ST. FRANCIS HIGH SCHOOL-NAMAGOMA

UGANDA ADVANCED CERTIFICATE OF EDUCATION

END OF TERM TWO EXAMINATIONS 2025

SENIOR FIVE

BIOLOGY

TIME: 2 HOURS 30 MINUTES

INSTRUCTIONS

This question paper has **six** items. Answer only **four (4)** items in all

Use of relevant instructions will earn you more scores

Item 1

Your biology class is studying plant structures and their functions. Today, the focus is on understanding the cellular organization of plants. Your teacher has just explained that to truly appreciate the intricate details of plant cells, you'll need to use a powerful tool, the compound microscope and the quality of the image depends on the objective lens used.

The teacher presents each group with a fresh *Tradescantia* leaf (spiderwort). He explains that *Tradescantia* leaves are excellent for observing plant cells due to their relatively large and easily identifiable structures. Before using a compound microscope, your teacher emphasizes that a thorough understanding of the microscope's operation is crucial for accurate observations and clear drawings.

Task:

As a biology learner, design a write up you will present to your teacher before giving you a compound microscope to observe the cells of *Tradescantia* leaf (spiderwort) practically.

Item 2

Dr. Nsubuga, a lead researcher at the National Biotechnology Centre in Uganda, is preparing for a new project investigating how various drugs enter and exit human cells. He's assembling his research team and has called you in for a preliminary briefing.

During the meeting, Dr. Nsubuga explains, "Understanding the cell's outer boundary, the plasma membrane, is absolutely fundamental to this project. It's not just a static wall; it's a dynamic and intelligent interface that controls everything. Before we can even begin discussing drug mechanisms, we need to be crystal clear on its fundamental nature." Dr. Nsubuga introduces you to other members of the team as his research assistant and you're to help him during the presentation.

Task: As Dr. Nsubuga's research assistant, prepare a presentation you will use to provide a clear and insightful overview of the plasma membrane for the project team.

Item 3

Your biology teacher presents you with three unlabeled slides, "Each contains a different animal tissue. You examined them with your teacher under the microscope, and you noted some differences and similarities with the observed tissues.

One slide showed a single, thin layer of flat, tightly packed cells. Another revealed tall, column-shaped cells with tiny projections on their surface. The third showed multiple layers of cells, forming a protective barrier. "They are all so different, yet they all seem to be forming a kind of boundary".

Task; As a biology learner,

(a) What common characteristics unite these diverse tissues into a single category?
(b) How do the distinct structures of these tissues relate to their functions in the mammalian body?

Item 4

In a bioengineering lab, a team of young scientists is working on a project to design a new, resilient organism capable of surviving extreme environments. Their lead scientist presents them with a critical problem. "We have the perfect proteins and lipids," he says, "but we need to design the fundamental blueprint for this new life form. This blueprint must be stable, capable of carrying vast amounts of information, and easily copied." He hands the team a detailed 3D model of a long, twisted molecule. "This is a representation of the master blueprint found in all life.

Task; As one member of the team,

(i) Examine this model closely and, based on your observations, give a detailed description of its structural organization**.**
(ii) Present an analysis of how this molecule's unique structure makes it perfectly suited for its function as the genetic blueprint of an organism.

Item 5

A team of young scientists is studying the circulatory systems of various vertebrates to understand how they have adapted to different lifestyles. Their research focuses on two

key aspects: the physical structures that keep blood moving efficiently, and the chemical processes that govern gas exchange.

During their research, they looked at the cardiovascular systems of a rat and an elephant. One has a tiny, lightning-fast heart, while the other has a massive, slow-beating one. Both were incredibly efficient at delivering oxygen and nutrients, but they achieve it in different ways. This posed a challenge to them and desired to understand deep how this is possible.

Task; As a member of the young scientist team,

(i) Describe the features that are present in the mammalian circulatory system to ensure blood moves effectively with the bodies of the vertebrates in the scenario
(ii) Explain the chemical mechanism that plays a crucial role in oxygen delivery at the cellular level.

Item 6

A local community is planning to establish a new agricultural cooperative. The area has a wide range of microclimates, from well-irrigated river valleys to arid, sunbaked hillsides. They want to select the most suitable crop plants for each section of the land to maximize yield and water efficiency. But lack the fundamental biology of the crops they have. The crops included rice, wheat, maize, sugarcane, pineapple and aloe vera. The cooperative members are seeking for advice from you.

Task;

As a biology learner, prepare a presentation for the farmers that explains the photosynthetic strategies of the types of crops above and your planting recommendations according to the geography of the area.

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