P530/2

BIOLOGY

PAPER 2

2½ hours

Mar-Apr 2023

Uganda Advanced Certificate of Education

BIOLOGY DEPARTMENT - 2023

SET FIVE

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. In an investigation to determine the effect of cyanide on mean amount of oxygen used in animal organs and organs in the different animals. Organs were extracted from animals that have just been killed. For each animal, three dishes were set up. Each dish contained; phosphate solution, saline (sodium chloride) solution and cyanide solution of known concentration. The measured mean amount of oxygen used by the slices of organs in one hour are shown in table below.

Animal organ	Mean amount of oxygen used, in absence or presence of cyanide, per hour/ arbitrary units.		
	No cyanide	10^{-4} moldm^{-3} cyanide	10^{-2} moldm^{-3} cyanide
Sheep liver	2.7	2.5	0.7
Sheep kidney	14.1	9.9	1.9
Ox liver	1.9	1.9	0.8
Rat liver	10.5	10.0	1.9
Rat kidney	20.7	18.8	2.3
Guinea pig kidney	16.8	14.4	1.9

a) Calculate the percentage difference in oxygen use for rat liver between cyanide concentration of 10^{-4} and 10^{-2} moldm^{-3}. **(03marks)**

b) Compare the mean amount of oxygen used by the organs extracted from sheep and rat at varying cyanide concentrations. **(08marks)**

c) Account for the observed difference in mean oxygen use between;

(i) Sheep kidney and rat kidney, **(05marks)**

(ii) Ox liver and rat liver, **(05marks)**

In absence of cyanide.

d) How does cyanide lower mean amount of oxygen used by different organs? **(05marks)**

e) An antidote (**hydroxocobalamin**), can reduce poisoning by cyanide. Briefly describe the action of this antidote. **(04marks)**

f) From the results above,

(i) Sketch the relative positions of the haemoglobin dissociation curves for the ox, rat and sheep on the same axes at varying oxygen partial pressures. **(04marks)**

(ii) Account for the difference of relative positions of the haemoglobin oxygen dissociation curves for the rat and that ox. **(06marks)**

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 fucntions 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