

**P530/2**  
**BIOLOGY**  
**(Theory)**  
**Paper 2**  
**Nov. / Dec. 2019**  
**2½ hours**



**UGANDA NATIONAL EXAMINATIONS BOARD**

**Uganda Advanced Certificate of Education**

**BIOLOGY**  
**(THEORY)**

**Paper 2**

**2 hours 30 minutes**

**INSTRUCTIONS TO CANDIDATES:**

*This paper consists of **six** questions.*

*Answer question **one** in Section A plus **three** others in Section B.*

*Candidates are advised to read the questions carefully, organise their answers and present them precisely and logically, illustrating with well labelled diagrams wherever necessary.*

## SECTION A (40 MARKS)

Question 1 is compulsory.

1. Methylene blue is an indicator which is blue when oxidised and colourless when reduced. The intensity of light passing through a mixture of solution/reactants containing methylene blue can be measured. A 100% transmission of blue light means that the methylene blue is in a complete oxidised state.

Three solutions were mixed in test tubes as shown in table 1.

Table 1

Test tube	Contents of the test tube
1	10 cm <sup>3</sup> of yeast suspension + 10 cm <sup>3</sup> of 0.5 % glucose + 1 cm <sup>3</sup> of 0.1 % methylene blue
2	10 cm <sup>3</sup> of yeast suspension + 10 cm <sup>3</sup> of 0.5 % sucrose + 1 cm <sup>3</sup> of 0.1% methylene blue.
3	10 cm <sup>3</sup> of yeast suspension + 10 cm <sup>3</sup> of 0.5% lactose + 0.1% methylene blue

The test tubes were covered and maintained at 35 °C for 20 minutes.

At 2 minute intervals, the percentage of blue light transmitted through the test tube of each solution was measured and the results are as shown in figure 1.

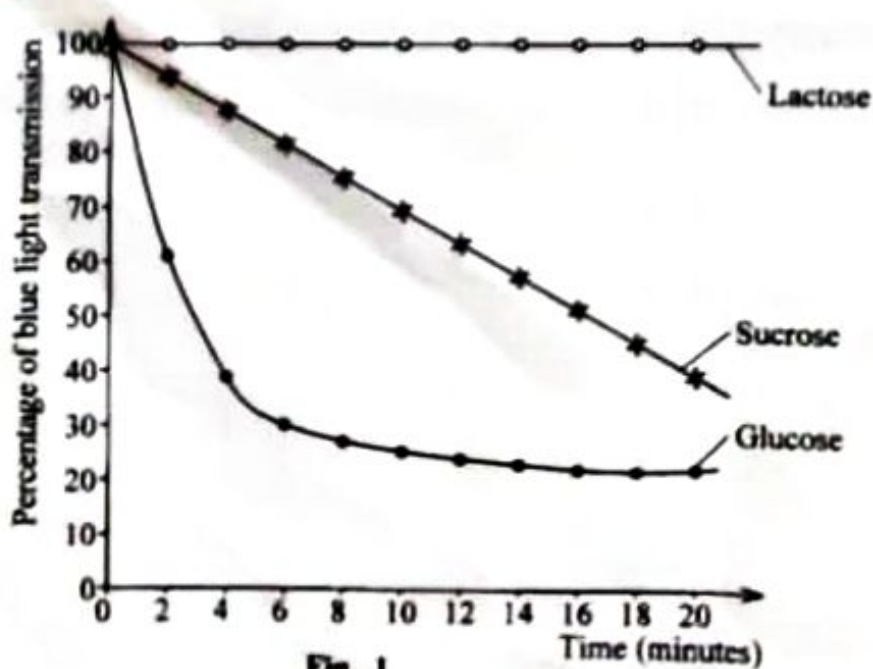


Fig. 1

- (a) (i) Compare the changes in the percentage of blue light transmission through the test tubes containing glucose and sucrose. (06 marks)
- (ii) Explain the difference(s) in (a) (i). (06 marks)
- (b) Explain the differences in the variation of blue light transmission through the test tubes containing lactose and sucrose. (08 marks)
- (c) (i) Suggest what would happen to the blue light transmission if lactose was mixed with lactase instead of the yeast suspension. (02 marks)
- (ii) Sketch a graph to illustrate your answer. (04 marks)
- (d) In another experiment, changes in products of an enzyme - catalysed reaction were determined at 25 °C, 37 °C and 60 °C. The results were presented graphically as shown in figure 2. Study the figure and answer questions that follow:

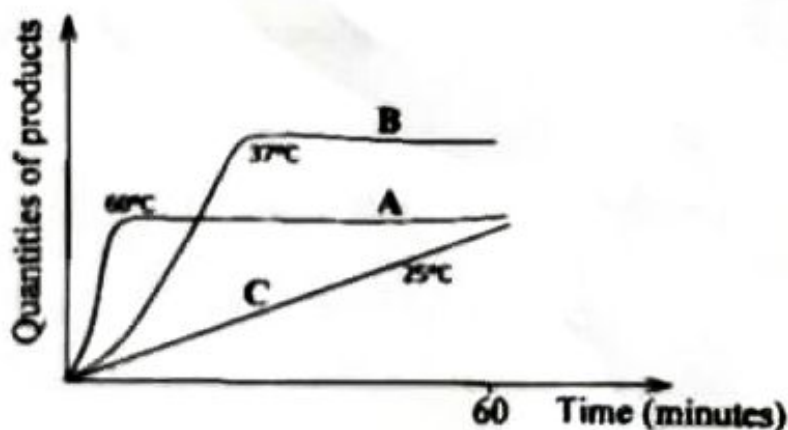


Fig. 2

Explain the pattern of changes in the quantities of products of reactions at each temperature.

- (i) A.
- (ii) B.
- (iii) C. (12 marks)
- (e) Suggest what would happen to the reaction if the temperature was maintained at 45 °C. (02 marks)

## SECTION B (60 MARKS)

Answer **three** questions from this section.

Any additional question(s) answered will **not** be marked.

2. Describe the physiological adaptations of:
- (a) vertebrates living in dry environments, giving examples in each case. (14 marks)
  - (b) plants to water shortage. (06 marks)
3. Explain the reproductive strategies of flowering plants that have led to their:
- (a) diversity. (08 marks)
  - (b) survival. (12 marks)
4. (a) How does instinctive behaviour differ from learned behaviour? (04 marks)
- (b) Explain the benefits of social behaviour to social animals. (16 marks)
5. (a) What is immunity? (02 marks)
- (b) Explain how the body reacts when:
- (i) a blood vessel is cut. (08 marks)
  - (ii) there is a presence of antigens in the body. (06 marks)
- (c) What are the likely consequences of over bleeding to an individual? (04 marks)
6. (a) Using the law of Independent Assortment, explain the 3:1 ratio in the  $F_2$  generation of a monohybrid inheritance when one parent is homozygous dominant and the other homozygous recessive for a trait? (12 marks)
- (b) Give situations where the law of Independent Assortment may not apply. (08 marks)