

P530/2

BIOLOGY

PAPER 2

2½ hours

Mar-Apr 2023

Uganda Advanced Certificate of Education

BIOLOGY DEPARTMENT - 2023

SET FOUR

PAPER 2

THEORY

2 hours 30 minutes.

INSTRUCTIONS TO CANDIDATES:

- ✓ Answer question one in section A plus three others from section B.
- ✓ Candidates are advised to read the questions carefully, organize their answers and present them precisely and logically, illustrating with well labeled diagrams where ever necessary.
- ✓ Write on the answer sheet, your name, index number and the questions attempted in their order as shown in the table.

QUESTION	MARKS
TOTAL	

SECTION A: (40 Marks)

Compulsory.

1. Two species of saltbush (*Atriplex* sp.), one a C₃ plant and the other a C₄ plant, were placed under the same conditions and their rates of carbon dioxide output or intake, were measured.

The data below shows their rates of net photosynthesis (carbon dioxide uptake in light), respiration (carbon dioxide release in the dark), and photorespiration (increase in photosynthesis in oxygen-free air in the light), at three different temperatures.

	Carbon dioxide flux ($\text{mg dm}^{-2} \text{hr}^{-1}$)					
	C ₃			C ₄		
	20°C	30°C	40°C	20°C	30°C	40°C
Net photosynthesis	27	29	17	24	31	32
Respiration	2.5	4	8	1.7	3	5.3
Photorespiration	5	11	10	0	0	0

Data from: G. Hofstra & J.D. Hesketh, *Planta*, No. 85, 1969)

- a) Represent the above data graphically. (08marks)
- b) Explain what is meant by the term photorespiration? (04marks)
- c) From the graph, compare C₃ and C₄ plants. (08marks)
- d) Account for the observed differences in the results obtained. (10marks)
- e) Suggest which of two plants is likely to grow faster in tropical climate.
Give a reason for your answer. (03marks)
- f) Explain the ecological advantage of the photosynthetic adaptation of the two plant species? (03marks)
- g) Describe the photosynthetic mechanism that occurs in CAM plants (09marks)

SECTION B: (60 Marks)

Attempt only 3 questions from this section.

2. (a) Compare the compact bone tissue of mammals and the sclerenchyma tissue of plants. (07marks)
- (b) Explain the similarities in (2) (a) above. (05marks)
- (c) Giving examples of cells, relate the presence of extensions found on the different cells to the functions which these cells perform. (08marks)

3. (a) Tongue-rolling is due to a dominant gene. If a man, whose parent are both non-tongue rollers, marries a rolling girl, whose mother and grandparents are rollers and whose father and sister are non-rollers. What are the chances that their first child will be a roller? Show all necessary working. (10marks)
- (b) Tall, cut-leaved tomato plants are crossed with dwarf, potato-leaved plants giving in the F₁ generation nothing but tall, cut-leaved plants. When selfed, the F₂ generation produced 926 tall, cut-leaved, 288 tall potato-leaved, 293 dwarf, cut-leaved; and 104 dwarf, potato-leaved. Explain the above results. (10marks)
4. (a) Describe the sequence of events that may lead to eutrophication of a previously non polluted water body. (10marks)
- (b) Account for the difference in the efficiency of energy transfer at the different stages of transfer in an ecosystem. (10marks)
5. (a) Outline effects of removing whole liver on body's homeostatic mechanisms. (08marks)
- (b) Describe how the Carmel is able to overcome the following challenges in its habitat.
- (i) Water stress. (06marks)
- (ii) Heat stress. (06marks)
6. (a) Compare growth of a flowering plant with that of a vertebrate animal. (10marks)
- (b) Summarise the changes that occur in the circulation of human foetus at, or soon after, birth. (10marks)

END