Name _____ Index No. _____/_____

1408/315
SCIENCE LABORATORY PRACTICE
(PRACTICAL)
June/July 2012
Time: 4 hours

Candidate's Signature _____

Date _____

THE KENYA NATIONAL EXAMINATIONS COUNCIL

SCIENCE LABORATORY TECHNOLOGY CRAFT

SCIENCE LABORATORY PRACTICE (PRACTICAL)

4 hours

INSTRUCTIONS TO CANDIDATES

Questions	Maximum Score	Candidate's Score
1	34	
2	33	
3	33	
	Total Score	

This paper consists of 9 printed pages.

Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.

Turn over

1. You are provided with:

- A solution mixture containing 2.44 gdm^{-3} of Na_2CO_3 and K_2CO_3.
- 0.1 M HCl
- methyl orange indicator
- other titration apparatus.

You are required to determine the percentage composition of the mixture w/w.

PROCEED AS FOLLOWS

(a) Fill the burette with the dilute hydrochloric acid solution.

(b) Pipette 25 cm^3 of the solution mixture into a clean conical flask and add three drops of methyl orange indicator.

(c) Titrate the solution mixture with the acid until a permanent colour change occurs. Repeat the experiment two more times and tabulate the results. (6 marks)

(d) Write balanced equations for the reaction between:

(i) Sodium carbonate and dilute hydrochloric acid; (2 marks)

(ii) Potassium carbonate and dilute hydrochloric acid. (2 marks)

(e) Given that the mass of Na_2CO_3 is Xgdm^{-3}. Calculate, the moles of Na_2CO_3 in:

(i) One litre of solution; (2 marks)

(ii) 25 cm^3 of the aliquot in terms of X.
(Na = 23, 0=16, C = 12) (2 marks)

(iii) Calculate the moles of HCl used to neutralise the sodium carbonate in 25 cm^3 of solution. (2 marks)

(f) (i) Write an expression for the mass of K_2CO_3 in one litre of solution in terms of X. (1 mark)

(ii) Calculate:

(I) Moles of K_2CO_3 in one litre of solution in terms of X. (2 marks)

(II) Moles of K_2CO_3 in 25 cm^3 of the aliquot. (2 marks)

(III) Moles of HCl used by the K_2CO_3 in 25 cm^3. (2 marks)

(IV) Total moles HCl used in the titre volume. (1 mark)

(g) (i) Write the mathematical equation relating the total moles of HCl in the titre value and the total moles of HCl used by both Na_2CO_3 and K_2CO_3. (2 marks)

(ii) Use your equation in g(i) above to determine the value of X. (5 marks)

(iii) Calculate:

% of Na_2CO_3 w/w. (2 marks)

% of K_2CO_3 w/w (3 marks)

2. In this test, you are required to investigate the action of the enzyme catalase on various substrates.

Proceed as follows:

(a) (i) Put 2 cm^3 of H_2O_2 into each of the 2 test tubes. Into one test-tube, sprinkle a pinch of fine sand, in the other test tube, sprinkle a pinch of iron filings. Test each tube for the presence of oxygen with a splinter.
Record your observation. (4 marks)

(ii) Pour 2 cm^3 of fresh H_2O_2 into a clean test-tube. Cut a cube of liver provided and drop it into the test-tube. Test the tube for oxygen. Record your observation. (2 marks)

(iii) Take another piece of liver, the same size as (i) above. Place it in a mortor, add a little fine sand and grid. Transfer the ground-up liver (along with the sand) to test-tube containing 2 cm^3 of fresh H_2O_2. Compare the reaction here with that observed in (ii) above. (2 marks)

(iv) Take another piece of liver and put it in a beaker of boiling water for 3 minutes. Take the boiled piece and put it in fresh H_2O_2 in a test-tube. Record your observation. (2 marks)

(b) Explain the results obtained in (a) above. (15 marks)

(c) What conclusions can be drawn from this experiment? (5 marks)

(d) Describe the proper disposal methods for the reagents and materials used in this experiment. (3 marks)

3. You are provided with the following
Object(candle), convex lens and lens holder, metre rule and screen (white cardboard with stand)

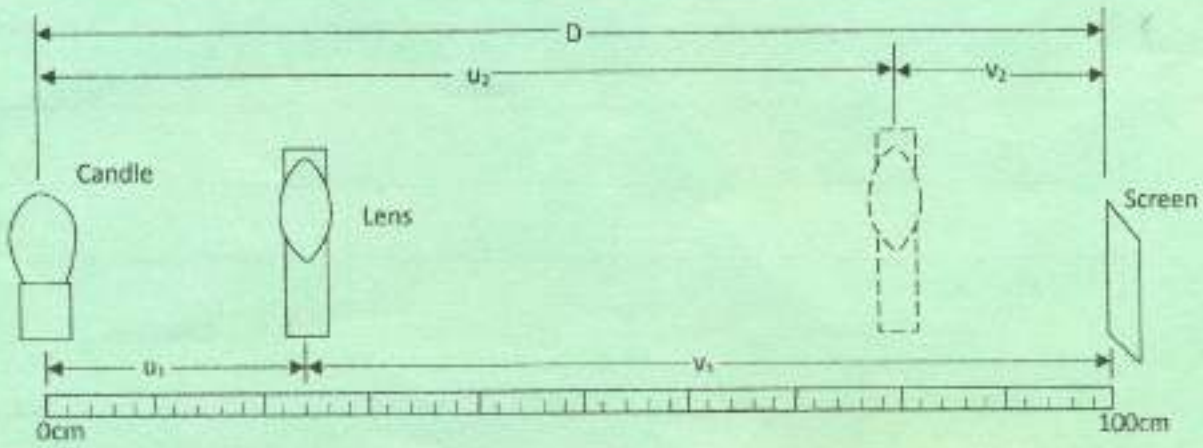

FIG 1

(a) (i) Arrange the apparatus as shown in figure 1.

(ii) Set the distance **D** between the object and the screen (image position) to be 100 cm.

(iii) Starting with the lens near the object move it slowly towards the screen and record the object and image distance $\mathbf{U_1}$ and $\mathbf{V_1}$ respectively when the object is clearly focussed.

(iv) Continue moving the lens in the same direction until you observe another clear image and record the new object distance $\mathbf{U_2}$ and image distance $\mathbf{V_2}$.

(v) Change the distance **D** between the object and screen to 90 cm and then 80 cm and in each case repeat steps (iii) and (iv).

(vi) Record your data in the table.

D in (cm)	U_1 (cm)	V_1 (cm)	U_2 (cm)	V_2 (cm)	$d = U_2 - U_1$ (cm)	$M = \frac{V_1}{U_1}$ (cm)	$K = \frac{D^2 - d^2}{4D}$ (cm)	$L = \frac{U_1 V_1}{U_1 + V_1}$ (cm)
100								
90								
80								

(30 marks)

(b) What is represented by the following quantities?

(i) M (1 mark)

(ii) K (1 mark)

(iii) L (1 mark)