THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATION COUNCIL

DIPLOMA IN SECONDARY EDUCATION EXAMINATION

733/1 **BIOLOGY 1**

Time: 3 Hour. **ANSWERS** **Year: 2007**

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. State four distinguishing features of amphibians.

Amphibians have moist, smooth skin without scales, which facilitates gas exchange through the skin, especially during respiration.

They undergo metamorphosis, with life stages that include aquatic larvae (like tadpoles) and terrestrial adults.

Amphibians lay eggs in water or moist environments because their eggs lack a hard shell and are prone to desiccation.

They possess limbs adapted for both swimming and jumping or walking, and many species have webbed feet to aid in movement in water.

2. Mention four components of the human central nervous system.

The brain is the control center, responsible for processing sensory input and coordinating responses.

The spinal cord transmits messages between the brain and the rest of the body and also controls reflex actions.

The meninges are protective membranes that cover the brain and spinal cord, cushioning them from injury.

Cerebrospinal fluid surrounds the brain and spinal cord, providing further protection and nutrient transport.

3. Give four examples of abiotic factors in an ecosystem.

Temperature influences the rate of metabolic processes and distribution of organisms.

Light intensity affects photosynthesis and thus the productivity of producers in an ecosystem.

pH levels in soil or water determine which organisms can survive in a given habitat.

Humidity impacts transpiration in plants and water loss in animals, affecting survival and activity.

4. List four examples of seed dispersal by wind.

The seeds of dandelion have a parachute-like structure that allows them to be carried by wind.

Maple seeds possess wing-like structures that spin and glide in the air when released.

Grass seeds such as those of fountain grass have hair-like structures that catch the wind.

Cotton seeds are surrounded by fluffy fibers that allow them to drift with air currents.

5. State four uses of microorganisms in industry.

Yeast is used in baking and alcohol production through fermentation of sugars.

Bacteria are employed in yogurt and cheese production by fermenting lactose.

Certain fungi like *Penicillium* are used in the production of antibiotics such as penicillin.

Microorganisms are also involved in biogas production, converting organic waste into methane for fuel.

6. Mention four diseases caused by viruses.

Influenza is a viral respiratory disease that spreads easily and causes fever, cough, and fatigue.

HIV/AIDS weakens the immune system, leaving the body vulnerable to infections.

Hepatitis B affects the liver, leading to inflammation and possibly liver damage or cancer.

Measles is a contagious disease marked by fever, cough, and a widespread skin rash.

7. List four causes of infertility in human females.

Blocked fallopian tubes can prevent the sperm from meeting the egg, often due to infections or past surgeries.

Hormonal imbalances can disrupt ovulation, making it irregular or absent.

Uterine abnormalities like fibroids can interfere with implantation or development of the fetus.

Chronic health conditions such as diabetes or thyroid disorders may impair fertility.

8. State four effects of water pollution on aquatic ecosystems.

Oxygen depletion caused by decaying organic matter can suffocate fish and other aquatic life.

Toxic substances like heavy metals may accumulate in aquatic organisms, leading to poisoning.

Algal blooms from excess nutrients block sunlight and disturb the balance of aquatic plant life.

Water pollution can reduce biodiversity as sensitive species die off, leaving only tolerant ones.

9. Mention four types of ecological relationships between organisms.

Predation involves one organism hunting and feeding on another, such as lions preying on zebras.

Parasitism is when one organism benefits at the expense of another, like ticks feeding on cattle.

Mutualism benefits both species, such as bees pollinating flowers while obtaining nectar.

Commensalism is when one organism benefits and the other is unaffected, like barnacles on whales.

10. Give four reasons why laboratory rules are important in a Biology class.

They ensure student safety by preventing accidents when handling sharp or hazardous materials.

They protect laboratory equipment from damage through responsible use and care.

Rules promote discipline and order, allowing practical sessions to run smoothly and efficiently.

They help prevent contamination of experiments, which ensures accurate and reliable results.

SECTION B (30 Marks)

Answer two questions from this section.

11. Describe five functions of the human skeleton.

The skeleton provides structural support for the body. It gives shape and framework, allowing organisms to maintain posture and form.

It protects internal organs from mechanical damage. For instance, the skull encases the brain, and the ribcage shields the heart and lungs.

The skeleton enables movement through its interaction with muscles. Bones act as levers, and joints allow flexibility, making movement possible.

It plays a role in the production of blood cells. The bone marrow found in long bones like the femur produces red and white blood cells and platelets.

Bones also serve as mineral reservoirs. They store essential minerals such as calcium and phosphorus, which are released into the bloodstream when needed.

12. Explain the process of fertilization in flowering plants.

Fertilization begins with pollination, where pollen grains from the anther are transferred to the stigma of a flower, either by wind, insects, or other agents.

Once on the stigma, a pollen grain germinates and forms a pollen tube that grows down through the style toward the ovary.

The tube carries two male nuclei. One fuses with the egg cell to form a diploid zygote, while the other fuses with two polar nuclei to form a triploid endosperm.

The zygote develops into an embryo, and the endosperm provides nourishment for the developing embryo during seed formation.

Following fertilization, the ovule becomes a seed, and the ovary develops into a fruit, enclosing and protecting the seed.

13. Describe five methods of food preservation and explain how each method works.

Refrigeration slows down the growth of bacteria and molds by keeping food at low temperatures, which helps in extending shelf life.

Drying removes moisture from food, preventing microbial activity since most microorganisms need water to grow.

Salting draws out moisture through osmosis and creates an environment unsuitable for bacterial growth, especially in meat and fish preservation.

Canning involves sealing food in airtight containers and heating it to destroy microorganisms, thus keeping the food safe for a long time.

Smoking exposes food to smoke from burning wood, which dehydrates the surface and adds antimicrobial chemicals that inhibit spoilage.

14. Discuss the structure and functions of the kidney in excretion.

Each kidney contains millions of nephrons, the functional units responsible for filtering blood and forming urine. The outer region is called the cortex, while the inner region is the medulla.

Blood enters the kidney through the renal artery, which branches into arterioles that supply each nephron. The glomerulus within Bowman's capsule filters blood under pressure, removing waste, excess salts, and water.

The filtrate passes through the proximal convoluted tubule, loop of Henle, distal tubule, and collecting duct. Along this path, useful substances like glucose and most water are reabsorbed into the bloodstream.

What remains forms urine, which consists of urea, excess salts, and water. It flows from the collecting ducts into the pelvis of the kidney, down the ureter, and into the bladder for temporary storage.

The kidney maintains homeostasis by regulating water and electrolyte balance, removing metabolic wastes, and controlling blood pH through selective reabsorption and secretion.

SECTION C (40 Marks)

Answer two questions from this section.

15. Discuss six ways a Biology teacher can use the local environment to make lessons more practical and meaningful.

A teacher can organize nature walks around the school environment to collect samples such as leaves, flowers, and insects for studying classification, structure, and ecological relationships.

They can use local plants and animals as examples during lessons. For instance, using a maize plant to demonstrate monocot characteristics helps students understand better through familiar specimens.

Soil from the school garden can be used in experiments to observe its texture, composition, and organisms present, making lessons on soil biology more interactive.

Water bodies like nearby ponds or streams can serve as observation sites for aquatic ecosystems, enabling students to see organisms like tadpoles, algae, and water beetles in their natural habitats.

Local waste dumps or compost pits can be used to teach about decomposition, nutrient recycling, and roles of microorganisms, helping students understand ecological cycles practically.

Teachers can engage students in setting up small school gardens where they can grow crops and observe plant growth, reproduction, and the effects of different variables on yield.

16. Explain six factors a Biology teacher should consider when selecting teaching aids.

The teaching aid should be relevant to the topic being taught. It must help in achieving the specific lesson objectives and directly relate to the content.

The aid must be appropriate to the learners' level. It should match their cognitive ability, language proficiency, and prior knowledge to enhance understanding rather than confuse them.

Cost and availability are important. The teacher should choose aids that are affordable or can be improvised locally, especially in resource-limited settings.

Durability and ease of handling should be considered. A good teaching aid must withstand repeated use and be simple for both teacher and students to operate or manipulate.

It should be accurate and free from misleading information. Scientific content must be correctly presented to avoid imparting misconceptions to students.

The size and visibility of the aid must suit the classroom environment. It should be large and clear enough to be seen by all students, especially in large classes.

17. Describe six strategies a teacher can use to address different learning styles among students in a Biology class.

To address visual learners, the teacher can use diagrams, flowcharts, and videos to present information in a format that appeals to their sight.

Auditory learners benefit from oral explanations, discussions, and the use of recorded materials or songs that reinforce key concepts.

For kinesthetic learners, the teacher should include hands-on activities such as experiments, model making, or role-plays that allow physical engagement with the content.

Reading/writing learners benefit from note-taking, reading textbooks, and structured handouts. The teacher should provide summaries and opportunities for written reflection.

The teacher can combine strategies in a multi-sensory approach, using tools that appeal to more than one style, such as a narrated video or interactive simulation.

Peer teaching or group work allows learners to explain concepts to each other in ways that suit their individual preferences, encouraging collaboration and deeper understanding.

18. Discuss six challenges faced by Biology teachers in integrating practicals into regular classroom teaching.

Limited laboratory equipment makes it difficult to conduct experiments, especially in schools where many students must share a few microscopes, test tubes, or specimens.

Large class sizes hinder effective supervision and interaction during practical sessions, making it hard to ensure safety and full participation of all learners.

Inadequate time allocation within the school timetable often forces teachers to rush practicals or omit them altogether, affecting skill development.

Some teachers may lack sufficient training in conducting or improvising practicals, leading to a preference for theoretical instruction over hands-on work.

Lack of support materials such as specimen charts, manuals, or reagents limits the variety of practicals that can be offered, reducing students' exposure to important concepts.

Safety concerns, especially in overcrowded or poorly ventilated labs, discourage teachers from doing practicals that involve fire, chemicals, or sharp instruments.