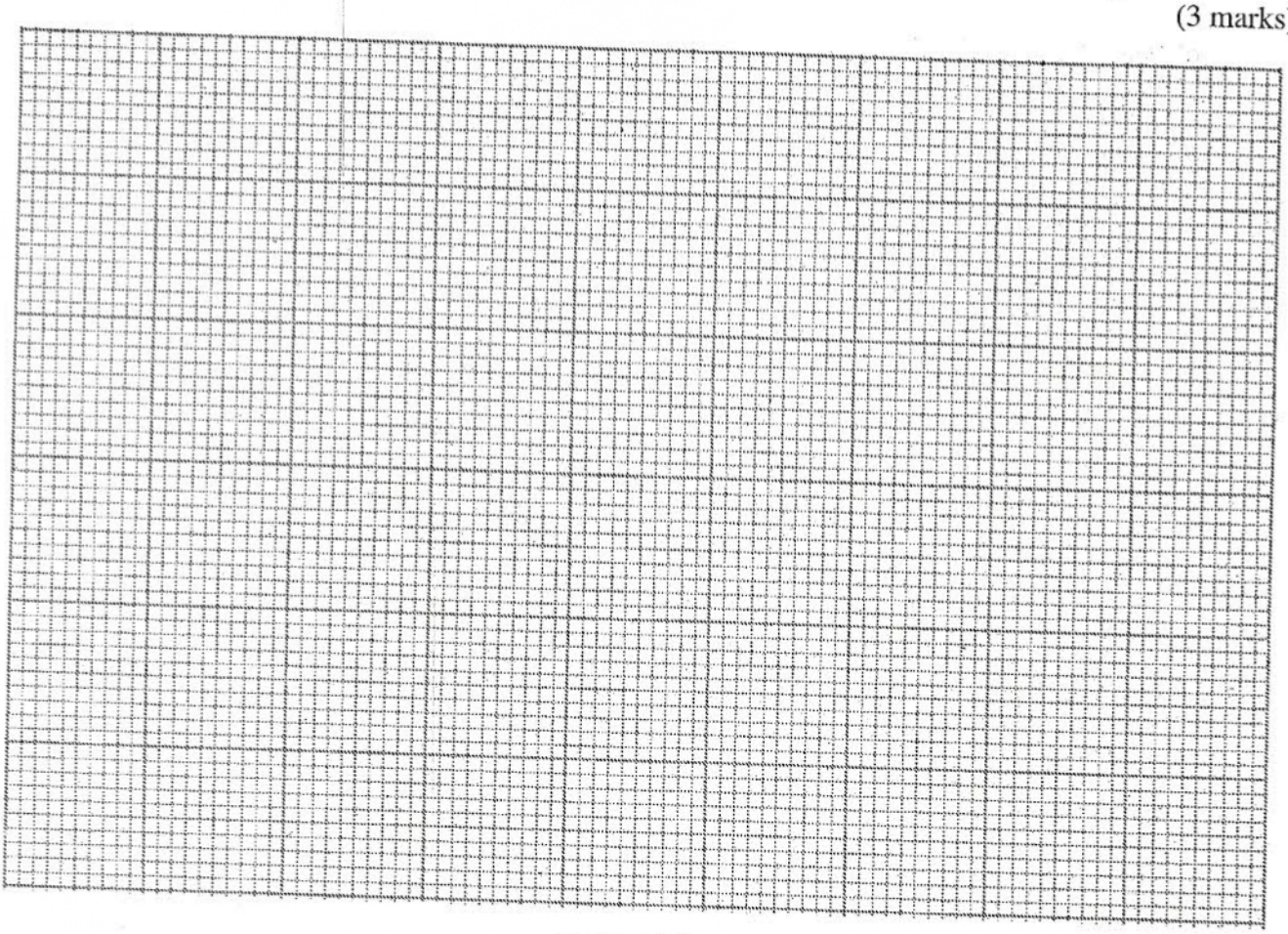
Table 1

Time (Min.)	0	1	2	3	4	5	6	7
Temperature (^0C)								

(3 marks)

(a) (i) Plot a graph of temperature (vertical axis) against time in the grid provided.

(3 marks)



(ii) From the graph, determine the;

(I) highest change in temperature, ΔT; (1 mark)

.....

(II) time taken for reaction to be completed. ($\frac{1}{2}$ mark)

.....

(iii) Calculate the heat change for the reaction. (Specific heat capacity of solution is 4.2 $Jg^{-1} K^{-1}$; Density of the solution is 1 gcm^{-3}). (2 marks)

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.....

.....

Procedure II

Carefully decant the mixture obtained in procedure I into a 250 ml volumetric flask. Add about 10 cm^3 of distilled water to the residue in the 100 ml beaker. Shake well, allow the mixture to settle and carefully decant into the volumetric flask. **Immediately**, add about 50 cm^3 of 2 M sulphuric (VI) acid to the mixture in the volumetric flask. Add more distilled water to make 250.0 cm^3 of solution. Label this as solution **D**.
Fill a burette with solution **C**. Using a pipette and a **pipette filler**, place 25.0 cm^3 of solution **D** into a 250 ml conical flask. Titrate solution **D** against solution **C** until the **first permanent pink** colour is obtained. Record your results in table **2** below. Repeat the titration two more times and complete the table. Retain the remaining solution **C** for use in question 3.

Table 2

	I	II	III
Final burette reading			
Initial burette reading			
Volume of solution **C** used (cm^3)			

(4 marks)

(a) Determine the average volume of solution **C** used. ($\frac{1}{2}$ mark)

.....

(b) Calculate the number of moles of:

(i) aqueous potassium manganate (VII) used; (1 mark)

.....

.....

(ii) iron (II) ions in 25.0 cm^3 of solution **D**. (1 mole of MnO_4^- reacts with 5 moles of Fe^{2+}). (1 mark

.....

.....

(iii) iron(II) ions in 250 cm^3 of solution **D**. (1 mark)

.....

.....

(c) Calculate the molar heat of displacement of copper by iron. (2 marks)

.....

.....

2 You are provided with solid **E**. Carry out the following tests and write your observations and inferences in the spaces provided.

(a) Place **all** of solid **E** in a boiling tube. Add about 10 cm^3 of distilled water and shake thoroughly. Filter the mixture into another boiling tube. **Retain** the filtrate for use in test 2(b) below. Dry the residue using pieces of filter papers.

(i) Transfer about half of the dry residue into a dry test-tube. Heat the residue strongly and test any gas produced using a burning splint.

Observations	Inferences
(1 mark)	(1 mark)

(ii) Place the rest of the residue in a dry test-tube. Add 4 cm^3 of 2M hydrochloric acid. **Retain** the mixture for test (iii) below.

Observations	Inferences
(1 mark)	(1 mark)

(iii) To 2 cm^3 of the solution obtained in (ii) above, add 6 cm^3 of aqueous ammonia dropwise.

Observations	Inferences
(1 mark)	(1 mark)

(b) (i) To 2 cm^3 of the filtrate obtained in (a) above, add about 3 cm^3 of aqueous ammonia (Excess).

Observations	Inferences
(1 mark)	(1 mark)

(ii) To 2 cm³ of the filtrate, add about 2 cm³ of 2M hydrochloric acid.

Observations	Inferences
(1 mark)	(1 mark)

(iii) To 2 cm³ of the filtrate, add one or two drops of barium nitrate solution.

Observations	Inferences
(1 mark)	(1 mark)

3 You are provided with solid **G**. Carry out the tests in (a) and (b) and write your observations and inferences in the spaces provided. Describe the method used in part (c).

(a) Place about one third of solid **G** on a **metallic** spatula and burn it in a Bunsen burner flame.

Observations	Inferences
(1 mark)	(1 mark)

(b) Dissolve all of the remaining solid **G** in about 10 cm^3 of distilled water in a boiling tube. Use the solution for tests (b)(i), (ii) and (c).

(i) Place 2 cm^3 of the solution in a test-tube and add 2 drops of acidified potassium manganate (VII); solution **C**.

Observations	Inferences
(1 mark)	(1 mark)

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

Observations	Inferences
(1 mark)	(1 mark)

(c) Determine the pH of the solution obtained in (b) above.

Method used	Inferences
(2 marks)	(1 mark)

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