

2914/106  
APPLIED BIOLOGY PRACTICAL I  
Oct./Nov. 2022  
Time: 4 hours



THE KENYA NATIONAL EXAMINATIONS COUNCIL

DIPLOMA IN APPLIED BIOLOGY

MODULE I

APPLIED BIOLOGY PRACTICAL I

4 hours

**INSTRUCTIONS TO CANDIDATES**

*Answer ALL the questions in the answer booklet provided.  
Maximum marks for each part of a question are indicated.  
Candidates should answer the questions in English.*

**This paper consists of 6 printed pages.**

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

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**Turn over**



- I. (a) An investigation was carried out on a potato tissue. Three potato chips of equal length were chopped out from a large potato and labelled as X, Y and Z.

Potato chip X was placed in a dry petri dish.

Potato chips Y and Z were each placed in 150 ml of different liquids in different containers.

You are provided with the three potato chips describe above, which have been placed in their respective containers for the last three hours.

- (i) Measure the length of potato chip X and record the findings as in table I.
- (ii) Remove chip Y from the liquid and dry it using a paper towel. Measure its length and record the findings as in table I.
- (iii) Repeat procedure (ii) for potato chip Z.

Table I

	Length in mm
Potato chip X	
Potato chip Y	
Potato chip Z	

(3 marks)

- (iv) Determine the change in length for potato chips Y and Z.

(4 marks)

- (v) Specify which of the two potato chips was immersed in:

(I) distilled water;

(1 mark)

(II) concentrated sodium chloride solution.

(1 mark)

- (vi) Explain the changes observed for potato chips Y and Z.

(4 marks)

- (b) A similar investigation was carried out by a group of students. They measured the mass of five potato chips before placing each chip in a different concentration of sucrose solution.

After two hours each chip was removed from the sucrose solution and its mass measured and recorded in table II.



**Table II**

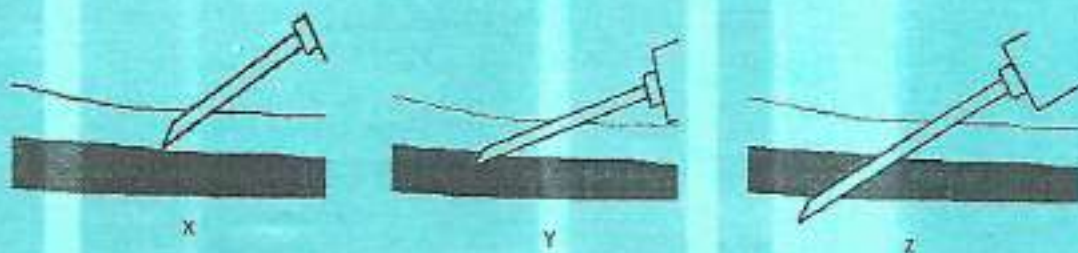
Concentration of sucrose solution g/dm <sup>3</sup>	Mass at start (g)	Mass after 2 hrs (g)	% change in mass (g)
0.00	1.36	1.49	—
35.0	1.41	1.48	—
70.0	1.46	1.47	—
175.0	1.47	1.38	—
345.0	1.45	1.31	—

- (i) Complete table II by calculating the percentage change in mass of the potato chips after 2 hours. (5 marks)
- (ii) Plot a graph to show the percentage change in mass of the potato chips (y-axis) against the concentration of the sucrose solution. (6 marks)
- (iii) Using the graph, determine the concentration of solution in which the mass of potato chip would remain the same. (1 mark)
2. (a) You are provided with three laboratory animals labelled as L<sub>1</sub>, L<sub>2</sub> and M.
- (i) State the:
- (I) common name for each of the laboratory animal labelled L<sub>1</sub> and M. (2 marks)
- (II) scientific name for each of the laboratory animal labelled L<sub>1</sub> and M. (2 marks)
- (ii) Determine the name of the genus to which L<sub>1</sub> and M belong. (2 marks)
- (iii) Determine the sex of each of the laboratory animals labelled L<sub>1</sub> and L<sub>2</sub>. (2 marks)
- (iv) Study the body sites labelled S<sub>1</sub>, S<sub>2</sub>, S<sub>3</sub>, S<sub>4</sub> and S<sub>5</sub> on the animal labelled M. Identify the site that matches each of the following actions:
- (I) intraperitoneal injection; (1 mark)
- (II) retro-orbital bleeding; (1 mark)
- (III) intracardiac puncture; (1 mark)
- (IV) Intramuscular injection. (1 mark)
- (v) State the name of the laboratory equipment in which the animals are contained. (1 mark)



- (b) In order to prevent undue suffering, ethical considerations in animal studies are important. Generally before experiments are conducted on animals, the research protocol must be reviewed by Animal Ethics Committees (AECs). Describe the **three** principles of the AECs. (6 marks)
- (c) During a practical lesson involving collection of blood from a vein in a laboratory mouse, a group of students noticed that there was no blood flowing into the syringe despite having presumably pushed the needle into the vein.

As part of trouble-shooting, the instructor drew diagrams X, Y and Z each depicting a possible scenario that may have caused the failure to collect blood.



Explain each of the depictions in the diagrams and state a corrective measure.

(6 marks)

3. (a) You are provided with samples of milk products labelled E and F.
- Carefully examine the milk samples and record the observations in table III.
  - Determine the pH of each of the samples E and F and record the findings in table III.
  - Measure  $50 \text{ cm}^3$  of sample E into a clean glass beaker. Again measure  $2.5 \text{ cm}^3$  of sample F into the same glass beaker. Stir the mixture and label the glass beaker as sample E + F.
  - Carefully examine E + F, determine its pH and record the findings in table III.

**Table III**

Sample	Observations (consistency)	pH
E		
F		
E + F		

(6 marks)

- (v) With reference to the pH values obtained, determine which of the samples is yoghurt. Explain. (2 marks)



- (vi) Outline the method used in (ii) to determine the pH of the milk samples. (4 marks)
- (b) (i) Place a drop of distilled water on the microscope slide.
- (ii) Using an applicator stick, take a small drop of the milk sample labelled F and smear it onto the slide. Spread to make a thin smear.
- (iii) Gently place a cover slip on the smear. Use a blotting paper to removed excess solution on the side of the slide.
- (iv) Place the slide on the stage of the microscope starting with lower magnification (x40) and change to higher magnification.
- (v) Draw the shapes of any two types of bacterial cells observed. (2 marks)
- (vi) State the kingdom and the order in which the observed cells belong. (2 marks)
- (c) You are provided with a microscope.
- (i) Identify the parts labelled I, II, III, IV, V and VI. (6 marks)
- (ii) Figure 1 shows an animal cell as observed using a X10 eye piece lens and a X20 objective lens.

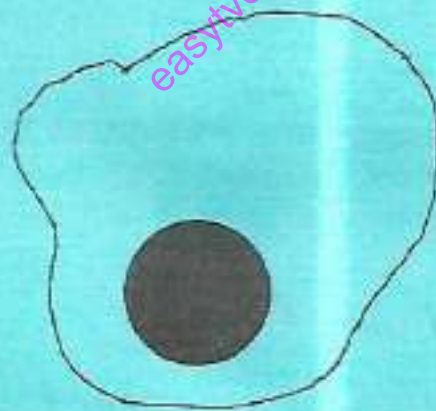


Fig. 1

Calculate the total magnification of the image shown in figure 1. (3 marks)



4. You are provided with seven common biology laboratory apparatus labelled as  $G_1$ ,  $G_2$ ,  $G_3$ ,  $G_4$ ,  $G_5$ ,  $G_6$  and  $G_7$ .

(a) Complete table IV by providing the required information.

Table IV

Laboratory apparatus	Drawing	Name	Function
$G_1$			
$G_2$			
$G_3$			
$G_4$			
$G_5$			
$G_6$			
$G_7$			

(21 marks)

(b) Explain the operation of apparatus  $G_3$  to accomplish its purpose.

(4 marks)

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