NAME: …… INDEX NO:……

Candidate's Signature: ……..……..

Date:……

233/3
CHEMISTRY
Paper 3
PRACTICAL
March/April, 2011
Time: 2 ¼ Hours

MOKASA JOINT EVALUATION EXAMINATION

Kenya Certificate of Secondary Education

233/3
CHEMISTRY
Paper 3
PRACTICAL
March/April, 2011
Time: 2 ¼ Hours

Instructions to Candidates

- *Write your name and index number in the spaces provided above.*
- *Sign and write the date of the examination.*
- *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 ¼ 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.*
- *All working **MUST** be clearly shown where necessary.*
- *Mathematical tables and silent electronic calculators may be used.*

FOR EXAMINER'S USE ONLY

Question	Maximum Score	Candidate's Score
1	12	
2	12	
3	16	
Total Score	**40**	

1. You are provided with the following:
Potassium iodide labelled solution A
Sodium thiosulphate labelled solution B
0.02M potassium permanganate labelled solution C
Starch indicator

You are required to standardise sodium thiosulphate solution by potassium permanganate.

When potassium permanganate is added to acidified potassium iodide solution, iodine is liberated and is titrated with the throsulphate solution according to the equation.

$$2KMnO_{4(aq)} + 10KI_{(aq)} + 16HCl_{(aq)} \longrightarrow 12KCl + 2MnCl_{2(aq)} + 8H_2O_{(l)} + 5I_{2(aq)}$$

Sodium thiosulphate reacts with iodine producing sodium iodide and sodium tetrathionate:

$$I_{2(aq)} + 2Na_2S_2O_{3(aq)} \longrightarrow Na_2S_4O_{6(aq)} + 2NaI_{(aq)}$$

Procedure

Fill the burette with solution B. Pipette 25cm^3 of solution A into a conical flask. Using a measuring cylinder, measure 25cm^3 of solution C and add it into the conical flask containing solution A.

From the burette, add solution B into the mixture in the conical flask until a pale yellow colour appears. Add starch indicator dropwise to obtain a blue colour and continue titrating until the blue colour clears. Record the volume in the table I below. Repeat the titration two more times.

Table I

	1	2	3
Final burette reading (cm^3)			
Initial burette reading (cm^3)			
Titre (cm^3)			

(4 mks)

(a) What is the average volume of solution B. (1 mk)

(b) How many moles of potassium permanganate were used in the reaction? (2 mks)

(c) How many moles of iodine were liberated? (1 mk)

(d) Calculate the molarity of sodium thiosulphate solution B given that one mole of iodine reacts with 2 moles of sodium thiosulphate. (2 mks)

(e) Calculate the concentration of solution B in g/l. (Na = 23, O = 16, S = 32) (2 mks)

2. You are provided with a 250 ml beaker, a boiling tube, a thermometer, tripod stand, wire gauze, source of heat, burette and solid X.

You are required to find out the effect of temperature changes on solubility of X in water.

(i) X is exactly 4.0g. Place it a clean dry boiling tube.

(ii) Add 10.0cm^3 of distilled water from a burette to the crystals; warm the mixture using a water bath or heat directly until all the crystals dissolve.

(iii) Cool the solution over a running tap of cold water or cold water bath in a beaker. As the solution cools, stir continuously with the thermometer and note the temperature when the crystals start to form.

Record the temperature in the table below and continue adding 10.0 cm^3 portions of water until 50.0cm^3 of water have been added noting the temperature at which crystals occur in each case. (RMF of X = 122.5).

Table II

Total volume of water added to solid X	10	20	30	40	50
Mass of solid X in grams per 100g of water	40			10	0
No. of moles of X per 100 g of water	0.33		0.11		
Crystallization temperature					

(a) Calculate the missing values in table II. (6 mks)

(b) From the table of results, draw a graph of solubility of solid X in moles per 100g of water against temperature. (4 mks)

(c) From your graph find the solubility of solid X in moles per 100g of water at: (2 mks)

(i) 30ºC

(ii) 45ºC

3. You are provided with solid P in boiling tube. P contains two cations and two anions. Carry out the tests below on solid P and record your observations and inferences in the spaces provided.

(i) Add about 20cm^3 of distilled water to all solid P provided. Shake well. Filter the mixture into a conical flask. **RETAIN BOTH THE FILTRATE AND THE RESIDUE.**

Observation	Inferences
(1 mk)	(1 mk)

(ii) Put a little of the filtrate into a clean metallic spatula and hold it over a Bunsen burner flame.

Observation	Inferences
(1 mk)	(1 mk)

(iii) To about $2cm^3$ of the filtrate add aqueous sodium hydroxide dropwise until in excess.

Observation	Inferences
(1 mk)	(1 mk)

(iv) To about $2cm^3$ of the filtrate, add three drops of acidified barium chloride.

Observation	Inferences
(1 mk)	(1 mk)

(b)(i) Scoop a little of the residue using a clean metallic spatula and hold it over a Bunsen flame.

Observation	Inferences
(1 mk)	(1 mk)

(ii) Put the remaining residue in a clean test-tube and add about $10cm^3$ of dilute nitric acid. Test for any gas produced using a glass rod dipped in a solution of calcium hydroxide. Retain the solution.

Observation	Inferences
(2 mks)	(1 mk)

(iii) To about $2cm^3$ of the solution obtained in b(ii) above, add sodium hydroxide solution until in excess.

Observation	Inferences
(1 mk)	(1 mk)

(iv) To about $2cm^3$ of the solution obtained in b(ii) above add aqueous ammonia solution till in excess.

Observation	Inferences
(½ mk)	(½ mk)