THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATION COUNCIL

DIPLOMA IN SECONDARY EDUCATION EXAMINATION

733/1 **BIOLOGY 1**

Time: 3 Hour. **ANSWERS** **Year: 2009**

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 importance of water in living organisms.

Water serves as a universal solvent, enabling biochemical reactions to occur in cells by dissolving solutes such as salts, sugars, and gases. This facilitates transport and interaction between molecules.

It is essential in temperature regulation. Due to its high specific heat capacity, water helps organisms maintain stable internal temperatures, which is critical for enzyme activity and cellular processes.

Water also acts as a transport medium. In plants, it carries nutrients and minerals from the roots to the rest of the plant via xylem vessels. In animals, blood plasma, which is mostly water, transports substances throughout the body.

Lastly, water is a raw material in photosynthesis. It provides the electrons and hydrogen ions needed to form glucose in plants and also releases oxygen as a byproduct.

2. List four differences between arteries and veins.

Arteries carry blood away from the heart, usually oxygenated, while veins carry blood towards the heart, usually deoxygenated, except in pulmonary circulation.

Arteries have thick, muscular, and elastic walls to withstand high pressure, whereas veins have thinner walls and larger lumens since they transport blood under low pressure.

Arteries do not have valves (except the semilunar valves at their base), but veins have valves along their length to prevent backflow of blood.

Blood flow in arteries is pulsatile due to heartbeats, whereas blood in veins flows steadily due to the absence of direct pumping and presence of skeletal muscle contraction.

3. Mention four factors that affect transpiration in plants.

Temperature increases transpiration by raising the evaporation rate of water from leaf surfaces.

Humidity reduces transpiration because high moisture content in the air lowers the water vapor gradient between the leaf and the atmosphere.

Wind speed enhances transpiration by removing the humid air around the leaf surface, maintaining a steep diffusion gradient.

Light intensity increases transpiration as stomata open wider in brighter conditions to allow gas exchange for photosynthesis.

4. State four advantages of sexual reproduction.

Sexual reproduction introduces genetic variation due to recombination and independent assortment, which enhances species adaptability to changing environments.

It allows for the elimination of harmful genes through natural selection, improving population health over generations.

Offspring produced through sexual reproduction have a better chance of surviving diseases due to varied genetic resistance.

It promotes evolution by generating diversity, which serves as raw material for natural selection and speciation.

5. Mention four examples of continuous variation in human beings.

Height varies from short to tall across a population with no clear boundary between categories.

Skin color shows a range of pigmentation, affected by multiple genes and environmental factors like sun exposure.

Body weight also varies continuously depending on genetics, metabolism, diet, and activity levels.

Intelligence is considered a continuous trait as it is influenced by both hereditary and environmental factors and does not fall into discrete categories.

6. Give four examples of parasitic relationships and the hosts they affect.

Tapeworms in the human intestines absorb nutrients from digested food, causing nutritional deficiencies in the host.

Mistletoe on mango trees extracts water and minerals from the host, potentially weakening the tree.

Ticks on cattle suck blood and may transmit diseases such as East Coast Fever.

Plasmodium species in humans cause malaria by destroying red blood cells, leading to anemia and fever.

7. State four characteristics of wind-pollinated flowers.

They have long, exposed stamens and stigmas to facilitate efficient dispersal and capture of pollen grains by wind.

Their pollen grains are light and smooth, allowing them to be easily carried by air currents over long distances.

These flowers usually lack scent and nectar because they do not need to attract animal pollinators.

They often have large, feathery stigmas that increase the surface area for catching airborne pollen.

8. List four methods used in controlling pests in agriculture.

Biological control involves introducing natural predators or parasites to reduce pest populations without chemicals.

Chemical control uses pesticides to kill pests quickly, although overuse can lead to resistance and environmental pollution.

Cultural control includes practices such as crop rotation and proper field hygiene to interrupt pest life cycles.

Mechanical control uses physical barriers, traps, or handpicking to remove or exclude pests from the crop area.

9. Mention four roles of decomposers in the ecosystem.

Decomposers break down dead organisms, releasing nutrients like nitrogen and phosphorus back into the soil for plant use.

They help recycle organic matter, preventing the buildup of dead material and maintaining ecosystem balance.

Decomposition contributes to soil formation and improves soil fertility by increasing humus content.

They play a role in energy flow by returning energy from dead matter into the food chain via detritivores and microorganisms.

10. Give four reasons why Biology is important in everyday life.

Biology helps in understanding the human body, enabling people to make informed health decisions and maintain wellness.

It supports agriculture by informing practices such as crop breeding, pest control, and soil conservation.

Biology is key in environmental conservation, providing knowledge on biodiversity, ecosystems, and pollution control.

It contributes to technological advances in medicine, such as vaccine development and genetic engineering for disease treatment.

SECTION B (30 Marks)

Answer two questions from this section.

11. Describe the process of digestion in humans from ingestion to egestion.

Digestion begins with ingestion, the process of taking food into the mouth. Mechanical digestion starts immediately as the teeth chew food, breaking it into smaller pieces. Saliva from salivary glands contains amylase, which begins the chemical digestion of starch.

The food is then swallowed and passes through the pharynx and esophagus via peristalsis into the stomach. In the stomach, food is mixed with gastric juices containing hydrochloric acid and pepsin, which begin protein digestion. The acidic environment also kills pathogens.

From the stomach, the semi-digested food (chyme) enters the duodenum. Here, bile from the liver emulsifies fats, and pancreatic juices containing enzymes such as lipase, protease, and amylase further digest fats, proteins, and carbohydrates respectively.

In the small intestine, particularly the ileum, digestion is completed and nutrients are absorbed into the bloodstream through the villi. The villi increase surface area and contain blood capillaries and lacteals to transport absorbed nutrients.

The remaining undigested materials pass into the large intestine, where water and mineral salts are reabsorbed. The leftover waste becomes more solid, forming feces.

Finally, the feces are stored in the rectum and expelled through the anus in a process called egestion, which removes undigested materials and waste products from the body.

12. Explain five roles of hormones in human reproduction.

Follicle-stimulating hormone (FSH), secreted by the pituitary gland, stimulates the growth and development of ovarian follicles in females and sperm production in males.

Luteinizing hormone (LH), also from the pituitary, triggers ovulation in females and stimulates the production of testosterone in males, which is crucial for sperm development and secondary sexual characteristics.

Oestrogen, produced by the ovaries, stimulates the repair and thickening of the uterine lining after menstruation and helps in the development of female secondary sexual features.

Progesterone, also produced by the ovaries, maintains the uterine lining during the second half of the menstrual cycle and supports pregnancy by preventing further ovulation.

Testosterone, secreted by the testes, controls the development of male reproductive organs, secondary sexual characteristics such as deeper voice and facial hair, and stimulates sperm production.

13. Describe the importance of classification in Biology.

Classification provides a systematic way to name and group organisms, making it easier to identify, study, and communicate about them across different regions and languages.

It helps in understanding evolutionary relationships. Organisms that are classified together often share a common ancestor, which allows scientists to trace the development and diversification of life.

Classification simplifies the study of organisms by organizing them into manageable groups based on shared characteristics, which reduces confusion and enhances learning.

It assists in predicting characteristics. If an organism is classified in a group, scientists can infer traits it may have based on what is known about other members of that group.

In applied sciences, classification is useful in fields like medicine and agriculture, where identifying harmful organisms or beneficial species quickly is critical for treatment and productivity.

14. Discuss the causes and effects of deforestation on the environment.

One major cause of deforestation is agricultural expansion. Farmers clear forests to create space for crop cultivation or grazing land, especially in regions experiencing population pressure.

Logging for timber and firewood is another significant cause. Trees are cut for commercial purposes or local energy needs, leading to gradual depletion of forest cover.

Infrastructure development, such as roads, settlements, and industrial zones, also contributes to forest clearance, especially in urbanizing regions.

Deforestation leads to loss of biodiversity, as the natural habitats of many species are destroyed, pushing some to extinction and disrupting ecosystems.

It also contributes to soil erosion. Without tree roots to anchor the soil, rainfall washes topsoil away, reducing land fertility and increasing sedimentation in rivers.

Another effect is disruption of the water cycle. Forests play a key role in maintaining rainfall patterns, and their removal can lead to drier climates and reduced groundwater recharge.

SECTION C (40 Marks)

Answer two questions from this section.

15. Describe six precautions a Biology teacher must take when preparing and conducting an experiment involving live organisms.

The teacher must ensure ethical treatment of all living organisms. Any use of animals or plants in experiments should follow humane practices, avoiding harm, stress, or death unless ethically and educationally justified.

Hygiene is essential. The teacher must ensure both students and the laboratory are clean before and after handling live organisms to prevent the spread of infections and contamination.

Proper identification of species is necessary. Teachers should use easily identifiable, safe, and non-endangered organisms for experiments to avoid confusion or legal issues related to protected species.

Environmental conditions must be controlled. The teacher should provide adequate conditions such as temperature, light, and moisture to ensure the welfare of live organisms during the experiment.

Students must be trained on handling procedures. Before the practical begins, the teacher should demonstrate proper techniques and provide safety instructions to avoid accidents or harm to the organisms.

After the experiment, appropriate disposal or return of organisms should be arranged. This may include returning them to their habitat or safely disposing of them according to regulations and ethical standards.

16. Explain six ways in which a Biology teacher can support learners with special needs in the classroom.

The teacher should use inclusive teaching methods. For example, using verbal explanations and tactile models helps visually impaired learners, while visual aids benefit hearing-impaired students.

Classroom arrangement should accommodate physical disabilities. The teacher should ensure that learners with mobility challenges can access lab tables and other resources comfortably.

Providing differentiated instruction is key. The teacher can prepare multiple versions of learning materials tailored to individual abilities, ensuring that all students can engage with the content meaningfully.

The teacher should collaborate with special education experts. Working with professionals helps identify specific accommodations or tools that best support each learner's success.

Regular feedback and encouragement build confidence. The teacher should recognize the efforts of learners with special needs and offer constructive support to keep them motivated.

Use of assistive technologies like audio recordings, speech-to-text software, or enlarged print materials enables learners with disabilities to access content more independently.

17. Discuss six qualities of a good Biology test.

A good test must be valid. It should accurately measure what it is intended to assess, such as knowledge of respiration or understanding of classification systems.

It must be reliable, meaning it yields consistent results over time and across different groups of learners under similar conditions.

The test should have a balanced coverage of content. It must reflect all areas taught, including knowledge, application, and analytical skills, avoiding overemphasis on recall.

Clarity of language is essential. Questions should be written in simple and understandable terms, avoiding ambiguity that may confuse learners.

It must be fair to all students. A good test considers the diversity of learners and avoids bias in culture, gender, or experience.

The test should be appropriately timed. It must allow average learners enough time to think and respond fully without being rushed or too lengthy.

18. Explain six reasons why lesson evaluation is important in the teaching of Biology.

Evaluation helps the teacher measure the effectiveness of the lesson. It reveals whether the intended objectives were met and what concepts learners understood or struggled with.

It guides future lesson planning. By identifying gaps in understanding, the teacher can adjust upcoming lessons to address weaknesses or reinforce key points.

Lesson evaluation provides feedback on teaching methods. It allows the teacher to assess whether their strategies—such as group work or demonstrations—helped learners or need modification.

It assists in student progress tracking. The teacher can identify which students are progressing well and which ones may need additional support or remediation.

Evaluation supports accountability. Teachers are able to justify their teaching outcomes and show evidence of student learning, which is important for professional development and school reporting.

It encourages reflection and growth. Through regular evaluation, the teacher continuously improves their instructional skills and adapts to better meet learners' needs.