NAME: …………………………………………………………INDEX NO:…………………..

SCHOOL: ……………………………………………….STREAM:…………………………

233/3
CHEMISTRY
THEORY
PAPER 3
MAY – JUNE 2014
TIME: 2 HOURS

BUNYORE – MARANDA (BUMA) JOINT EXAMINATIONS
CHEMISTRY PAPER 1 2014

INSTRUCTIONS TO CANDIDATES

- Write your name and index number in the spaces provided above.
- 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 2 ½ hours allowed for this paper. This time it to enable you to read the question paper and make sure you have all the chemicals and apparatus that you may need.
- All working MUST be clearly shown where necessary
- Mathematical tables and electronic calculators may be used.

FOR EXAMINER'S USE ONLY

QUESTION	MAX. SCORE	SCORE---------
1	20	
2	14	
3	6	
TOTAL SCORE	40	

1. You are provided with: -
   - 4.5g of solid A in a boiling tube.
   - Solution B, 0.06M acidified Potassium manganate (VII)

You are required to determine

(1) The solubility of solid A at different temperatures.

(2) The number of moles of water of crystallization in solid A.

PROCEDURE

(a) Using a burette, add 4cm3 of distilled water to solid A in the boiling tube. Heat the mixture while stirring with the thermometer to about 70^0C. When the entire solid has dissolved, allow the solution to cool while stirring with the thermometer. Note the temperature at which crystals of solid A firs appear. Record this temperature in table 1.

(b) Using the burette, 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 A firs appear.

(c) Repeat procedure (b) two more times and record the temperatures in table I. Retain the contents of the boiling tube for use in procedure (e)

(d) (i) Complete table 1 by calculating the solubility of solid A at the different temperatures. The solubility of a substance is the mass of the substance that dissolves in 100cm^3 (100g) of water at a particular temperature. (6 marks)

Table 1

Volume of water in the boiling tube (cm^3)	Temperature at which crystals of solid A first appear (^{0}C)	Solubility of solid A (g/100g water)
4		
6		
8		
10		

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

(iii) Using your graph, determine the temperature at which 100g of solid A would dissolve in 100cm^3 of water. (1 mark)

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(e) (i) 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 A. Fill a burette with solution B. Using a pipette and a pipette filler, place 25.0cm^3 of solution A into a conical flaks. Warm the mixture to about 70^0C. Titrate the hot solution A with solution B until a permanent pink colour persists. Record your readings in table 2. Repeat the titration two more times and complete table 2. (Retain the remaining solution B for use in question 3).

Table 2

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

(3 marks)

(ii) Calculate the:

I. Average volume of solution B used. (1 mark)

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II. Number of moles of potassium manganate (VII) used. (1 mark)

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III. Number of moles of A $25cm^3$ of solution A given that 2 moles of potassium manganate (VII) react completely with 5 moles of A. (1 mark)

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VI. Relative formula mass of A. (2 marks)

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(iii) The formula of A has the form D. xH_2O. Determine the value of x in the formula given that the relative formula mass of D is 90.0 and atomic masses of oxygen and hydrogen are 16.0 and 1.0 respectively.

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2. You are provided with $10cm^3$ P. Solution P contains two cations and one anion. Carry out the tests below and record your observations and inferences in the spaces provided.

(a) Add $20cm^3$ of 2M aqueous sodium hydroxide to all of solution P provided. Shake well filter the mixture into conical flask. Retain both and the residue.

(b)

Observations	Inferences
(1 mark)	(1 mark)

(b) (i) To about $2cm^3$ of the filtrate, add 2m nitric acid dropwise until in excess (i.e. about $1cm^3$ of the acid). Retain the mixture.

Observations
(1 mark)

Divide the mixture in b(i) above into two portions.

(ii) To the first portion, add aqueous sodium hydroxide dropwise until in excess.

Observations	Inferences
(1 mark)	(2 marks)

(iii) To the second portion, add aqueous ammonia drowise until in excess.

Observations	Inferences
(1 mark)	(1 mark)

(c) To $2cm^3$ of the filtrate, add 3 drop of potassium iodide solution.

Observations	Inferences
(1 mark)	(1 mark)

(d) To $2cm^3$ of filtrate, add 3 drops of acidified barium nitrate solution.

Observations	Inferences
(1 mark)	(1 mark)

(e) To the residue in (a) add $8cm^3$ of dilute nitric acid and allow it to filter into a boiling tube.
(i) To $2cm^3$ of this filtrate, add aqueous ammonia dropwise until in excess.

Observations	Inferences
(1 mark)	(1 mark)

3. Dissolve all of solid G in about $10cm^3$ of distilled water in a boiling tube. Use the solution for tests (a) to (c) below.

(a) Place $2cm^3$ of the solution in a test tube and add 2 drops of acidified potassium manganate (VII), solution B from the burette.

Observations	Inferences
(1 mark)	(1 mark)

(b) To $2cm^3$ of the solution in another test-tube, add 2-3 drops of bromine water.

Observations	Inferences
(1 mark)	(1 mark)

(c) To $2cm^3$ of the solution in a third test-tube add a spatula full of the sodium hydrogen powder provided.

Observations	Inferences
(1 mark)	(1 mark)