THE KENYA NATIONAL EXAMINATIONS COUNCIL
Kenya Certificate of Secondary Education

231/2 **Paper 2**

Biology – (Theory)

Dec. 2022 – 2 hours

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 space 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.**

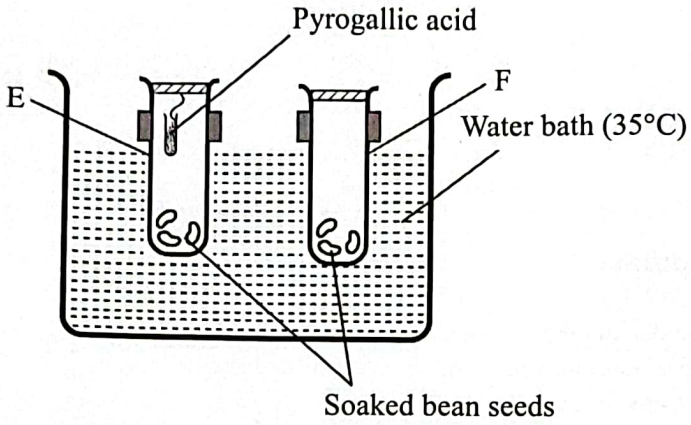
For Examiner's Use Only

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	

SECTION A (40 marks)

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

1. The set-up below was used to investigate a certain factor necessary for seed germination.



(a) (i) Identify the factor under investigation. (1 mark)

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

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(b) Explain why it was necessary to:

(i) maintain the water bath at 35°C (1 mark)

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(ii) use soaked bean seeds (1 mark)

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(c) (i) Explain the expected observations at the end of the experiment in test tubes **E** and **F**. (2 marks)

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(ii) Explain what is likely to happen if set-up **F** was maintained for 7 days. (2 marks)

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2. A fresh water lake surrounded by agricultural farms has the following organisms:

- Fish
- Hippopotamus
- Reeds
- Algae

(a) State the roles of each of the following organisms in the lake ecosystem:

(i) hippopotamus (2 marks)

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(ii) algae (2 marks)

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(b) Explain the likely positive and negative effects of the surrounding agricultural farms on the lake ecosystem.

(i) Positive effects (2 marks)

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(ii) Negative effects (2 marks)

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3. (a) Two tall garden pea plants were crossed and of the resulting offspring, 750 were tall and 250 were short. Using letter **T** to represent the dominant gene, determine the genotypic ratio of the off-spring. (5 marks)

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(b) Besides height in the garden pea plants, state **two** other contrasting seed traits that Mendel focused on in his genetic studies. (2 marks)

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(c) State how the genetic knowledge has been used to improve pea plant farming. (1 mark)

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4. (a) Explain how each of the following factors affect uptake of mineral ions in plants:

(i) temperature (3 marks)

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(ii) glucose concentration in root hair cell sap (3 marks)

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(b) State **two** characteristics of the root hairs that increase their surface area for absorption of mineral ions. (2 marks)

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5. (a) State **two** main functions of the ear ossicles. (2 marks)

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(b) Explain how each of the following parts of the ear are structurally adapted to their functions:

(i) tymphanic membrane (1 mark)

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(ii) cochlea (1 mark)

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(c) State the function of the eustachian tube in the mammalian ear. (1 mark)

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(d) State the importance of each of the following in the mammalian ear:

(i) wax (1 mark)

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(ii) endolymph and perilymph (2 marks)

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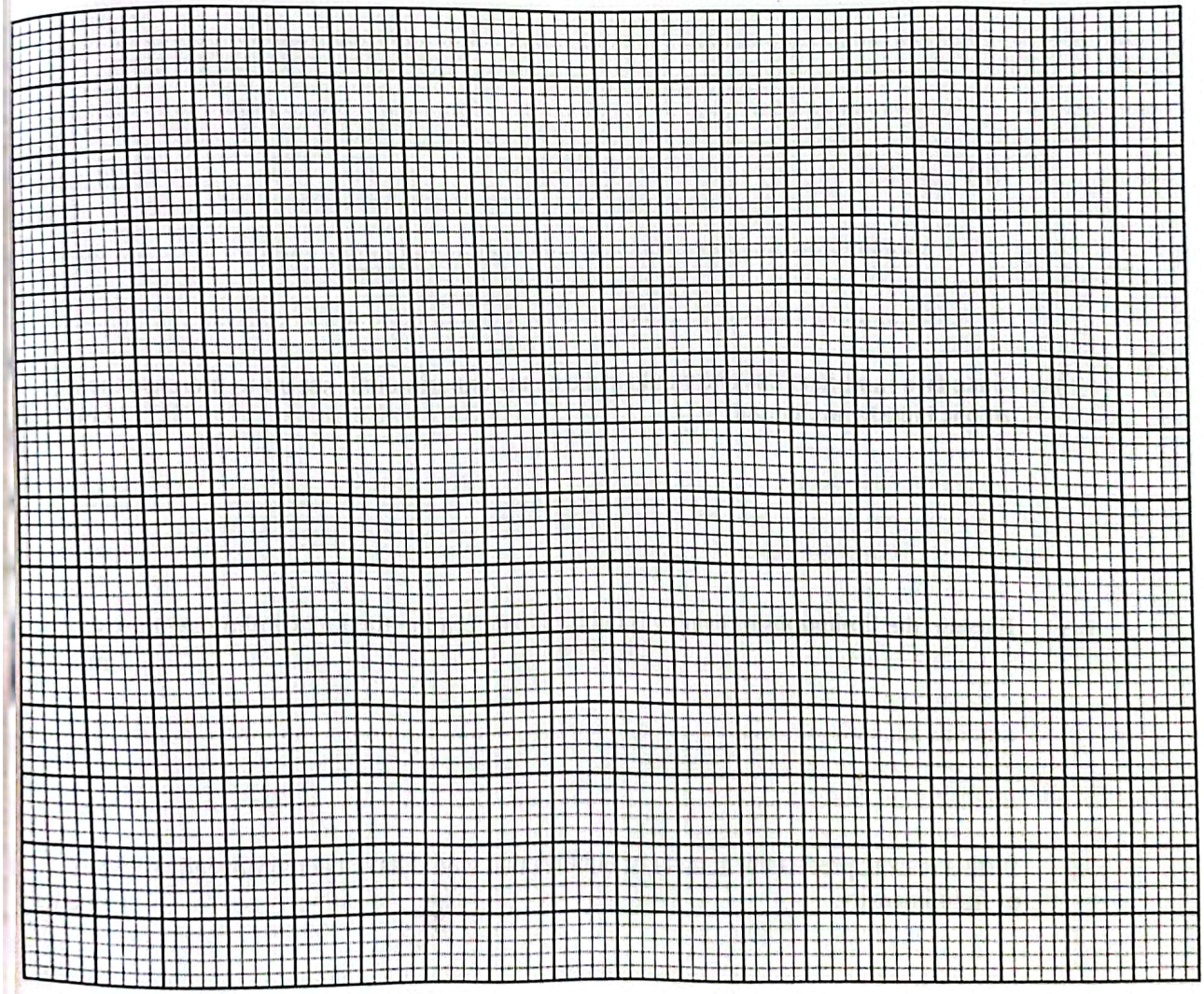
SECTION B (40 marks)

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

6. A shoot of an aquatic plant was exposed to different light intensities and the rate of photosynthesis estimated by counting the number of bubbles of a gas leaving the shoot per minute. The results were tabulated as shown below.

No. of bubbles per minute	0	9	16	22	28	31	32	32	32
Light intensity (arbitrary units)	0	1	2	3	4	5	6	7	8

(a) On the grid below, draw the graph of the number of bubbles produced per minute against light intensity. (6 marks)



(b) State how the identity of the gas produced can be determined in the laboratory. (1 mark)

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(c) Name the apparatus used for measuring light intensity. (1 mark)

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(d) Why was it necessary to get the shoot from an aquatic plant? (1 mark)

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(e) Account for the number of bubbles produced between the following units of light intensities.

(i) 0–6 (3 marks)

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(ii) 6–8 (3 marks)

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(f) State **two** modifications one would make on the experimental set up to increase the rate of gas bubble production. (2 marks)

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(g) Explain the limitations of using gas bubbles to determine the rate of photosynthesis. (2 marks)

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(h) With a reason, predict the number of bubbles that would have been produced at 15 units of light intensity. (1 mark)

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7. (a) Describe how plants eliminate waste products. (8 marks)

(b) Describe the structure and function of the mammalian nephron. (12 marks)

8. (a) Describe **five** tropic responses in plants and their survival values. (15 marks)

(b) Describe how the mammalian heart beat is controlled. (5 marks)