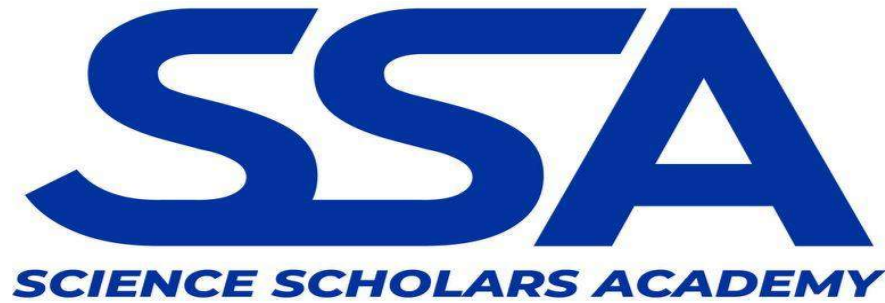




S.5/6 BIO

PAPER 1 ASSIGNMENT

MODULE 01

GROUP ASSIGNMENT CODE: **BIO | B1Mo1**

GROUP NAME: STREAM:

GROUP CHAIRPERSON: EXPECTED SCORE:

INSTRUCTIONS:

- Items 1, 2, 3 and 4 are set from Assessment Objectives [Elements of Construct] 1, 2, 3 and 4 respectively, following UNEB-Standard Assessment Guidelines.
- Keywords have been put in “**bold**” to guide you on content-expansion!

ITEM 1:

In Kibaale District, a farming community depends on a **wetland stream** as the **main source of water** for **irrigating rice** and **vegetable gardens**. The wetland also receives **biodegradable domestic wastes** from nearby homes, which are normally **broken down by microorganisms**.

Recently, a food-processing factory and a leather tannery were established upstream. Within a few months, residents noticed that **warm acidic wastewater** was being discharged into the stream. Farmers later reported a **strong unpleasant smell** from the wetland, **accumulation of partly**

decomposed organic matter, poor germination of crops and reduced crop yields despite regular irrigation.

Environmental officers investigated the wetland and collected samples from both the water and the affected gardens. Their findings are summarized in Tables 1 and 2.

Table 1. Wetland Water Analysis

Parameter	Normal	Polluted wetland
Water temperature (°C)	22–28	42
pH	6.5–7.5	4.5
Activity of decomposer enzymes (%)	100	18

Table 2. Garden Investigation

Parameter	Wetland water	Clean borehole water
ATP in root cells (%)	15	98
Active mineral uptake	Very low	High
Mitotic activity (%)	5	100

Laboratory analysis further detected **traces of heavy metals** and a **compound that interferes with cytochrome oxidase activity**. Microscopic examination of root tips also showed **failure of spindle fibre formation during cell division**.

Tasks:

a) **Analyse the findings from the wetland and garden investigations in relation to the farmers' observations.**

b) **Evaluate the recommendations given by the environmental officers and suggest additional measures that could restore the wetland ecosystem.**

ITEM 2:

To **improve crop production** in areas frequently affected by **prolonged drought**, farmers in Lira District introduced a **fast-growing tomato variety** that had **previously performed** well under **moderate rainfall conditions**. During the first few weeks after **transplanting**, the plants **established successfully** and **produced healthy shoots**. However, as the **dry season**

progressed, the plants developed **weak stems**, **reduced leaf expansion**, **early fruit ripening** and **excessive shedding of flowers and fruits**. Consequently, the farmers harvested **very low marketable yields** despite applying *adequate fertilizers*.

Plant scientists investigated the problem and found that the tomato plants had experienced **prolonged water deficit** and **high daytime temperatures**. Laboratory analysis showed **reduced gibberellin activity** in the **shoot tips**, **increased ethylene production**, a **reduced leaf area index** and **low photosynthetic efficiency**. In the neighbouring fields, a *sorghum variety* **remained vigorous** and produced **satisfactory yields** under the **same environmental conditions**.

The findings are summarised in Table 1.

Parameter	Tomato Variety	Sorghum Variety
<i>Photosynthetic pathway</i>	C3	C4
<i>Primary growth rate (cm week⁻¹)</i>	3.1	8.9
<i>Gibberellin activity (arbitrary units)</i>	22	70
<i>Ethylene production (ppm)</i>	10.8	3.8
<i>Leaf area index</i>	1.6	5.0
<i>Premature flower and fruit drop (%)</i>	38	4
<i>Yield (kg ha⁻¹)</i>	1,120	2,940

Following the investigation, the scientists recommended **improving water conservation practices**, **regulating plant hormonal balance** where appropriate, and **promoting crop varieties with physiological adaptations that enable efficient growth under water-limited conditions**. They also advised farmers to **adopt irrigation methods that minimise water loss during prolonged dry periods**.

Tasks:

(a) *Analyse* how the **physiological changes** shown in Table 1 **contributed** to the **poor growth** and **low yield** of the tomato variety.

(b) *Evaluate* the scientists' **recommendations** and **suggest additional strategies** that farmers could use to **improve tomato production** under **prolonged drought conditions**.

ITEM 3:

Sarah, a wildlife veterinarian *from Kenya*, travelled to *Bwindi Impenetrable National Park* to participate in a week-long wildlife conservation expedition. *Before travelling*, she received the recommended **travel vaccinations** and **malaria prophylaxis**. On the third day of field activities, while trekking under **hot** and **humid** conditions, she developed **excessive sweating**, **rapid heartbeat**, **flushed skin** and a **mild headache**.

She was taken to the park health centre where the clinician carried out a physical examination and requested laboratory investigations. The results are shown in Table 1 below.

Parameter	Sarah's results	Reference range
<i>Body temperature</i>	38.8°C	37.0°C
<i>Blood pH</i>	7.18	7.35–7.45
<i>Sympathetic nerve activity (%)</i>	76	20–35
<i>Malaria rapid test</i>	Positive	Negative
<i>Memory B-lymphocytes (%)</i>	88	40–60
<i>Active sweat glands (%)</i>	86	10–30

The clinician concluded that Sarah's symptoms were mainly due to **malaria infection** complicated by **heat stress** during **prolonged physical activity**. He recommended **immediate antimalarial treatment**, **adequate oral rehydration**, **rest in a cool environment** and **close monitoring of body temperature before resuming strenuous activities**.

Tasks:

(a) **Analyse** how the **clinical findings** and **laboratory results** **explain Sarah's symptoms** during the expedition.

(b) **Evaluate** the clinician's **recommendations** and **propose additional measures** that would **promote rapid recovery** and **prevent similar episodes in future**.

ITEM 4:

For over fifteen years, communities living around Budongo Central Forest Reserve have **depended on the forest** for **rainfall regulation, fuelwood, medicinal plants** and **ecotourism**. In recent years, however, **large sections of the forest** have been **cleared to establish commercial crop plantations, expand settlements** and **construct access roads**. **Parts of the surrounding wetlands** have also been **drained to create more agricultural land**.

Environmental monitoring teams reported noticeable changes in the ecosystem. Residents observed **irregular rainfall patterns, prolonged dry spells, declining crop productivity** in neighbouring farms, **increasing daytime temperatures** and a **marked reduction in the abundance of birds, monkeys and other wildlife species**. Although **agricultural production** and **household incomes initially increased** following **land conversion**, scientists expressed concern that **continued habitat destruction** could **threaten the long-term stability of the ecosystem**.

To assess the impact of land-use changes, environmental scientists **compared** ecological indicators recorded in an **undisturbed section of the forest in 2014** with those measured in the **disturbed area in 2024**. The results are presented in Table 1.

Parameter	Undisturbed Forest (2014)	Disturbed Forest (2024)
<i>Soil organic carbon (%)</i>	9.4	4.3
<i>Mammal population (groups/10 km²)</i>	15	5
<i>Above-ground biomass (tons ha⁻¹)</i>	340	96
<i>Tree density (trees ha⁻¹)</i>	215	61
<i>Bird diversity index</i>	0.89	0.37
<i>Estimated carbon released from vegetation loss (tons CO₂ ha⁻¹)</i>	0	175
<i>Mean annual surface temperature change (°C)</i>	Baseline	+2.4
<i>Rainfall reliability</i>	High	Low

Following the investigation, the environmental scientists recommended **restoring degraded forest areas through afforestation, protecting wetlands from further encroachment, strengthening community-based conservation programmes and promoting sustainable land-use practices that minimise habitat destruction while maintaining agricultural productivity.**

Tasks:

(a) **Analyse** how **habitat disturbance** contributed to the **ecological changes** shown in Table 1.

(b) **Evaluate** the scientists' **recommendations** and **suggest additional measures** that could **promote biodiversity conservation** and **long-term ecosystem sustainability.**

~ END ~

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