

THE KENYA NATIONAL EXAMINATIONS COUNCIL
Kenya Certificate of Secondary Education



Paper 1

231/1

BIOLOGY (Theory)

Nov. 2023 - 2 hours

Serial No.

21936271

Name: **Index Number:**

Candidate's signature: **Date:**

Instructions to candidates

- (a) Write your name and index number in the spaces provided above.
- (b) Sign and write the date of examination in the spaces provided above.
- (c) Answer **all** the questions in this question paper.
- (d) All answers must be written in the spaces provided in the question paper.
- (e) **This paper consists of 11 printed pages.**
- (f) **Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.**
- (g) **Candidates should answer the questions in English.**



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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

17	18	19	20	21	22	23	Grand Total



Turn over



1. Name the disease caused by the following micro-organisms:

(a) *Entamoeba histolytica*; (1 mark)

.....

(b) *Plasmodium ovale*. (1 mark)

.....

2. (a) State **two** sites in animals where counter-current flow of fluids occurs. (2 marks)

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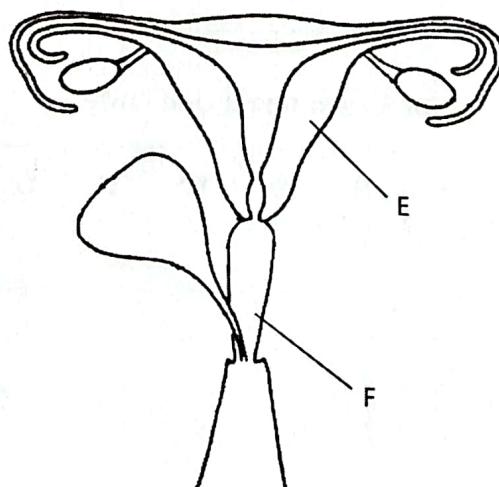
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(b) Explain the significance of the counter-current flow system in living organisms. (2 marks)

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3. The following diagram represents parts of the female reproductive system.



- (a) Identify the part labelled F.

(1 mark)

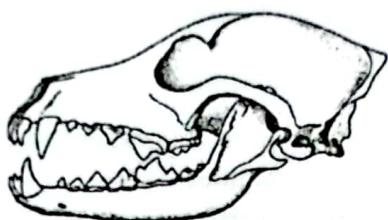
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- (b) Explain the structural adaptation of the part labelled E to its function. (2 marks)

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- (c) Use letter H to label on the diagram the part where ectopic pregnancy is likely to occur. (1 mark)

4. The following diagram represents a skull of a certain mammal.



- (a) State the likely mode of nutrition for the animal from which the skull was obtained. (1 mark)

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5. Students observed that the smell from a decomposing animal carcass was stronger at mid-day than early in the morning.

- (a) Name the physiological process by which the smell reached the students. (1 mark)

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- (b) Account for the observation made by the students. (2 marks)

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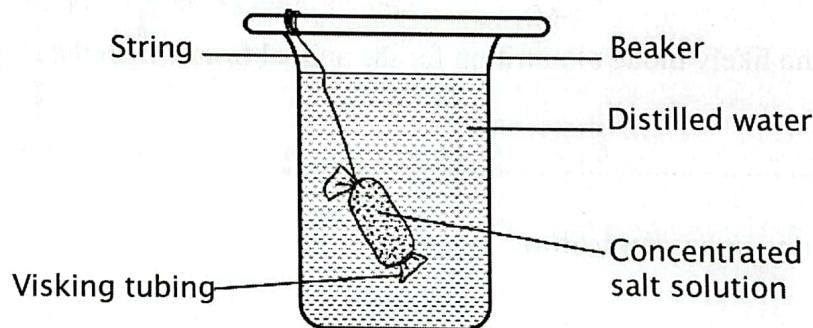
6. State **two** ways in which sweating is significant to the human body. (2 marks)

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7. State **three** characteristics of the Kingdom Monera that are not found in the Kingdom Animalia. (3 marks)

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8. The following diagram illustrates a setup to investigate a certain physiological process. The setup was left undisturbed for 10 minutes.



- (a) Name the physiological process under investigation. (1 mark)

- (b) State the observations made after 10 minutes. (2 marks)

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- (c) Account for the observation made in 8(b). (2 marks)

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9. In a genetics study, a pure breeding black bull was crossed with a pure breeding white heifer. All the offsprings were black.

(a) Account for the black colour phenotype in all the offsprings. (1 mark)

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- (b) Work out the genotypic ratio of the offsprings if the pure breeding black bull was crossed with a female heterogeneous for colour. (5 marks)

Account for the following observations:

- (a) When the pancreatic duct of a mammal is blocked, blood sugar regulation remains normal while digestion is impaired. (2 marks)

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- (b) Most desert animals have longer loops of henle. (3 marks)

11. The following diagrams represent beaks of different birds.



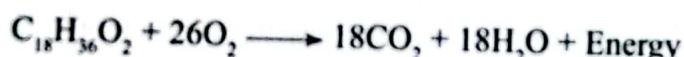
- (a) State the type of evolution illustrated by the diagrams.

(1 mark)

- (b) Explain the significance of the type of evolution stated in 11(a).

(2 marks)

12. The following equation represents a certain metabolic reaction taking place in animal cells.



- (a) Name the organelle where the reaction occurs.

(1 mark)



- (b) (i) Calculate the respiratory quotient of the substrate being oxidized.

(2 marks)

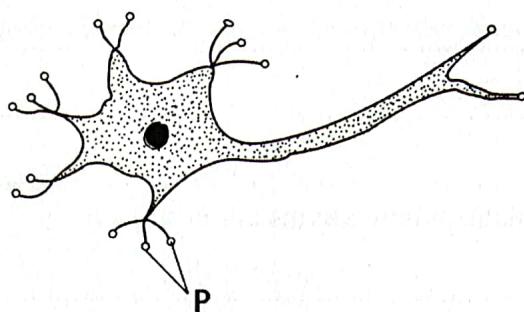
- (ii) Identify the substrate being oxidized in the reaction.

(1 mark)

- (c) State two factors other than oxygen concentration, that can affect the rate of the illustrated reaction.

(2 marks)

13. The following diagram illustrates a neurone.



(a) (i) Identify the neurone. (1 mark)

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(ii) Give a reason for your answer in 13a(i). (1 mark)

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(b) (i) Name the part labelled P on the diagram. (1 mark)

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(ii) State the function of the part named in 13b(i). (1 mark)

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14. In an experiment, students added some water to a beaker containing maize flour and yeast. The beaker was covered and left on the laboratory bench undisturbed for three days.



(a) State the aim of the experiment. (1 mark)

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(b) State **two** observations made by the students after the three days. (2 marks)

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15. (a) State two characteristics likely to be observed in a 25-year old male incapable of producing enough testosterone. (2 marks)

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- (b) Name one part in plants where auxins are produced. (1 mark)

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16. (a) Name the branch of Biology that deals with the study of insects. (1 mark)

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- (b) Name one piece of apparatus one would use to collect insects for study. (1 mark)

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17. (a) Distinguish between magnification and resolution as used in microscopy. (1 mark)

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- (b) State the significance of the following procedures during the preparation of temporary wet mounts of plant tissues:

- (i) staining; (1 mark)

.....

- (ii) making thin sections. (1 mark)

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18. (a) State two means through which plants eliminate excess water. (2 marks)

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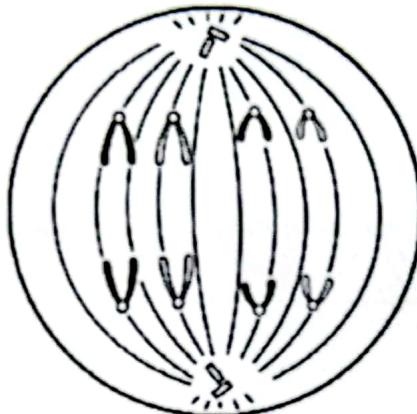
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- (b) Explain the significance of hair on the human skin during cold weather. (3 marks)

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19. The following diagram represents a stage in the mitotic division of a cell.



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- (a) (i) Identify the stage of mitosis illustrated. (1 mark)

- (ii) Give a reason for your answer in 19(a)(i). (1 mark)

- (b) State the role of centrioles in cell division. (1 mark)

20. State the significance of each of the following characteristics of living organisms:

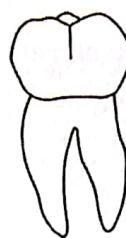
- (a) irritability; (1 mark)

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- (b) reproduction. (1 mark)



21. The following diagram represents a mammalian tooth.



- (a) Explain the structural adaptation of the tooth to its function. (2 marks)

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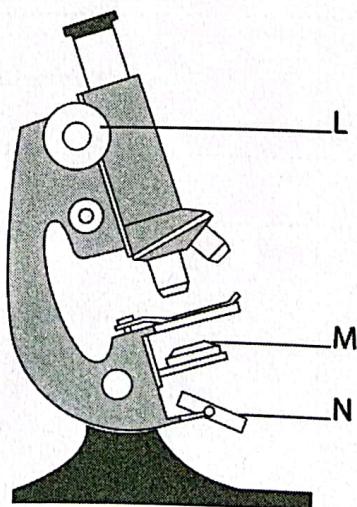
- (b) How does drinking cold water immediately after a meal affect digestion? (2 marks)

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22. Explain the concept of natural selection among organisms in relation to an ecosystem with insufficient food. (2 marks)

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23. The following diagram represents a light microscope.



(a) Name the part labelled **N**. (1 mark)

 (b) State the functions of the parts labelled **L** and **M**.

L (1 mark)

M (1 mark)



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THE KENYA NATIONAL EXAMINATIONS COUNCIL
Kenya Certificate of Secondary Education



231/2

BIOLOGY (Theory)

Nov. 2023 – 2 hours

Paper 2

Serial No.

24106242

Name: **Index Number:**

Candidate's signature: **Date:**

Instructions to candidates

- (a) Write your name and index number in the spaces provided above.
- (b) Sign and write the date of examination in the spaces provided above.
- (c) This paper consists of **two** sections; **A** and **B**.
- (d) Answer **all** the questions in section **A** in the spaces provided.
- (e) In section **B** answer question **6 (compulsory)** and either question **7 or 8** in the spaces provided after question **8**.
- (f) **This paper consists of 12 printed pages.**
- (g) **Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.**
- (h) **Candidates should answer the questions in English.**



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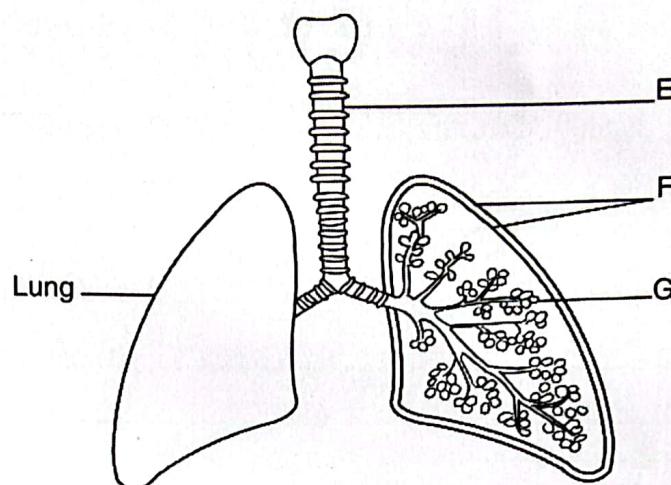
Section	Question	Maximum Score	Candidate's Score
A	1	8	
	2	8	
	3	8	
	4	8	
	5	8	
B	6	20	
		20	
Total Score		80	



2
SECTION A (40 marks)

Answer all the questions in this section in the spaces provided.

1. The following diagram represents a section of the mammalian respiratory system.



(a) Identify:

- (i) the region of the mammalian skeleton where the represented section is found. (1 mark)

-
(ii) the part labelled F. (1 mark)

- (b) Explain the function of the part labelled F. (2 marks)

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- (c) Explain the structural adaptations of the parts labelled E and G to their functions. (2 marks)

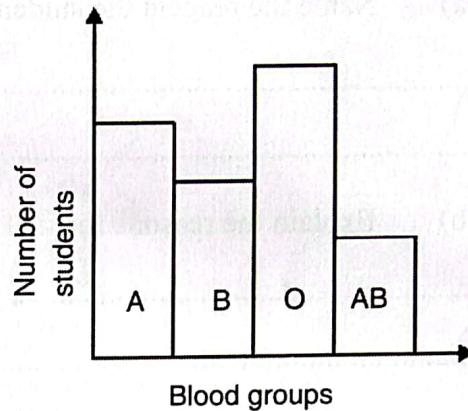
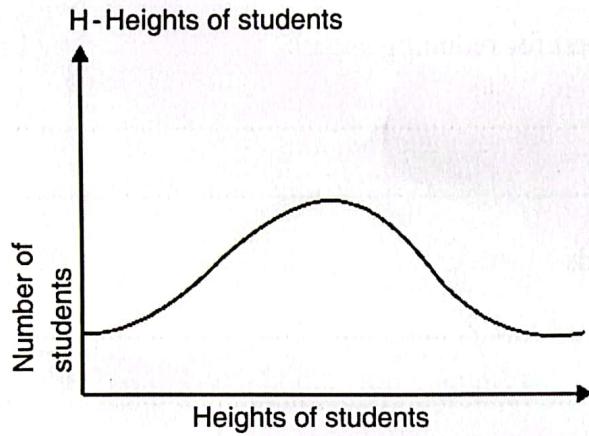
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- (d) Give similarities between the part labelled G and gill filaments. (2 marks)

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2. In an investigation, data on students' heights and blood groups were collected and presented in graphs H and J as shown.

J - Blood groups



- (a) (i) State the type of variation illustrated by graph H. (1 mark)

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- (ii) Give a reason for your answer in 2a(i). (1 mark)

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- (b) Explain the advantage of having the greatest proportion of students with blood group O as illustrated in graph J. (2 marks)

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- (c) After the investigation, a student of blood group O reported that the father and mother are blood group A and B respectively. Use a genetic cross to illustrate this possibility. (4 marks)

3. In an experiment, students soaked maize seeds in water for 48 hours at room temperature and tested them for reducing sugars.

- (a) Name the reagent the students used to test for reducing sugars. (1 mark)

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- (b) Explain the reasons for soaking the seeds. (2 marks)

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- (c) State the observation made by the students during the food test. (1 mark)

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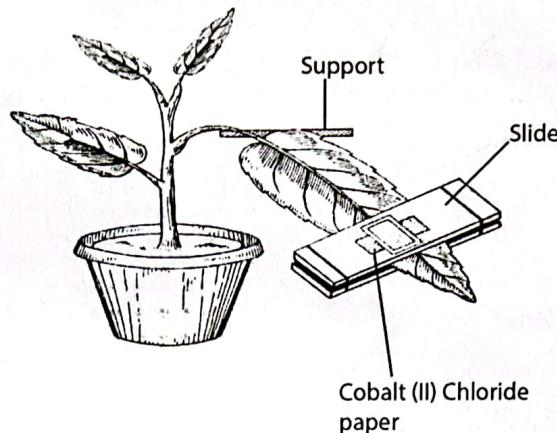
- (d) Explain the effect of soaking the seeds in hot water on the food test results. (2 marks)

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- (e) A sample of maize seeds were planted in soils with favourable conditions but failed to germinate. Suggest possible causes of this failure. (2 marks)

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4. In an investigation, students placed dry cobalt (II) chloride paper on both sides of a mesophyte leaf and covered the strips with cello tape as shown in the following experimental setup.



- (a) State the aim of the experiment. (1 mark)

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- (b) (i) State the observation the students made on the cobalt (II) chloride paper. (1 mark)

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- (ii) Account for the difference in the time taken for the observations to be made on the two cobalt (II) chloride papers. (3 marks)

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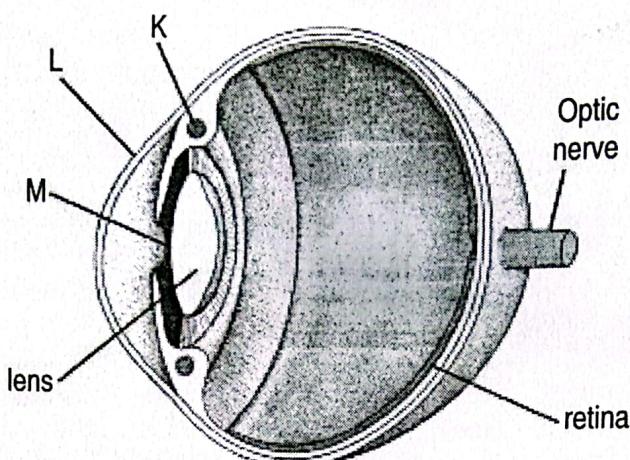
- (c) Suggest **two** modifications students would make on the setup to have the observations made within a shorter time. (3 marks)

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5. The following diagram represents the structure of a human eye.



- (a) Name the part labelled M.

(1 mark)

- (b) Explain the adaptations of the part labelled L to its function.

(2 marks)

- (c) Describe the events initiated in the part labelled K to enable a distant object to be clearly seen.

(3 marks)

- (d) State the role of tears in the human eye.

(2 marks)

SECTION B (40 marks)

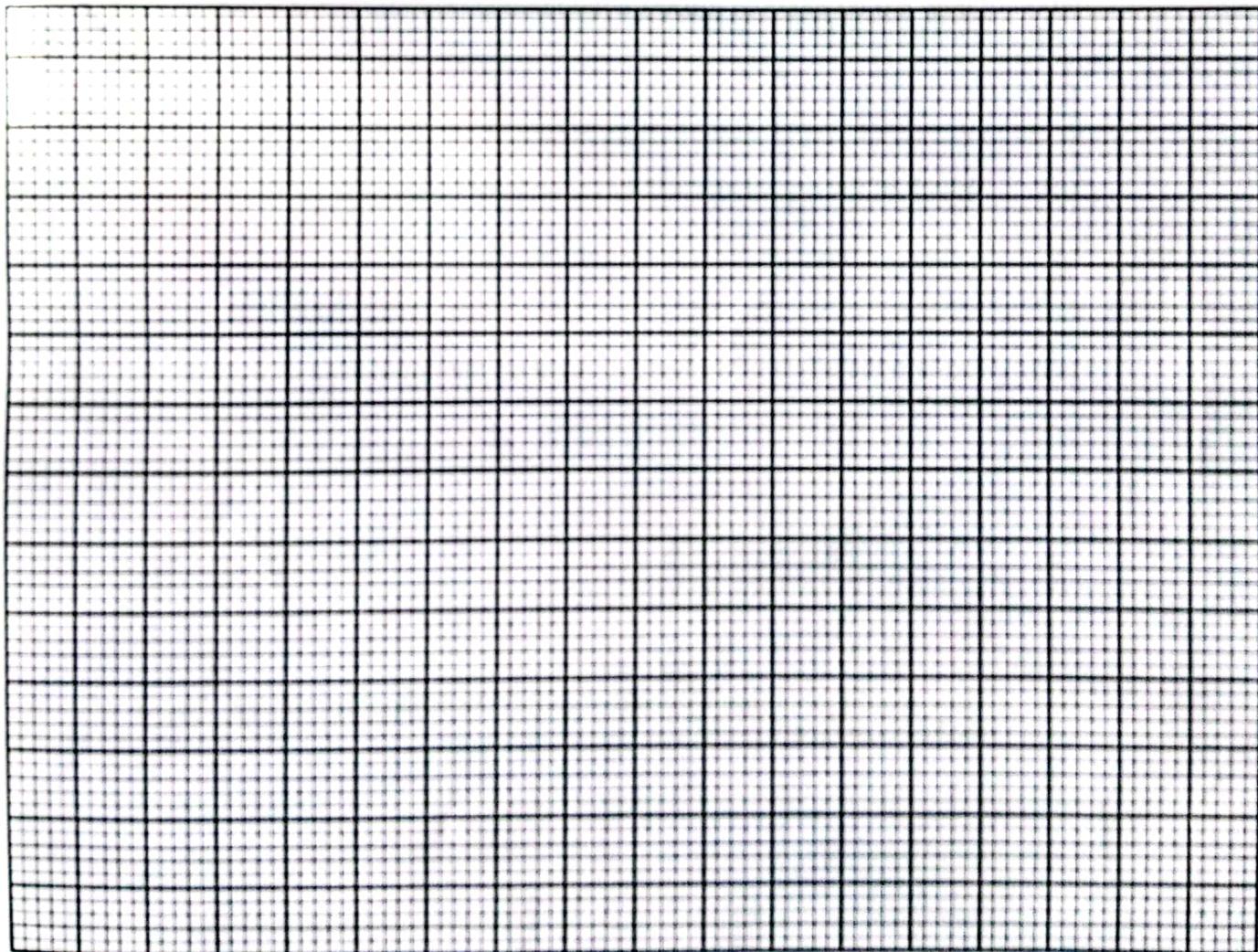
Answer question 6 (compulsory) and either question 7 or 8 in the spaces provided after question 8.

6. During an ecological study, students obtained the following data from a certain ecosystem.

Trophic level of organisms	Number of organisms
Producers	1000
Primary consumers	200
Secondary consumers	30
Tertiary consumers	4

- (a) Use the data in the table to draw a pyramid of numbers on the grid provided.

(5 marks)





(b) Account for the shape of the pyramid.

(3 marks)

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(c) If the following organisms were found in the ecosystem represented by the data:

- Eagle
- Plant
- Snake
- Mouse

(i) Draw a food chain to illustrate the feeding relationship in this ecosystem.

(1 mark)

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(ii) Which of the organisms will have the least biomass? (1 mark)

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(iii) Explain the effect of a severe drought on the population of organisms in the ecosystem. (3 marks)

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- (d) Describe the method one would use to estimate the population of a particular plant species in the ecosystem. (4 marks)



7. (a) Describe the various functions of lipids in the human body. (10 marks)

(b) Describe how the process of photosynthesis occurs in green plants. (10 marks)

8. Describe how the section of the human digestive system from the mouth to the stomach is adapted to its functions. (20 marks)



- Describe how the section of the human digestive system from the mouth to the stomach is adapted to its functions. (20 marks)

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Turn over

THE KENYA NATIONAL EXAMINATIONS COUNCIL
Kenya Certificate of Secondary Education



231/3

BIOLOGY (Practical)

Nov. 2023 – 1 $\frac{3}{4}$ hours

Paper 3

Serial No.

25630932

Name: **Index Number:**

Candidate's signature: **Date:**



Instructions to candidates

- (a) Write your name and index number in the spaces provided above.
- (b) Sign and write the date of examination in the spaces provided above.
- (c) Answer **all** the questions in the spaces provided.
- (d) You are required to spend the first 15 minutes of the 1 $\frac{3}{4}$ hours allowed for this paper reading the whole paper carefully before commencing your work.
- (e) Additional pages must **not** be inserted.
- (f) **This paper consists of 6 printed pages.**
- (g) **Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.**
- (h) **Candidates should answer all the questions in English.**

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Question	Maximum Score	Candidate's Score
1	11	
2	15	
3	14	
Total Score	40	

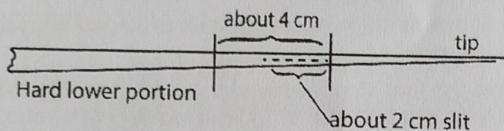


1 You are provided with the following materials:

- Two similar leaves of *Brassica oleracea* (Sukuma wiki)
- A scalpel
- 5 cm³ of liquid K₁ in a test tube
- 5 cm³ of liquid K₂ in a test tube
- (Access) to means of timing

Procedure

- (i) Remove the entire leafy parts along the midribs of both leaves.
- (ii) Retain the two midribs still attached to their petioles.
- (iii) Discard the hard lower petiole.
- (iv) Measure about 4 cm of the remaining midrib towards the tip. Cut and discard the tip.
The process is illustrated as follows:



- (v) Make a 2 cm slit from the tip end of each of the 4 cm portions as shown in the diagram above.
- (vi) Place one piece into the test tube with liquid K₁ and the other into liquid K₂ and leave them for 20 minutes. Remove the two pieces and make observations.

(a) Draw the appearance of each piece.

(i) Piece from K₁



(1 mark)

(ii) Piece from K₂

(1 mark)

(b) Account for the observations made on the piece from each liquid.

(i) Piece from **K₁**

(3 marks)



(ii) Piece from **K₂**

(3 marks)

(c) State how the experiment would be modified to obtain the same results within a shorter period of time.

(2 marks)

(d) Explain why the petiole and the lower parts of the midribs were not suitable for use in this experiment.

(1 mark)

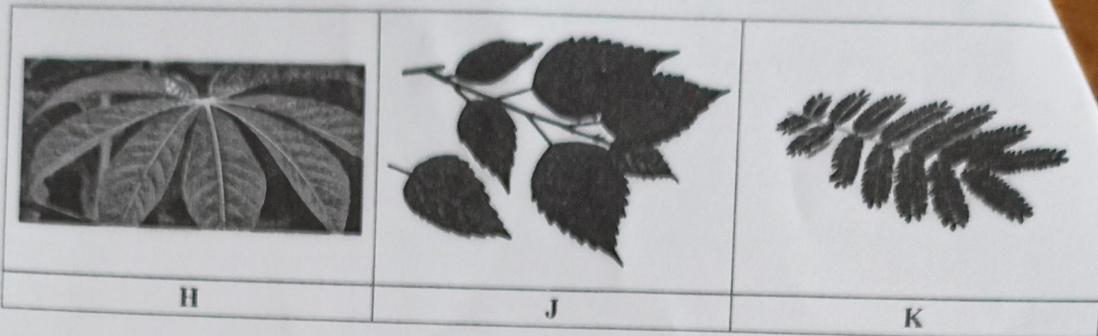
2

You are provided with three plant specimens labelled **E**, **F** and **G** obtained from different plants belonging to different Families.

(a) Use the specimens provided together with the photographs below to construct a dichotomous key that can be used to identify them. Use the features below in the order given to construct the key:

(10 marks)

- Simple or compound leaves
- Leaf venation
- Type of compound leaf
- Leaf margin
- Nature of leaf lamina



- (b) Fill the following table indicating the steps followed to identify specimens E, F and G.
(3 marks)



Specimen	Steps
E	
F	
G	

- (i) State **one** feature in the root and **one** in the stem of specimen **G** that places the plant in its Class. (2 marks)

Root



.....

Stem

.....

- 3 You are provided with the following materials:

- 3 test tubes and means of labelling them
- Solutions L_1 , L_2 and L_3 ,
- 10 cm³ measuring cylinder,
- Iodine solution.

Procedure

- Label the three test tubes **A**, **B** and **C**.
- To test tube **A**, add 1cm³ of L_1 , add one drop iodine solution. Record the observations in the table below.
- Add 1cm³ of each of L_1 and L_2 into tube **B**. Place it on the test tube rack and leave it undisturbed for ten minutes. Add a drop of iodine solution and record the observations in the table below.
- To the third test tube, **C**, add 1cm³ of L_2 , add two drops of dilute hydrochloric acid. Leave the contents undisturbed for ten minutes. Add 1cm³ of L_1 , shake the contents and again place the contents on the test tube rack for about five minutes, add a drop of iodine solution.
- Record the observations and inferences in the table below.

Test tube	Observations after adding iodine solution	Conclusion
A		
B		
C		

(6 marks)

- (a) (i) Suggest the likely identity of solution L_2 .

(1 mark)

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- (ii) Explain your answer in 3(a)(i). (2 marks)



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- (b) Suggest with a reason where the process being investigated in this experiment would take place in the human alimentary canal. (1 mark)

- (i) Part of alimentary canal
(ii) Reason (2 marks)

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- (c) State **two** other modifications one would make in test tube C to obtain similar observations (2 marks)



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