THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATION COUNCIL

DIPLOMA IN SECONDARY EDUCATION EXAMINATION

733/1 **BIOLOGY 1**

Time: 3 Hour. **ANSWERS** **Year: 2005**

Instructions

1. This paper has Section A, B and C.
2. Answer **all** questions from Section A and **two (2)** questions from Section B and C each.
3. Section A and B carry 30 marks each and Section C carries 40 marks.
4. Mobile phones are not allowed inside the examination room.
5. Write your Examination Number on every page of your answer booklet.

SECTION A (30 Marks)

Answer all questions from this section.

1. Define trophic level and list four types of feeding relationships.

A trophic level is a specific level or position that an organism occupies in a food chain, based on its source of nutrition or energy. Each step represents a different stage in energy transfer within an ecosystem.

Predation is a feeding relationship where one organism (predator) hunts and consumes another (prey), such as a lion feeding on a zebra.

Herbivory involves animals feeding on plants, such as a cow grazing on grass.

Parasitism is a relationship in which one organism (parasite) lives on or in another organism (host), deriving nutrients at the host's expense.

Scavenging occurs when organisms feed on dead animals, like vultures consuming carcasses.

2. Give four properties of water that support life.

Water has a high specific heat capacity, which helps in regulating temperature in organisms and the environment, preventing sudden changes.

Its universal solvent property allows it to dissolve many substances, aiding in nutrient transport and chemical reactions in living organisms.

Water has cohesive and adhesive properties that help in capillary action, essential for water movement in plants.

Water's high heat of vaporization allows for cooling through sweating and transpiration, maintaining thermal stability in organisms.

3. State four differences between DNA and RNA.

DNA is double-stranded, forming a double helix, whereas RNA is single-stranded.

DNA contains the nitrogenous base thymine, while RNA has uracil in place of thymine.

The sugar in DNA is deoxyribose, while RNA contains ribose.

DNA primarily remains in the nucleus and stores genetic information, while RNA moves to the cytoplasm and plays a role in protein synthesis.

4. List four behavioral adaptations of nocturnal animals.

Nocturnal animals are active at night to avoid predators or heat, conserving energy and staying safe.

They have enhanced night vision or large eyes that allow them to see better in low light conditions.

Many possess heightened senses of smell or hearing to navigate and hunt in the dark.

They often have quiet, stealthy movement patterns to avoid detection while hunting or escaping threats.

5. State four advantages of sexual reproduction.

Sexual reproduction promotes genetic variation, which increases adaptability and survival chances in changing environments.

It allows for the combination of beneficial traits from two parents, improving offspring fitness.

Genetic recombination during meiosis helps eliminate harmful mutations over generations.

It contributes to evolution by producing unique individuals that may possess advantageous traits.

6. List four laboratory safety rules for handling acids.

Always wear protective gear such as gloves and goggles when handling acids to avoid burns and eye damage.

Acids should be poured slowly and carefully to prevent splashing and accidental contact with skin or surfaces.

Never mix acids with water directly; instead, add acid to water to prevent violent reactions and splattering.

Label all acid containers clearly and store them in designated, ventilated storage cabinets to prevent accidents.

7. State four causes of soil erosion.

Deforestation removes tree cover that binds soil, exposing it to wind and water erosion.

Overgrazing by livestock reduces vegetation cover, making the soil loose and prone to being carried away.

Improper farming practices, such as plowing along slopes, lead to increased runoff and soil loss.

Heavy rainfall or flooding can wash away topsoil, especially in unprotected or bare land areas.

8. Give four functions of plant stem.

The stem supports leaves, flowers, and fruits, positioning them for maximum sunlight and pollination.

It transports water and minerals from roots to other parts of the plant through xylem vessels.

It carries synthesized food from leaves to storage organs and growing regions via phloem.

Some stems serve as storage organs, such as in potatoes, where nutrients are stored for later use.

9. Mention four ways to assess learners during a Biology lesson.

Oral questioning allows for immediate feedback and checks students' understanding during the lesson.

Written quizzes or tests evaluate individual performance and retention of content.

Practical demonstrations help assess students' ability to perform scientific procedures and interpret results.

Group discussions or presentations provide insight into students' communication, collaboration, and conceptual grasp.

10. State four qualities of a good quiz question.

It should be clear and concise to avoid confusing the learner.

It must test specific knowledge or skills related to the lesson objectives.

A good question should be free of ambiguity and trick language that may mislead students.

It should be at an appropriate difficulty level for the learners' grade or academic stage.

SECTION B (30 Marks)

Answer two questions from this section.

11. Explain the steps and significance of protein synthesis.

Protein synthesis begins with transcription, which occurs in the nucleus. During this process, a segment of DNA is used as a template to form messenger RNA (mRNA). The enzyme RNA polymerase facilitates the copying of genetic information from DNA into mRNA.

After transcription, the mRNA leaves the nucleus and enters the cytoplasm where translation takes place. This process occurs at the ribosomes, which read the mRNA codons (three-base sequences) to assemble the protein.

Transfer RNA (tRNA) molecules bring amino acids to the ribosome. Each tRNA has an anticodon that pairs with the corresponding mRNA codon to ensure the correct amino acid is added.

The ribosome joins amino acids together using peptide bonds, forming a polypeptide chain. This process continues until a stop codon is reached, signaling the end of protein synthesis.

Protein synthesis is essential for cell structure and function. It allows the cell to produce enzymes, hormones, antibodies, and structural components necessary for growth, repair, and regulation of body processes.

12. Discuss the adaptations of desert plants.

Desert plants have thick cuticles on their leaves and stems to reduce water loss through evaporation. This waxy layer acts as a barrier to excessive transpiration.

They often have small, narrow, or needle-like leaves which reduce surface area and minimize water loss. Some plants like cacti have no leaves at all and conduct photosynthesis through their stems.

Deep root systems allow them to reach underground water sources, while shallow, widespread roots enable them to quickly absorb surface water from light rains.

Many desert plants exhibit CAM (Crassulacean Acid Metabolism) photosynthesis, where stomata open at night to reduce water loss and close during the day.

They may have water-storing tissues in stems or leaves, known as succulence, which allows them to survive long dry periods.

Some produce seeds that remain dormant for long periods and only germinate when there is sufficient moisture, ensuring survival during scarce rainfall.

13. Describe the endocrine control of blood glucose.

The pancreas plays a key role in regulating blood glucose levels through the secretion of two hormones: insulin and glucagon.

When blood glucose levels rise after eating, beta cells in the pancreas release insulin. Insulin promotes the uptake of glucose by body cells and stimulates the liver to convert excess glucose into glycogen for storage.

If blood glucose levels drop, alpha cells of the pancreas secrete glucagon. Glucagon triggers the liver to break down stored glycogen into glucose and release it into the bloodstream.

This balance between insulin and glucagon maintains homeostasis by keeping blood glucose levels within the normal range (about 70–110 mg/dL).

Disruption in this hormonal control can lead to diseases such as diabetes mellitus, where either insulin is insufficient or the body's cells fail to respond properly to it.

14. Explain ecological succession and its types.

Ecological succession is the gradual and predictable change in the composition and structure of a biological community over time. It occurs in response to environmental changes or disturbances.

Primary succession begins in areas where there was no previous life, such as on bare rock after a volcanic eruption or glacier retreat. Pioneer species like lichens and mosses colonize the area, creating conditions suitable for other organisms.

As soil forms and organic matter accumulates, grasses, shrubs, and eventually trees establish, leading to a stable climax community, such as a forest.

Secondary succession occurs in areas where a disturbance (like fire, flood, or farming) has cleared an existing community but left the soil intact. It progresses more rapidly because seeds and nutrients are already present.

Succession increases biodiversity and leads to more stable and complex ecosystems capable of supporting a wide range of species and ecological functions.

SECTION C (40 Marks)

Answer two questions from this section.

15. A student-teacher uses a simulation for osmosis but students are disengaged. Cite six feedback points to improve interactivity and clarity.

First, I would advise the teacher to use real-life examples related to osmosis, such as soaking vegetables in saltwater, to help students relate the simulation to their everyday experiences.

Second, I would recommend integrating more student-centered activities within the simulation, like having learners make predictions, record observations, or manipulate variables themselves.

Third, I would suggest using clear, labeled visuals and step-by-step narration during the simulation to guide learners through each stage and maintain their focus.

Fourth, I would encourage the teacher to ask guided questions during the demonstration to prompt critical thinking and ensure learners are mentally engaged.

Fifth, I would recommend pausing periodically to allow discussion, clarification, and questions so that learners can digest what is happening before moving on.

Finally, I would advise conducting a brief recap or quiz immediately after the simulation to reinforce learning and check for understanding.

16. During group work on classification, some learners dominate while others remain silent. Describe six strategies to manage participation and fairness.

First, I would assign specific roles within each group such as a timekeeper, recorder, presenter, and questioner to ensure everyone has a responsibility and a chance to contribute.

Second, I would set clear expectations at the beginning of the activity, emphasizing equal participation and respect for others' input.

Third, I would circulate the room and monitor groups, stepping in where necessary to encourage quieter students and limit dominating behavior.

Fourth, I would use structured turn-taking systems like round-robin speaking to ensure each member has an opportunity to share their ideas.

Fifth, I would provide guiding questions or worksheets that require input from all group members, promoting collaboration and shared accountability.

Lastly, I would follow up with individual reflections or self-assessments, asking students to comment on their contributions and what they learned from the group activity.

17. A practical on blood typing causes unexpected allergic reactions. Detail six procedures to ensure safety, record keeping, and follow up.

The first step is to immediately stop the activity and provide first aid to affected students while ensuring their safety and comfort.

Second, I would alert the school nurse or medical personnel for professional assessment and treatment of the allergic reactions.

Third, I would document the incident in detail, including the names of students involved, symptoms observed, and actions taken, to ensure proper record keeping.

Fourth, I would inform the school administration and the students' parents or guardians about the incident promptly and transparently.

Fifth, I would review and revise safety protocols for practical lessons, ensuring allergy histories are known and safety guidelines are strictly followed in future.

Lastly, I would conduct a reflective discussion with the class about lab safety, preventive measures, and learning from such incidents to foster awareness and preparedness.

18. A teacher fails to align instructional materials with cultural context. Recommend six reflective and corrective actions to enhance relevance and learner engagement.

First, the teacher should reflect on the learners' background and identify aspects of the materials that may not align with their cultural values, beliefs, or experiences.

Second, I would recommend consulting local examples and case studies that connect biological concepts to familiar environments or practices.

Third, the teacher should engage learners through discussion to understand their perspectives and adapt materials in response to feedback.

Fourth, I would suggest integrating culturally relevant illustrations, analogies, and scenarios in lesson planning to make content more relatable.

Fifth, the teacher can collaborate with colleagues or community members to co-create learning resources that reflect the local context accurately and respectfully.

Lastly, I would recommend ongoing professional development in culturally responsive teaching to strengthen the teacher's ability to plan inclusive and effective Biology lessons.