

2913/106

APPLIED SCIENCE AND MICROBIOLOGY
PRACTICAL
Oct./Nov. 2019
Time: 4 hours



THE KENYA NATIONAL EXAMINATIONS COUNCIL

DIPLOMA IN FOOD SCIENCE AND PROCESSING TECHNOLOGY

MODULE I

APPLIED SCIENCE AND MICROBIOLOGY PRACTICAL

4 hours

INSTRUCTIONS TO CANDIDATES

You should have the following for this examination:

Answer booklet;

Non-programmable scientific calculator.

*This paper consists of **THREE** practical tests.*

*Carry out **ALL** the practical tests and answer **ALL** the questions in the answer booklet provided.*

Maximum marks for each part of the practical test are as indicated.

This paper consists of 4 printed pages.

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

$\frac{23}{16}$ $\frac{23}{12}$ $\frac{23}{4}$ 25

1. You are required to determine the focal length of a lens using magnification (M) method.

Apparatus

- A 3 Volt bulb and a bulb holder.
- A convex lens with lens holder.
- A meter rule.
- A white screen with a support.
- A pair of dry cells (size D) with a cell holder.
- Connecting wires.

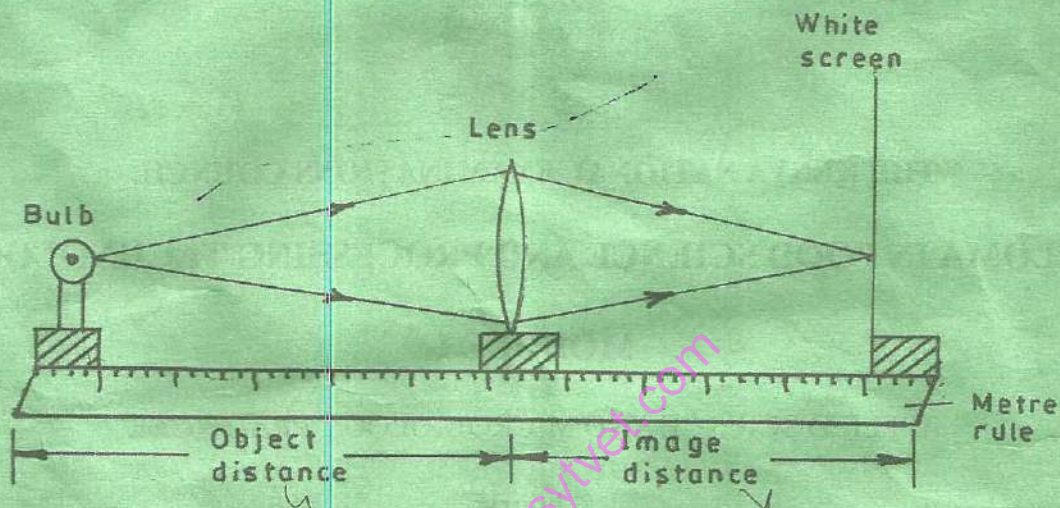


Fig.1

Procedure

- Set up the apparatus as shown in Figure 1.
- With the bulb on, set the object distance $U = 25$ cm and move the screen to and fro until a sharp image of the object is formed on the screen. Measure the image distance (V cm) and record in table 1.
- Repeat step (b) for the other values of U by adjusting lens and complete table 1.

(14 marks)

Object distance U cm	25	30	40	50	60	70	80
Image distance V cm	50 ³	14 ^{cm}	13 ⁵	13 ^{cm}	13 ^{cm}	12 ^{cm}	12 ^{cm}
$m = \frac{V}{U}$	0.6×10^2	0.46×10^2	0.32×10^2	0.26×10^2	0.216×10^2	0.171×10^2	0.15×10^2

$M = 4.6 \times 10^{-2} \quad 3.3 \quad 2.6 \quad 2.16 \quad 1.71 \quad 1.5$

Applied science & micropract

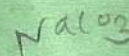
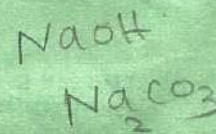
- (d) Plot a graph of m against V in cm on the graph paper provided.
- (e) Determine the gradient of the graph. $g = \frac{\Delta y}{\Delta x}$ (4 marks)
- (f) Determine the value of V in cm on the graph when $m = 0.00$. (2 marks)
- (g) Calculate the value of $f = \frac{1}{\text{gradient}}$. (2 marks)
- (h) Calculate the difference between value of f and V obtained in (g) and (f) above. (2 marks)

2. (a) You are provided with the following.

- (i) Analar grade sodium carbonate.
- (ii) Dilute hydrochloric acid solution.
- (iii) Sodium hydroxide solution.
- (iv) Methyl orange indicator.
- (v) Titration apparatus.

(b) You are required to:

- (i) prepare a standard solution of 0.2 M sodium carbonate;
- (ii) standardise dilute hydrochloric acid solution;
- (iii) determine the molarity of sodium hydroxide solution.



(c) Proceed as follows:

- (i) calculate the mass of sodium carbonate required to prepare 250 cm³ of 0.2 M sodium carbonate ($\text{Na} = 23, \text{C} = 12, \text{O} = 16$). (5 marks)
- (ii) weigh accurately the mass of sodium carbonate calculated in (i) above and record the exact mass weighed. (1 mark)
- (iv) Transfer completely the mass weighed into a 250 cm³ volumetric flask, add 100 cm³ of distilled water, shake until all sodium carbonate dissolves and top up with distilled water to the 250 cm³ mark.
- (v) Calculate the exact molarity of the solution you have prepared. (4 marks)

- (d) (i) Fill a burette with HCl solution.
- (ii) Pipette 25 cm³ of sodium carbonate solution prepared into a clean conical flask and add three drops of methyl orange indicator.

- 23
14
1. You (iii) Titrate the sodium carbonate solution with HCl until a permanent colour change occurs. Repeat the titration two more times recording the volume of the titre. (4 marks)
- 19th
average
7.5
7.8
- (iv) Calculate the molarity of the dilute HCl solution. (6 marks)
- 7.5
- (e) (i) Measure 200 cm³ of sodium hydroxide provided and dilute to the mark in a 1 litre volumetric flask with distilled water, and set aside.
- 4-5
39
- (ii) Fill a burette with HCl solution. 1000cm³ X = gram negative
- (iii) Transfer 25 cm³ of sodium hydroxide in (i) above into a conical flask, add three drops of methyl orange indicator.
- (iv) Titrate the sodium hydroxide solution with HCl to a permanent colour change. Repeat the titration two more times recording the titre volume. (4 marks)
- (v) Calculate the molarity of the sodium hydroxide solution. (9 marks)

3. (a) You are provided with the following.

- Two micro-organism labelled X and Y growing on nutrient agar (NA) plates.
 - 2 microscope slides.
 - 2 cover slips.
 - 1 wire loop.
 - Distilled water in a wash bottle.
 - Crystal violet solution. ✓
 - Gram's iodine. ✓
 - Ethanol/Acetone. ✓
 - Safranin. ✓
 - Blotting paper.
 - Bunsen burner.
 - Immersion oil.
 - Staining tray.
 - Microscope with X10, X40 and X100 objectives.
- Molarity = $\frac{\text{Number of Mole}}{\text{Volume}}$

- (b) Examine the cultures and describe the colony characteristics of the two microorganisms provided. (12 marks)
- (c) Make a smear for each micro-organism and stain using the Gram stain method. Write the procedure for Gram staining. (15 marks)
- (d) Describe the appearance of the micro organisms upon staining. (6 marks)

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