

P530/1  
BIOLOGY  
THEORY  
PAPER 1  
SENIOR Five  
22<sup>nd</sup> APRIL 2025  
Time 2 HOURS

**UGANDA ADVANCED CERTIFICATE OF EDUCATION  
COMPETENCY BASED CURRICULUM  
S5 EOT 1 BIOLOGY 2025**

**PAPER ONE**

**TIME: 2 HOURS**

**INSTRUCTIONS**

- ✓ Attempt all items in section A and only one in section B
- ✓ Answers for item one and two are written in the space provided
- ✓ Answers for item three and four are written on the separate answer sheet
- ✓ Illustrate your work with diagrams equations, pathways etc as much as you can.

**SECTION A**

**ITEM ONE**

In a rural community, agricultural runoff containing fertilizers and pesticides is heavily affecting the nearby freshwater ecosystems. Scientists studying these waters discover a unique microorganism thriving in the polluted environment and it plays crucial role in keeping their water safe. When examining its cellular structure under a microscope, they note the following:

- ✓ **It lacks a nucleus and other membrane-bound organelles, resembling simpler organisms seen in extreme environments.**
- ✓ **Its plasma membrane, made up of a phospholipid bilayer and proteins, adapts to allow water and certain ions to freely pass while regulating the uptake of nutrients.**
- ✓ **Advanced microscopy shows that pollutants cause observable changes to its plasma membrane over time, potentially influencing its survival mechanisms.**

Community members are curious about how the microorganism might be used to mitigate environmental damage caused by the runoff. The research could inform better farming practices or lead to solutions for cleaning polluted water sources.

**TASKS**

1. Identify the type of microorganism described and justify your classification using the cellular traits mentioned. Give an example of the organisms identified above **(05 scores)**

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2. Explain how the structure of the plasma membrane allows the microorganism to thrive in polluted water. **(05 scores)**

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3. Discuss the potential impact of pollutants on the permeability of the microorganism's plasma membrane, as observed under advanced microscopy. **(05 scores)**

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**ITEM TWO**

Kamwenge community members are facing a crisis. Their main cash crop, maize, has been showing poor yields due to stunted growth and yellowing leaves. Concerned about food security and their livelihoods, the farmers have reached out to a team of young scientists to investigate the problem and propose solutions.

After conducting investigations, the team uncovers the following:

- ✓ **Photosynthesis Trouble:** Microscopic analysis of maize leaves reveals issues with chloroplasts. The light-dependent reactions are producing less ATP and NADPH, slowing down the Calvin Cycle. This has led to reduced glucose production.
- ✓ **Environmental Challenges:** Cloudy weather has decreased sunlight availability, while rising temperatures have affected enzyme activity in photosynthesis.
- ✓ **Soil Health Concerns:** Soil tests show low nitrogen levels, affecting chlorophyll production, and excessive pesticide use has degraded soil quality.

The community leaders have called for an emergency meeting, inviting you to present your findings and suggest actionable solutions.

**Your Task:**

As part of the research team, create an engaging presentation for the farmers and community leaders. Your presentation should:

1. Explain the process of photosynthesis, highlighting the importance of light-dependent and light-independent reactions. **(08 scores)**

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2. Describe how environmental factors like light intensity, temperature, and nutrient availability are impacting the crops. **(05 scores)**

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3. Propose sustainable solutions to improve photosynthesis and crop health **(05 scores)**

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**SECTION B**

**ITEM THREE**

In a rural community, children are experiencing malnutrition, showing signs of stunted growth and poor cognitive development. The water available is often contaminated, leading to diseases such as diarrhea, which further worsen malnutrition by reducing nutrient absorption. A health worker emphasizes the importance of proper nutrition, safe water, and community-driven solutions to address these intertwined challenges. However, the resources available are limited, and the health worker urges the community to use locally available knowledge and materials to create sustainable solutions.

Imagine you are the health worker addressing the community during the educational session mentioned in the scenario. Prepare either a speech you will be aimed at convincing the community to take action to improve nutrition and access to clean water. Incorporate scientific evidence and practical solutions while addressing the challenges described in the above.

#### ITEM FOUR

A small town is struggling with worsening air pollution from nearby factories and vehicle emissions. Residents are experiencing respiratory issues, and as part of a health initiative, you decide to explore the root causes and solutions with the community. During your visit, you notice several hints about the connection between air quality and health:

- ✓ A doctor at the local clinic mentions that damage to the epithelial tissues lining the lungs can reduce their ability to filter harmful particles. They point out that this has left many residents more vulnerable to respiratory conditions.
- ✓ Conversations with townsfolk reveal how pollutants like dust and smoke have visibly increased in the air, leading to frequent coughing and wheezing. You start to wonder how these pollutants might be affecting the microscopic layers protecting their lungs.
- ✓ At a town hall meeting, people talk about their frustrations with chronic health issues. They seem eager for practical ideas to protect their lungs and improve the air quality in their community.

Nearby schools are excited to join the cause. The headteacher asks you to help inspire students to take part in awareness campaigns or green projects to protect the lungs of future generations.

#### TASK

Write a simple write up that you will use to teach and inspire these students to join the campaign and save the environment

**\*\*\*END \*\*\***

**\*\*\*\*SUCCESS DOC\*\*\*\***