

NAME..... INDEX NO.....

CANDIDATE'S SIGNATURE.....

DATE.....

233/3

CHEMISTRY (PRACTICAL)

PAPER 3

JULY/AUGUST 2011

TIME: 2¼ HRS.

## NANDI EAST, NANDI SOUTH AND TINDIRET DISTRICTS JOINT EXAMINATION 2011

*Kenya Certificate of Secondary Education*

*CHEMISTRY PAPER 3 (PRACTICAL)*

*TIME: 2¼ HRS.*

### INSTRUCTIONS TO CANDIDATES:

Answer **all** the questions in the spaces provided in this question paper.

In the first 15 minutes read the questions carefully before you start working with the apparatus.

All workings **must be** clearly shown.

Mathematical table and electronic calculators **may be** used.

### FOR EXAMINER'S USE ONLY:

Questions	Maximum Score	Candidate's Score
1	22	
2	10	
3	08	
<b>Total Score</b>	<b>40</b>	

1. You are provided with:

- (i) Solution A - Ferrous ammonium sulphate ( $\text{FeSO}_4 \cdot (\text{NH}_4)_2 \text{SO}_4 \cdot \chi \text{H}_2\text{O}$ ) containing 8.5g in  $250\text{cm}^3$  of solution.
- (ii) Solution B - 0.02M of acidified potassium manganate (VII).
- (iii) Solution C - An organic substance.
- (iv) Stopwatch.
- (v) Thermometer.

You are required to:

- (i) Determine the value of  $\chi$  in  $\text{FeSO}_4 \cdot (\text{NH}_4)_2 \text{SO}_4 \cdot \chi \text{H}_2\text{O}$ .
- (ii) Determine how the rate of reaction of potassium manganate (VII) with organic substance C varies with change in temperature.

**Procedure I:**

Fill the burette with solution B. Pipette  $25\text{cm}^3$  of solution A into a clean conical flask and titrate until the solution turns pink. Record your results in the table **I** below. Repeat the procedure two more times and record your results in table **I** below. Retain the remaining unused solution B to be used in procedure **II**.

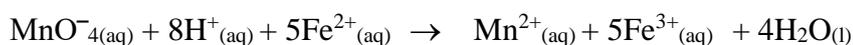
(a) **Table I**

	I	II	II
Final burette reading ( $\text{cm}^3$ )			
Initial burette reading ( $\text{cm}^3$ )			
Volume of solution B used ( $\text{cm}^3$ )			

(b) (i) Calculate the average volume of solution B used. (1mk)

(ii) Calculate the number of moles of solution B that reacted. (1mk)

(c) Given that the reaction equation is



Determine:

(i) the number of moles of iron II salt solution A in  $25\text{cm}^3$  of the solution used. (1mk)

(ii) the concentration of solution A in grams per litre. (2mks)

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(iii) the relative formula mass of the iron (II) salt used. (2mks)

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(iv) the value of  $\chi$  in the formula  $\text{FeSO}_4 \cdot (\text{NH}_4)_2 \text{SO}_4 \cdot \chi \text{H}_2\text{O}$ .  
(Fe = 56, N = 14, S = 32, O = 16) (1mk)

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### **Procedure II**

- Using 10ml measuring cylinder place 1cm<sup>3</sup> of solution **B** (acidified potassium manganate (VII) ) into each of the five test tubes.
- Using a clean 50ml measuring cylinder place 24cm<sup>3</sup> of solution **C** into a boiling tube.
- Insert a thermometer into the solution **C** in the boiling tube and warm until it attains a temperature of 40°C.
- Place the boiling tube in the test tube rack and add the first portion of solution B in the test tube at the same time start the stopwatch. Record the time taken for the purple colour to be decolourised in the table **II below**.
- Repeat the procedure at temperatures of 50°C, 60°C, 70°C, 80°C and record your results in the table **II below**.

(a) **Table II**

Temperature of solution C (°C)	40	50	60	70	80
Time taken for colour to decolourise (t) sec					
Rate ( $1/t$ ) S <sup>-1</sup>					

(5mks)

(b) (i) Using the grid (graph) provided plot a graph of ( $1/t$ ) Sec<sup>-1</sup> (Y-axis) against temperature (°C). (3mks)

(3mks)

## GRAPH

- (ii) From the graph determine the time taken for decolourization of the mixture if the temperature of the solution was 58°C. (1mk)

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- (iii) State how the rate of reaction of potassium manganate (VII) and organic substance vary with increase in temperature. (1mk)

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2. You are provided with solid F. Carryout the tests below. Write your observations and inferences in the spaces provided.

- (a) Take a spatula endful of solid F in a dry test tube and heat strongly. Test any gas(es) produced using a litmus paper.

Observations	Inferences
(2mks)	(1mk)

- (b) Transfer the remaining portion of solid F into a boiling tube. Add 15cm<sup>3</sup> of distilled water and shake until all the solid dissolves. Divide into three portions of about 2cm<sup>3</sup> each.

- (i) To the first portion add sodium hydroxide dropwise till in excess.

Observations	Inferences
(1mk)	(1mk)

- (ii) To the second portion add few drops of lead II nitrate solution and warm.

Observations	Inferences
(1mk)	(1mk)

- (iii) To the third portion add Barium nitrate solution followed by a few drops of 2M hydrochloric acid.

Observations	Inferences
(1mk)	(1mk)

3. You are provided with solid G. Carry out the tests below. Write your observations and inferences in the spaces provided.

- (a) Using a metallic spatula heat half of solid G strongly over a Bunsen burner flame.

Observations	Inferences
(1mk)	(1mk)

- (b) Transfer all of the remaining solid G into a clean boiling tube, and add about 10cm<sup>3</sup> of distilled water and shake until all the solid dissolves. Divide the solution into three portions.

- (i) To the first portion add 2-3 drops of acidified potassium manganate (VII).

Observations	Inferences
(1mk)	(1mk)

- (ii) To the second portion add 2-3 drops of bromine water.

Observations	Inferences
(1mk)	(1mk)

- (iii) To the third portion add 2-3 drops of universal indicator and determine its P<sup>H</sup>.

Observations	Inferences
(1mk)	(1mk)