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

SCHOOL …………………………………………… CANDIDATE'S SIGNATURE….…..……..

DATE….……………………………………

233/3
CHEMISTRY
PAPER 3
(PRACTICAL)
JULY/AUGUST, 2014
TIME: 2¼ HOURS

TRANS-NZOIA COUNTY JOINT EVALUATION EXAMINATION-2014
Kenya Certificate of Secondary Education

CHEMISTRY
PAPER 3
(PRACTICAL)
TIME: 2¼ HOURS

- *INSTRUCTIONS TO CANDIDATES:*
- *Write your name and index number and school in the spaces provided.*
- *Sign and write the date of examination in the spaces provided above.*
- *Answer ALL questions in the spaces provided in this question paper.*
- *You are NOT allowed o start working with the apparatus for the first 15 minutes of 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.*
- *All workings MUST be clearly shown where necessary.*
- *Mathematical tables and electronic calculators may be used.*

FOR EXAMINER'S USE ONLY:

QUESTION	MAXIMUM SCORE	CANDIDATES SCORE
1	21	
2	10	
3	09	
TOTAL SCORE	40	

This paper consists of 6 printed pages. Candidates should check to ascertain that all papers are printed as indicated and that no questions are missing.

1.   You are provided with:
        - 2M hydrochloric acid solution A.
        - 2M sodium hydroxide solution B.
        - 2g of dustless chalk (impure calcium carbonate) solid P.

        You are required to:
        Determine how the rate of the reaction of calcium carbonate (marble chips) with hydrochloric acid varies with the concentration of hydrochloric acid.

        Procedure I
        (a)   Measure 10cm³ of solution B into a 100cm³ measuring cylinder. To this solution add distilled water to make to the 100cm³ mark. Transfer into a conical flask and label this solution C. Fill the burette with sodium hydroxide solution C.

        (b)   Label 5 test tubes as A, B, C, D and E.

        (c)   Using a dropper and the 10cm³ measuring cylinder measure 1cm³ of solution A and place it in test tube A.

        (d)   Measure 100cm³ of solution A using the 100ml measuring cylinder and place in the conical flask. Place all solid P in the same conical flask. **IMMEDIATELY START THE STOP WATCH**.

        (e)   Swirl the mixture for 1 minute. Using the dropper and 10cm³ measuring cylinder draw 1cm³ of the reacting mixture and place in test tube B.

        (f)   Swirl the mixture for a further 1 minute and repeat procedure (e) to fill test tubes C.

        (g)   Repeat procedure (f) to fill test tubes D and E.

        (h)   To each of the test tube A – E add 10cm³ of water. Transfer the content of test tube A into a clean conical flask. Add 2-3 drop phenolphthalein indicator to the solution in conical flask. Titrate this solution against the solution B in burette by adding solution B from the burette drop by drop until the solution Just turns permanently PINK. Record the volume required in table.

        (i)   Pour the contents in the conical flask and rinse it with distilled water. Repeat procedure (h) with contents in test tubes B, C, D and E to complete table 1.

        RETAIN THE REACTING MIXTURE FOR USE IN PROCEDURE II – label it as solution P.
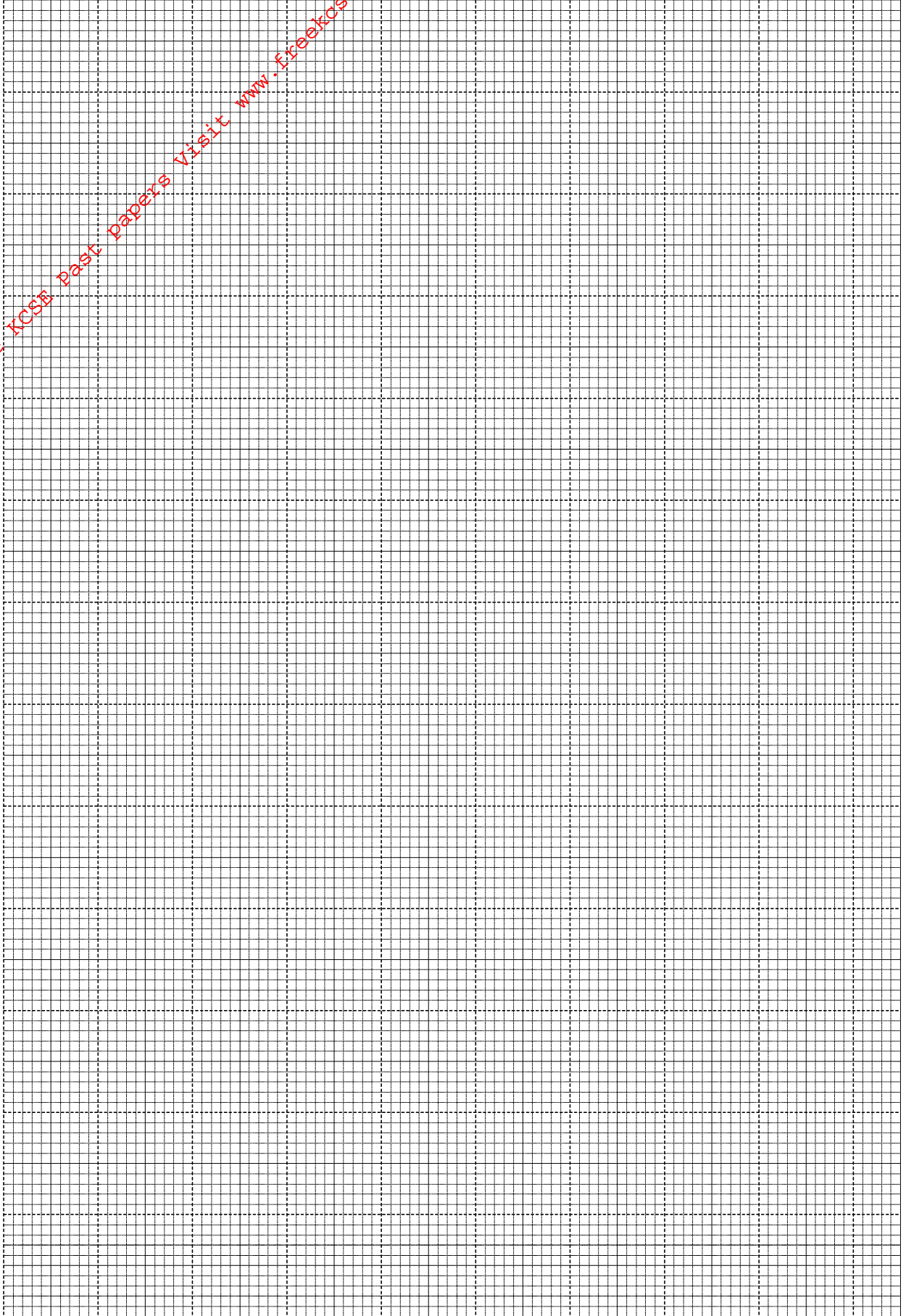
        Table 1

Test tube	A	B	C	D	E
Time (minutes)	0	1	2	3	4
Final burette reading					
Initial burette reading					
Volume of solution B used (cm³)					

        (6 marks)

        (a)   Plot a graph of volume of sodium hydroxide solution B used (vertical axis) against time (horizontal axis).   (3 marks)

(b) (i) Use the graph determine the volume of solution B that reacts with 1cm³ of reacting mixture after 3½ minutes. (1 mark)

(ii) Find the concentration of the reacting mixture after minutes. (2 marks)

(c) In terms of the rate of the reaction, explain the shape of your graph. (1 mark)

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Procedure II

Filter solution P obtained in procedure I above into a clean conical flask. Pipette 25cm³ of the solution P obtained in procedure I into a 250cm³ conical flask. To this solution add 20cm³ of water. Rinse the burette and fill it with sodium hydroxide solution B and titrate using 2-3 drops of phenolphthalein indicator. Record in table **2 below** and repeat to complete the table.

Table 2

Experiment number	I	II	III
Final burette reading (cm³)			
Initial burette reading (cm³)			
Volume of B used (cm³)			

(4 marks)

(a) Calculate the average volume of B used. (1 mark)

(i) Determine the number of moles of excess hydrochloric acid in 25cm³ of solution P. (1 mark)

(ii)   Calculate the number of moles of hydrochloric acid in 100cm³ of
         solution P.   (1 mark)

(iii)   Determine the number of moles of acid that reacted with active component of
         chalk.   (2 marks)

2.   You are provided with solid L. Carry out the tests below. Write your observations and
     inferences in the spaces provided.
     (a)   Place all of solid L in a dry test tube and heat it strongly for about 2 minutes. Test the
             gas with a glowing splint. Keep the residue for tests in (b).

Observation	Inference
(1mk)	(1mk)

     (b)   Allow the residue from (a) above to cool for about 3 minutes. Add 5-6 drops of
             concentrated nitric acid, and then add distilled water until the test tube is three
             quarters full. Filter the mixture into a boiling tube then add more distilled water to
             the filtrate until the boiling tube is half full. Shake well. Use the solution obtained
             for the tests **below**.
             (i)   To about 2cm³ portion of the solution in a test tube add 2M sodium hydroxide
                     dropwise until in excess.

Observation	Inference
(1mk)	(1mk)

             (ii)   To another 2cm³ portion of the solution in a test tube add aqueous ammonia
                     dropwise until in excess.

Observation	Inference
(1mk)	(1mk)

(iii) To the third portion of the solution add a spatula end full of solid sodium carbonate.

Observation	Inference
(1mk)	(1mk)

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

(a) Place of spatula measure of solid H in a clean dry boiling tube. Add a spatula end full of copper (II) oxide and heat strongly. Test any gas produced with a glass rod dipped in calcium hydroxide solution.

Observation	Inference
(1mk)	(1mk)

(b) Dissolve the remaining portion of solid H into 10cm³ of water and divide into 3 portions.

(i) To the first portion add 2 drops of acidified potassium permanganate solution.

Observation	Inference
(1mk)	(1mk)

(ii) To the second portion add 2 drops of acidified potassium chromate (VI).

Observation	Inference
(1mk)	(1mk)

(iii) Determine the pH of the third portion using a universal indicator paper.

Observation	Inference
(1mk)	(1mk)