

# ST. PETERS HIGH SCHOOL-BUSABALA

UGANDA ADVANCED CERTIFICATE OF EDUCATION (UACE)

## BEGINNING OF TERM 11 EXAMS 2026

S.6 BIOLOGY 1

Time: 3 Hours

NAME.....SIGN.....

---

### Instructions

- This paper consists of TWO sections: A and B.
  - Answer ALL items in Section A.
  - In Section B, answer ONE item from Part I and ONE item from Part II.
  - Read all scenarios carefully before answering the questions.
  - Credit will be awarded for:
    - Biological reasoning
    - Data interpretation
    - Critical thinking
    - Problem solving
    - Application of biological concepts to real-life situations
  - Scientific illustrations should be used where necessary.
- 

### SECTION A (COMPULSORY)

---

#### Item 1

A sports science team investigated the effect of physical activity on oxygen demand among three groups of students.

- **Group A:** Students at rest
- **Group B:** Students jogging for 20 minutes daily
- **Group C:** Students involved in intensive athletic training

Blood samples were analysed after two months and the following data were obtained.

| Group | Average breathing rate<br>(breaths/min) | RBC count<br>( $\times 10^{12}/L$ ) | Lactic acid level<br>(mg/dL) |
|-------|-----------------------------------------|-------------------------------------|------------------------------|
| A     | 16                                      | 5.1                                 | 12                           |
| B     | 24                                      | 5.8                                 | 18                           |
| C     | 38                                      | 6.5                                 | 35                           |

Athletes in Group C occasionally complained of muscle fatigue after competitions.

### Task

(a) Analyse the relationship between physical activity, breathing rate and red blood cell count.

(8 marks)

(b) Explain why lactic acid levels were highest in Group C.

(6 marks)

(c) Using your knowledge of respiration, explain the cause of muscle fatigue experienced by some athletes.

(6 marks)

(d) Suggest biological adaptations that enable trained athletes to tolerate intense exercise better than untrained individuals.

(10 marks)

---

### Item 2

A horticultural research centre investigated the effect of environmental conditions on tomato production.

Three greenhouses were set under different conditions:

- **Greenhouse A:** Adequate watering and moderate temperature
- **Greenhouse B:** Limited watering and high temperature
- **Greenhouse C:** Excessive watering and poor drainage

The following observations were recorded after five weeks.

| Greenhouse | Average plant height (cm) | Number of fruits per plant | Leaf condition |
|------------|---------------------------|----------------------------|----------------|
| A          | 65                        | 28                         | Healthy green  |
| B          | 40                        | 11                         | Wilted         |
| C          | 52                        | 9                          | Yellowing      |

Further analysis showed reduced root growth in Greenhouse C.

### Task

- Analyse the relationship between environmental conditions and plant productivity.  
(8 marks)
- Explain the biological causes of wilting in Greenhouse B.  
(6 marks)
- Account for the yellowing leaves and reduced root growth observed in Greenhouse C.  
(8 marks)
- Recommend sustainable agricultural practices that could improve tomato production in all three greenhouses.  
(8 marks)

---

## SECTION B

### PART I

**Respond to only ONE item from this part**

---

#### Item 3

A district hospital conducted a study on students from three different boarding schools after repeated complaints of fatigue, poor concentration and frequent illness.

- School A:** Students received balanced meals and participated in regular physical exercise.

- **School B:** Students consumed mainly carbohydrate-rich foods with limited proteins and vegetables.
- **School C:** Students lived in a crowded lowland area with frequent malaria infections.

Blood analysis was carried out after one school term and the following data were recorded.

| School | RBC count<br>( $\times 10^{12}/L$ ) | Haemoglobin<br>(g/dL) | White blood cells<br>( $\times 10^9/L$ ) |
|--------|-------------------------------------|-----------------------|------------------------------------------|
| A      | 5.4                                 | 15.2                  | 7.0                                      |
| B      | 4.3                                 | 11.5                  | 7.5                                      |
| C      | 3.8                                 | 10.2                  | 13.8                                     |

Some students in School C also showed enlarged spleens and persistent headaches.

### Task

(a) Analyse the relationship between nutrition, disease exposure and blood composition among the three schools.

(8 marks)

(b) Explain the possible biological reasons for:

- The low haemoglobin level in School B
- The high white blood cell count in School C

(8 marks)

(c) Predict two long-term physiological effects that may occur in students from School C if the condition persists.

(6 marks)

(d) Suggest practical interventions the schools and health authorities could implement to improve the health conditions observed.

(8 marks)

### Item 4

A wildlife researcher observed rabbit populations living in two contrasting habitats.

- **Habitat A:** Open grassland with few predators and abundant food

- **Habitat B:** Dense shrubland with many predators and limited food supply

The following observations were recorded over six months.

| <b>Habitat</b> | <b>Average feeding time<br/>(hours/day)</b> | <b>Average body<br/>mass (kg)</b> | <b>Reproductive<br/>success (%)</b> |
|----------------|---------------------------------------------|-----------------------------------|-------------------------------------|
| A              | 6                                           | 2.8                               | 82                                  |
| B              | 2                                           | 1.9                               | 41                                  |

Rabbits in Habitat B were also more alert and spent more time hiding.

### **Task**

(a) Analyse the relationship between environmental conditions and rabbit behaviour in the two habitats.

(8 marks)

(b) Explain how the nervous and endocrine systems help rabbits survive in Habitat B.

(8 marks)

(c) Predict the long-term effects of reduced feeding time on the rabbit population in Habitat B.

(6 marks)

(d) Suggest ecological management practices that could improve survival of rabbits in Habitat B without disrupting ecosystem balance.

(8 marks)

---

## **PART II**

**Respond to only ONE item from this part**

---

### **Item 5**

A conservation team investigated fish populations in two lakes over a five-year period.

- **Lake X:** Surrounded by protected wetlands and controlled fishing activities

- **Lake Y:** Exposed to industrial waste discharge and overfishing

The following data were collected.

| Year | Fish population in Lake X<br>(millions) | Fish population in Lake Y<br>(millions) |
|------|-----------------------------------------|-----------------------------------------|
| 1    | 2.8                                     | 2.7                                     |
| 2    | 2.9                                     | 2.1                                     |
| 3    | 3.0                                     | 1.5                                     |
| 4    | 3.2                                     | 0.9                                     |
| 5    | 3.3                                     | 0.4                                     |

Researchers also reported reduced oxygen concentration and increased algal growth in Lake Y.

### Task

- Analyse the population trends observed in the two lakes.  
(6 marks)
- Explain how industrial pollution may have contributed to the ecological changes observed in Lake Y.  
(8 marks)
- Predict the possible long-term consequences of declining fish populations on surrounding communities and ecosystems.  
(8 marks)
- Propose scientifically sound conservation measures that could restore ecological balance in Lake Y.  
(8 marks)

---

### Item 6

A biotechnology company developed a genetically improved maize variety resistant to a common pest. The maize was introduced in two farming regions.

- **Region A:** Farmers followed recommended planting and pest management guidelines.
- **Region B:** Farmers repeatedly planted only the improved maize variety season after season without crop rotation.

After several years, scientists collected the following information.

| Region | Average maize yield (tons/hectare) | Pest damage (%) |
|--------|------------------------------------|-----------------|
| A      | 6.8                                | 12              |
| B      | 4.1                                | 48              |

Further studies revealed that pest populations in Region B had developed resistance to the modified maize.

### Task

(a) Analyse the relationship between farming practices and pest resistance development in the two regions.

(8 marks)

(b) Explain how natural selection may have led to resistant pest populations in Region B.

(8 marks)

(c) Discuss the possible ecological and economic effects of relying on a single crop variety over a long period.

(6 marks)

(d) Suggest integrated farming strategies that could reduce pest resistance while maintaining high crop productivity.

(8 marks)

---

**END**

**"The secret to getting ahead is simply to begin."**