THE UNITED REPUBLIC OF TANZANIA
NATIONAL EXAMINATIONS COUNCIL OF TANZANIA
DIPLOMA IN SECONDARY EDUCATTION EXAMINATION

733/1 **BIOLOGY 1**

Time: 3 Hours **ANSWERS** **Year: 2022**

Instructions.

1. This paper consists of sections A and B with a total of **Fourteen (14)** questions.
2. Answer **all** questions from section A and **four (4)** questions from section B.
3. Section A carries **forty (40)** marks and section B Carries **sixty (60)** marks.
4. Cellular phones are **note** allowed in the examination room.
5. Write your **examination Number** on every page of your answer booklet(s).

SECTION A (40 Marks)

Answer all questions from this section. Each question carries 4 marks.

1. Differences between Active and Passive Body Immunity

Active immunity is the type of immunity where an individual's body produces its own antibodies after exposure to a disease-causing organism or through vaccination. In this case, the immune system is actively involved in recognizing the foreign organism and building a defense against it, which results in long-lasting protection that can sometimes last for life. On the other hand, passive immunity occurs when a person is given antibodies that were produced by another organism, without the person's immune system being involved in their production. This kind of immunity offers immediate protection but is temporary since the body does not develop memory cells.

Another difference is that active immunity usually takes time to develop because the body must first recognize the pathogen, activate immune cells, and produce the necessary antibodies. In contrast, passive immunity offers instant protection since the ready-made antibodies begin working immediately upon introduction into the body. This is particularly useful in cases where immediate protection is needed, such as after exposure to rabies or snake venom.

A third distinction is that active immunity can be achieved naturally through infection or artificially through vaccination, both of which stimulate the body's defense system to produce antibodies. Passive immunity, however, is typically acquired naturally through the transfer of antibodies from mother to child through breast milk or the placenta, or artificially through injections of antibody-containing preparations like antiserum.

Lastly, active immunity leads to the creation of memory cells which help the body respond faster to future infections by the same pathogen. Passive immunity does not produce memory cells, meaning once the injected or transferred antibodies degrade, the person is no longer protected against the disease.

2. Two Challenges That Made the Tanzanian Government Ban Plastic Bags

One of the major challenges was the widespread environmental pollution caused by the careless disposal of plastic bags. These plastic materials do not decompose easily, leading to their accumulation in the environment. This resulted in blocked drainage systems, flooding during rainy seasons, and the destruction of natural scenery, affecting both urban and rural areas.

Another serious challenge was the threat that plastic bags posed to the health of livestock and wildlife. Animals would often ingest plastic materials while grazing or scavenging, causing intestinal blockages and sometimes death. The harmful effects extended to humans as well, as microplastics entered the food chain, posing long-term health risks.

3. Why a Mango Tree and a Bean Plant Are in the Same Class

Despite the obvious difference in their physical size, both the mango tree and the bean plant belong to the class of dicotyledons. This classification is based on certain botanical characteristics they share, not their size. One key feature is that both plants have seeds containing two cotyledons, which are the seed leaves that provide nutrients to the embryo during germination.

Both the mango tree and the bean plant also possess a type of leaf venation known as reticulate venation, where the veins form a network-like pattern. This is a typical feature of dicotyledonous plants. Additionally, both plants show secondary growth, meaning they can increase in thickness as they grow, a process made possible by the presence of a vascular cambium layer.

Another similarity is seen in the arrangement of their floral parts, which typically occur in multiples of four or five. This is a characteristic trait used to group dicotyledonous plants. Therefore, regardless of the difference in their overall physical appearance and size, these internal and reproductive similarities place them within the same botanical class.

4. Energy Requirement in the Initial Stage of Respiration

The first reason energy is required during the initial sub-stage of respiration is to activate glucose molecules, making them more reactive for subsequent breakdown. This activation step involves the use of ATP molecules to phosphorylate glucose, lowering the activation energy needed for the following reactions to proceed efficiently.

Secondly, energy is needed to rearrange and destabilize the glucose molecule structure, enabling it to split into two smaller three-carbon molecules known as triose phosphate. This structural adjustment would not happen spontaneously without the input of energy from ATP, which helps in breaking and forming chemical bonds during this transformation.

The two sub-stages that follow this initial energy-requiring step are glycolysis and the Krebs cycle. In glycolysis, the glucose molecule is broken down further into pyruvate, producing ATP and NADH. This is followed by the Krebs cycle, which takes place in the mitochondria and involves the oxidation of acetyl-CoA to carbon dioxide while generating more electron carriers and a small amount of ATP.

5. How the Induced Fit Model Explains Enzyme Inhibition Better Than Lock and Key

The induced fit model suggests that an enzyme’s active site is flexible and can slightly change shape to better accommodate a substrate upon binding. This flexibility also explains how a non-competitive inhibitor, which binds to a site other than the active site, can alter the enzyme’s overall shape, preventing the substrate from fitting even after the enzyme adjusts. The lock and key model cannot explain this because it assumes a fixed, rigid shape of the active site.

Another advantage of the induced fit model is that it accounts for how the binding of a non-competitive inhibitor affects the enzyme's function without directly blocking the active site. By binding elsewhere on the enzyme, the inhibitor changes the shape of the enzyme in such a way that even if the substrate can still bind, the catalytic activity is impaired. The lock and key model does not consider this type of structural flexibility.

6. Preparation of Iodine and Alcohol Solutions

To prepare a 1% iodine solution, measure 1 gram of iodine crystals and dissolve them in a small amount of ethanol to help the iodine dissolve, then add distilled water to make up the final volume to 100 cm^3. Stir thoroughly until all the iodine has dissolved and the solution is evenly mixed.

To prepare a 50% alcohol solution from 95% alcohol, measure equal volumes of 95% alcohol and distilled water and mix them together. For example, mixing 50 cm^3 of 95% alcohol with 45 cm^3 of distilled water will give you approximately 95 cm^3 of 50% alcohol, which can then be adjusted accurately to 100 cm^3.

7. Four Requirements Before a Microteaching Activity

The first requirement is for the student teachers to prepare a well-structured lesson plan detailing the objectives, content, teaching methods, and evaluation procedures for the microteaching session. This ensures that the teaching process is organized and follows a logical sequence.

Secondly, the necessary teaching and learning materials must be gathered and arranged before the session. This includes textbooks, charts, teaching aids, chalk or markers, and any audio-visual equipment needed to enhance the presentation.

A third requirement is to organize the microteaching venue, ensuring it is clean, arranged, and equipped with seats, boards, and writing materials. This helps create a conducive learning environment for both the teacher and the students.

Lastly, the students who will act as the class during the microteaching activity should be selected and informed in advance. This allows them to prepare and understand their role during the session, contributing effectively to the learning process.

8. Ways to Encourage Curiosity and Creativity in Biology

The teacher can begin by asking thought-provoking and open-ended questions that stimulate students to think beyond the obvious and explore new ideas. This encourages students to investigate biological phenomena and develop their own explanations.

Another way is to engage students in hands-on practical experiments where they can manipulate materials, make observations, and draw conclusions. Such activities build curiosity as students learn by doing and observing real-life biological processes.

The use of local examples and familiar environmental situations in teaching biological concepts helps make learning relevant and relatable. When students see how biology connects to their daily lives, they become more curious and interested in exploring the subject further.

Finally, the teacher can promote group discussions and debates on current biological issues, encouraging students to express their views and listen to others. This not only sharpens creativity but also nurtures critical thinking as students learn to defend their ideas logically.

9. Advice to Form One Students on Getting Quality Books

Students should first ensure that the books they intend to buy are recommended in the national syllabus. This guarantees that the content is relevant, accurate, and aligned with what is taught in schools.

They should also check that the books are written by reputable authors or published by recognized educational publishers. Such books are often reviewed and updated to meet educational standards.

It is important for students to select books that have clear explanations, appropriate illustrations, and sample exercises for practice. A good quality book should simplify difficult topics and offer opportunities for students to test their understanding.

Lastly, students should consider seeking advice from teachers or senior students before purchasing books. These individuals often have experience with various textbooks and can recommend those that are most helpful for Form One studies.

10. General Principles to Follow During Biology Exam Marking

Markers should begin by thoroughly reading and understanding the marking scheme to ensure consistency and fairness when awarding marks. This helps avoid personal bias and maintains uniformity across all scripts.

It is also essential to mark one question at a time across all scripts before proceeding to the next. This method allows for easier comparison of answers and consistency in awarding marks for each question.

Markers must ensure they carefully read and understand each candidate's response before deciding on the score. Rushing through answers might result in overlooking relevant points or misunderstanding what the student intended to communicate.

Lastly, examiners should provide fair and justifiable marks, avoiding favoritism or harshness. They should also make clear and constructive remarks where necessary to explain deductions or to commend good answers, ensuring transparency in the marking process.

SECTION B (60 Marks)

Answer all questions from this section. Each question carries 15 marks.

11. Six strategies to help youth in their mission against STDs

To effectively address the problem of sexually transmitted diseases among youth, the first strategy the Tanzania Youth Alliance should recommend is to intensify public health education programs targeting young people. These programs should provide accurate, age-appropriate information about the causes, transmission, prevention, and treatment of STDs. It should correct myths and misconceptions about sexual health, and promote responsible behaviors.

Another important strategy is to increase accessibility and availability of condoms and other forms of protection. Youth should be empowered with both the knowledge and the means to protect themselves. Condom distribution points should be established in youth-friendly areas such as clubs, colleges, and community centers where young people regularly gather, without fear of judgment.

The alliance should also promote regular voluntary counseling and testing services. Many youths avoid testing because of stigma and fear of being judged. To overcome this, the organization could create safe, confidential, and youth-friendly health centers where young people can be tested, counseled, and if necessary, treated without discrimination.

A fourth strategy would be to integrate peer education programs, where trained youth educate their fellow peers about sexual health and the risks of unprotected sex. Young people often feel more comfortable discussing sensitive issues with those of their own age group, and peer educators can act as positive role models within their social circles.

Strengthening laws and policies to protect young people from sexual exploitation and abuse is another essential approach. The government should be urged to enforce strict regulations against sexual predators and harmful practices such as child marriages, which expose young girls to early and unsafe sexual experiences, increasing their vulnerability to STDs.

Lastly, the alliance should involve religious and community leaders in their campaigns. These individuals hold influence over social values and norms, and their active involvement can help reduce stigma, encourage responsible sexual behavior, and support affected youth to seek care without fear or shame.

12. (a) Genetic cross showing possible blood groups of children

When a father has heterozygous blood group A (genotype AO) and the mother has heterozygous blood group B (genotype BO), their possible genetic combinations can be established through a simple cross. The father can contribute either an A or an O allele, while the mother can contribute either a B or an O allele. When crossing these, four possible combinations result: AB, AO, BO, and OO. This means their children could have blood groups A, B, AB, or O.

(b) Probability that both non-identical twins would have blood group A

Since the possible genotypes are AB, AO, BO, and OO, the chance of a single child having blood group A would be when the combination is either AO or, in this case, no AA possible. From the cross, there's one

AO out of four possible outcomes. This makes the probability of one child being blood group A as 1 out of 4, or 0.25. Since the twins are non-identical and their blood types are independent events, the probability that both would have blood group A is 0.25 × 0.25, which equals 0.0625 or 6.25%.

13. How to collect and preserve organisms for national examination

When collecting a mushroom, it should be carefully uprooted from the soil using a small trowel or knife to avoid damaging its delicate structure. The specimen should be kept in a cool, moist container such as a paper bag or basket lined with damp cotton wool to prevent drying out. Pine branches should be collected by carefully cutting a fresh, healthy branch with attached needles using a sharp knife or pruning shears. The branch can be preserved by immersing the cut end in water or by wrapping it in a damp cloth to retain moisture.

Ascaris worms, being parasites commonly found in the intestines of hosts, would be obtained from a freshly slaughtered animal or by careful dissection in a laboratory setting. Once collected, the worms should be preserved in a 5-10% formalin solution to prevent decay and maintain their structure for examination. Mosses should be collected gently by scraping them off rocks or tree trunks using a flat blade, taking care not to damage their fine leafy structure. They can be kept in sealed plastic bags or containers with moist paper towels to maintain humidity.

Centipedes can be collected from under stones, logs, or within moist leaf litter. They should be handled with care using forceps or a stick to avoid bites. After collection, they are best preserved in alcohol, preferably 70% ethanol, to maintain their body integrity. Lizards should be captured using humane traps or by hand while wearing gloves to avoid injury. Once collected, small lizards can be preserved in 10% formalin or 70% ethanol to prevent decomposition and preserve their physical features for later identification and study.

14. Critical assistance required for Amina after a snake bite

The first and immediate action required was to reassure Amina and keep her calm. Panic and movement can accelerate the spread of venom through the bloodstream, so it was important to prevent her from walking or moving the affected limb unnecessarily. The bitten part should have been immobilized using a splint or a firm cloth to restrict movement, while keeping it below heart level to slow the venom's spread.

The next step would be to identify or safely observe the snake if possible, without risking further bites. A description of the snake's color, size, and markings can be helpful for medical staff to decide on the appropriate antivenom. However, if this was not safely possible, one should avoid wasting time trying to capture or kill the snake.

Another critical measure would be to avoid cutting the wound or attempting to suck out the venom. These traditional practices are outdated, dangerous, and can worsen the injury. Instead, the wound should be left alone, and no tourniquets should be applied, as they can cause more harm than good by cutting off blood supply.

It was also important to avoid giving Amina anything to eat or drink, especially alcohol or caffeine, as these substances can speed up the body's metabolism and accelerate venom absorption. Keeping her at rest and preventing unnecessary exertion would slow down her heart rate and venom spread.

If a clean cloth or dressing was available, it should have been loosely placed over the bite site to protect it from infection. This helps keep the wound clean without restricting blood flow. The last and most vital step was to immediately arrange transport to the nearest health facility equipped with antivenom and emergency care, providing information about the bite and any observations made about the snake to assist medical personnel in treatment.