Students Name: .....

School Name:..... Index Number .....

P530/2

BIOLOGY

PAPER 2

JULY/AUGUST 2025

HES MOCK EXAMINATIONS 2025

UGANDA ADVANCED CERTIFICATE OF EDUCATION

BIOLOGY

PAPER 2

THEORY

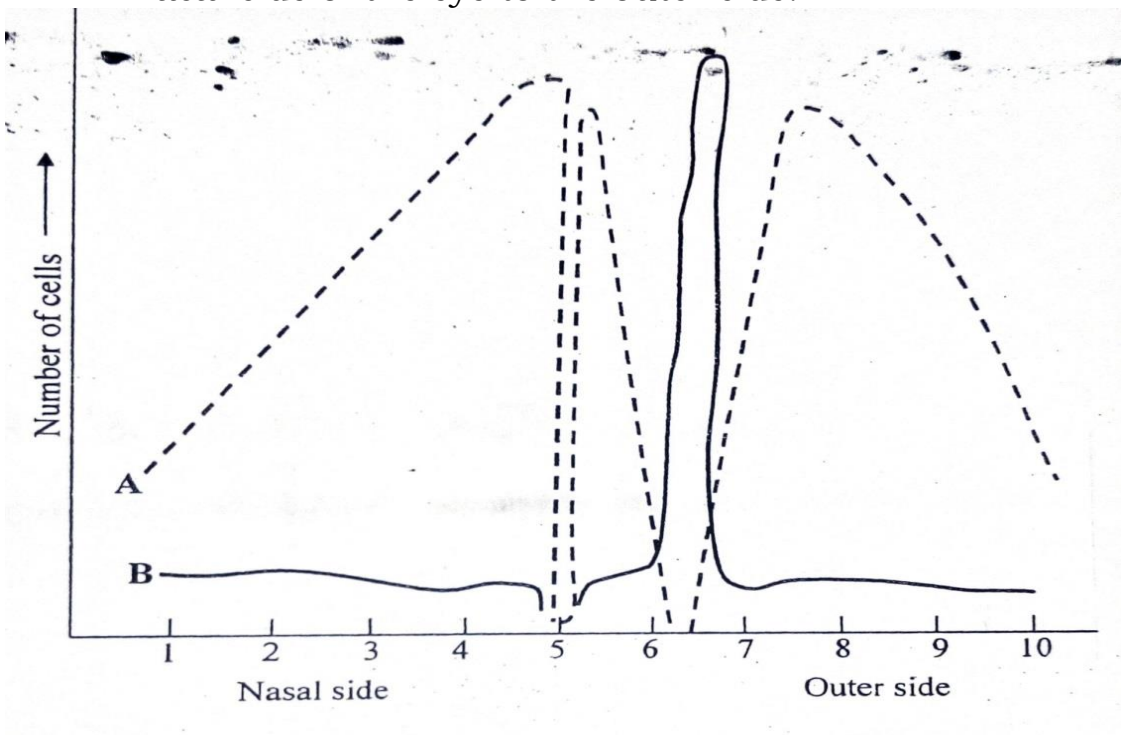
2 HOURS 30 MINUTES

INSTRUCTIONS

- This paper consists of Sections **A** and **B**
- 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 wherever necessary.

SECTION A: 40 marks
This is a compulsory question.

1. The graph below shows the number of receptor cells of type A and B in arbitrary units in the human retina along a horizontal line from the nasal side of the eye to the outer side.



a) i) Giving reasons, identify the types of receptor cells represented by A and B. (3 marks)

ii) Explain why there are no receptor cells at position 5. (2 marks)

iii) What is the name of the region of the retina at position 6.3. Give reason for your answer. (2 marks)

b) Explain why;

i) The greatest concentration of receptor cells of type B occur at position 6.3. (3 marks)

ii) On entering a dimly-lit room, objects in the room at first are invisible but gradually become visible. (6 marks)

iii) Some nocturnal animals like cats close their pupils to a vertical slit and squint in bright light. (4 marks)

iv) The position of an object placed in front of the face can be accurately judged. (3 marks)

c) i) From the graph, identify and describe the features of the receptor cells which allow colour vision. (4 marks)

ii) The flowers of three species of a plant are similar in form and appear to have yellow colours of petals. When photographed in ultraviolet light, each species shows a different pattern of its petals. Using this information, explain how bees are able to distinguish between the flowers of the three species, but not humans. (3 marks)

2. A theory of colour vision suggests that a photoreceptor has pigment that exists in three forms red, blue and green according to the colour of wave length absorbed by each. The absorption of different wave lengths by the three forms of photoreceptor pigments is given in the table below. Study the information and answer questions that follow.

Wave lengths (nm)	Amount of light absorbed as a percentage of maximum		
	Red cones	Green cones	Blue cones
660	5	0	0
600	75	15	0
570	100	45	0
550	85	85	0
530	60	100	10
500	35	75	30
460	0	20	75
430	0	0	100
400	0	0	30

a) From the data, explain why light of wave length:
i) 430nm appears blue. (2 marks)
ii) 550nm appears yellow (2 marks)
iii) 570nm appears orange. (2 marks)

b) Explain why two closely placed small objects can easily be distinguished by cones than rods. 04 marks

SECTION B: 60 marks.

Attempt any three questions

2. a) Explain why proteins are able to regulate the pH of blood. (5 marks)

b) How does the lock and key hypothesis explain how enzymes function? (8 marks)

c) Explain specifically how allosteric enzymes regulate cell metabolism. (6 marks)

3. a) Explain how leaf modifications are related to the distribution of terrestrial plants? (10 marks)

b) How do stomata open and close according to the osmotic pressure theory? (10 marks)

4. a) Differentiate between monocotyledonous and dicotyledonous plants. (5 marks)

b) Explain the advantage of having each of the following phases in the life cycle of an organism.

i) sexual phase. (6 marks)

ii) asexual phase (5 marks)

c) How is the sporophyte of a fern adapted for terrestrial life? (4 marks)

5. a) Describe the role of hypothalamus in regulation of core body temperature. (6 marks)

b) Explain how animals benefit from ectothermy and endothermy. (8 marks

c) Explain why it is dangerous to bath hot water on cold days. (6 marks)

6. a) How do each of the following human activities harm the environment?

i) Use of plastics. (10 marks)

ii) Use of chlorofluorocarbons. (5 marks)

b) Why is it important to conserve nature? (5 marks)

END