THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATION COUNCIL

DIPLOMA IN SECONDARY EDUCATION EXAMINATION

733/1 **BIOLOGY 1**

Time: 3 Hour. **ANSWERS** **Year: 2008**

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. List four characteristics of mammals that distinguish them from other vertebrates.

Mammals have mammary glands which produce milk to nourish their young. This feature is unique to mammals and is one of their defining traits.

They possess hair or fur on their bodies at some stage of life, which provides insulation and helps in temperature regulation.

Mammals give birth to live young (with few exceptions like the platypus and echidna), whereas many other vertebrates lay eggs.

They have a diaphragm, a muscular partition between the thoracic and abdominal cavities, which aids in efficient breathing.

2. State four differences between voluntary and involuntary muscles.

Voluntary muscles are under conscious control, such as those involved in walking or writing, while involuntary muscles work automatically, like those in the digestive tract.

Voluntary muscles are striated and attached to the skeleton, whereas involuntary muscles are non-striated and found in organs such as the stomach and intestines.

Voluntary muscles contract quickly but tire easily, while involuntary muscles contract slowly and sustain activity for longer without fatigue.

Voluntary muscles are multinucleated and cylindrical in shape, while involuntary muscles are spindle-shaped with a single nucleus.

3. Mention four effects of drug abuse on the human body.

Drug abuse can lead to liver damage, especially with prolonged alcohol consumption, which impairs detoxification and metabolic functions.

It causes addiction and dependence, affecting brain chemistry and leading to cravings and withdrawal symptoms when the drug is not taken.

Drug abuse weakens the immune system, making the individual more susceptible to infections and diseases.

It impairs judgment and behavior, increasing the risk of accidents, violence, and unsafe practices like unprotected sex.

4. List four types of blood vessels in the human circulatory system.

Arteries carry blood away from the heart under high pressure and have thick, elastic walls.

Veins return blood to the heart under low pressure and contain valves to prevent backflow.

Capillaries are microscopic vessels where exchange of gases, nutrients, and waste occurs between blood and tissues.

Venules are small vessels that collect blood from capillaries and channel it into veins.

5. Outline four adaptations of red blood cells to their function.

Red blood cells are biconcave in shape, increasing their surface area for efficient oxygen absorption.

They lack a nucleus, creating more space to carry hemoglobin and thus more oxygen.

Their flexible membrane allows them to squeeze through narrow capillaries without rupturing.

They contain a high concentration of hemoglobin, which binds oxygen and transports it to body tissues.

6. Mention four types of connective tissues found in the human body.

Bone tissue provides structural support and protection and acts as a storage site for minerals like calcium.

Cartilage offers flexible support and reduces friction at joints between bones.

Tendons connect muscles to bones, transmitting force to enable movement.

Ligaments connect bones to other bones and stabilize joints, preventing excessive movement.

7. Give four differences between aerobic respiration and fermentation.

Aerobic respiration requires oxygen, while fermentation occurs in the absence of oxygen.

Aerobic respiration produces carbon dioxide and water, whereas fermentation produces lactic acid in animals or alcohol in yeast.

Aerobic respiration yields much more energy (up to 36 ATP), while fermentation yields only 2 ATP per glucose molecule.

Aerobic respiration occurs in the mitochondria, while fermentation takes place in the cytoplasm.

8. List four examples of excretory products in plants.

Oxygen produced during photosynthesis is released through the stomata as a waste product.

Water vapor is also lost through transpiration, especially from the leaves via stomata.

Resins and gums are excreted into woody tissues or damaged areas as protective substances.

Alkaloids and tannins are waste chemicals stored in vacuoles or special structures, sometimes used for defense.

9. State four roles of chromosomes during cell division.

Chromosomes ensure that genetic material is accurately replicated and evenly distributed to daughter cells.

They carry hereditary information in the form of genes, which control traits passed from parents to offspring.

During meiosis, chromosomes enable genetic variation through crossing over and independent assortment.

They organize DNA into compact structures, making it manageable for transport during mitosis and meiosis.

10. Mention four importance of mitosis in multicellular organisms.

Mitosis is essential for growth by increasing the number of cells in an organism.

It aids in tissue repair and replacement of damaged or worn-out cells.

Mitosis supports asexual reproduction in organisms like Hydra and plants such as strawberries.

It ensures genetic stability, as daughter cells produced through mitosis are genetically identical to the parent cell.

SECTION B (30 Marks)

Answer two questions from this section.

11. Explain five importance of photosynthesis to living organisms.

Photosynthesis provides oxygen, which is essential for the survival of aerobic organisms. The oxygen released during the process is used in cellular respiration by animals, plants, and other organisms.

It is the primary source of food for most living organisms. Plants produce glucose, which not only fuels their own growth but also serves as the base of food chains for herbivores and, subsequently, carnivores.

Photosynthesis helps regulate carbon dioxide levels in the atmosphere. By absorbing carbon dioxide, plants reduce the concentration of this greenhouse gas, which helps control global warming and maintain climate balance.

It enables the storage of solar energy in chemical form. The energy trapped in glucose during photosynthesis is transferred through food chains and is eventually released during respiration.

Photosynthesis supports the production of other plant products like starches, oils, and cellulose. These products are important for human use in food, fuel, medicine, and construction materials.

12. Describe five differences between monocotyledonous and dicotyledonous plants.

Monocotyledonous plants have one cotyledon in their seeds, while dicotyledonous plants have two cotyledons, which store food for the developing embryo.

The leaves of monocots have parallel venation, meaning veins run side by side, while dicots have a net-like or reticulate venation pattern.

In monocots, vascular bundles in the stem are scattered, while in dicots, they are arranged in a ring formation, which aids in secondary growth.

Monocot flowers usually have floral parts in multiples of three, such as three or six petals, while dicot flowers have parts in multiples of four or five.

Monocots typically have fibrous root systems, where many roots emerge from the base, whereas dicots usually develop a taproot system with a main central root.

13. Explain the stages of mitosis and its significance to organisms.

The first stage of mitosis is prophase, where chromatin condenses into visible chromosomes, each made up of two sister chromatids. The nuclear membrane breaks down and spindle fibers form.

In metaphase, the chromosomes align at the equator of the cell. Spindle fibers attach to the centromeres of the chromosomes, ensuring equal distribution during the next stage.

Anaphase follows, where the sister chromatids separate and move to opposite poles of the cell, pulled by the spindle fibers. This ensures that each daughter cell receives an identical set of chromosomes.

During telophase, the chromatids reach the poles, and a new nuclear membrane forms around each group of chromosomes. The chromosomes begin to uncoil, returning to their original thread-like form.

Cytokinesis occurs after telophase, dividing the cytoplasm and forming two genetically identical daughter cells. In animal cells, this happens by furrowing; in plant cells, a cell plate forms.

Mitosis is significant as it enables growth, repair of damaged tissues, and asexual reproduction in organisms. It also ensures genetic stability by producing identical cells.

14. Discuss the adaptations of the alveoli for efficient gaseous exchange.

Alveoli have a large surface area due to their high number and balloon-like shape. This allows for maximum diffusion of oxygen and carbon dioxide between air and blood.

They are surrounded by a dense network of capillaries, which ensures a constant blood supply to maintain a steep diffusion gradient for gases.

The walls of alveoli are extremely thin, consisting of a single layer of epithelial cells. This short diffusion distance facilitates faster gas exchange.

Alveoli surfaces are moist, allowing gases to dissolve before diffusing across membranes. This aids in the efficient absorption of oxygen into the bloodstream.

Elastic fibers in the alveolar walls allow them to expand and recoil during breathing, ensuring proper ventilation and continuous exchange of gases.

A high oxygen concentration in the alveoli compared to the blood and a high carbon dioxide concentration in the blood compared to the alveoli maintain the necessary concentration gradient for diffusion.

SECTION C (40 Marks)

Answer two questions from this section.

15. Describe six characteristics of a good Biology lesson.

A good Biology lesson is learner-centered. It involves students actively through questions, discussions, and hands-on activities rather than just teacher lecturing, which increases understanding and engagement.

It should have clear and measurable objectives. The teacher must plan and communicate what students should know or be able to do by the end of the lesson to keep both teacher and learners focused.

Effective use of teaching and learning aids is a key characteristic. Diagrams, charts, specimens, and models help simplify abstract concepts and make learning concrete and memorable.

A good Biology lesson is logically sequenced. Concepts should be introduced step by step, starting from known to unknown, simple to complex, ensuring students build upon previous knowledge.

It encourages critical thinking. The teacher should include questions and activities that make learners analyze, compare, interpret, or apply biological knowledge instead of just memorizing facts.

The lesson includes continuous assessment. The teacher uses questioning, exercises, or observations during the lesson to check students' understanding and address misconceptions immediately.

16. Explain six challenges a Biology teacher may face when conducting practical sessions.

One major challenge is inadequate laboratory equipment and materials. A lack of microscopes, specimens, or chemicals can limit students' ability to observe and experiment.

Large class sizes make it hard to supervise all students effectively during practical work, leading to poor management, confusion, and reduced learning outcomes.

Insufficient time allocation for practical sessions can hinder proper preparation, experimentation, and discussion, leaving students with incomplete understanding.

Poor student attitude or lack of interest in practicals can reduce participation. Some learners may fear handling specimens or see practicals as less important than theory.

Limited teacher competence in certain experiments may reduce the effectiveness of the practical session. This occurs especially when the teacher is not well-trained in handling apparatus or conducting demonstrations.

Environmental factors such as unreliable electricity or water supply can disrupt experiments that depend on these resources, leading to incomplete or failed sessions.

17. Discuss six reasons for using locally available resources in teaching Biology.

Locally available resources are often cost-effective. Teachers and schools reduce expenses by utilizing materials found in the environment instead of buying expensive equipment.

They make learning more relevant and relatable. Using familiar plants, animals, or materials helps students connect biological concepts to their daily lives.

Local resources support practical learning. Items like leaves, seeds, or soil samples enable students to observe and experiment directly, which strengthens their understanding.

They promote creativity and innovation. Teachers and students may improvise models, teaching aids, or conduct investigations using simple materials, enhancing problem-solving skills.

Using local resources encourages environmental awareness and appreciation. Students learn to observe, preserve, and value their natural surroundings through interaction with local ecosystems.

These resources ensure inclusivity, especially in rural or under-resourced schools where commercial laboratory supplies may be unavailable or unaffordable.

18. Explain six reasons why evaluation of Biology teaching aids is important before use in the classroom.

Evaluation ensures the aid is relevant to the topic. It helps the teacher determine whether the teaching aid supports the specific content and objectives of the lesson.

It checks for accuracy of information. Diagrams, charts, or models must reflect correct biological structures and processes to avoid misleading learners.

Evaluating aids ensures they are age-appropriate. Some aids may be too advanced or too basic for the learners' cognitive level, reducing their effectiveness.

It assesses the clarity and visibility of the aid. Charts and models should be large, clear, and readable to serve all students in the classroom.

Evaluation helps identify any safety risks. For example, sharp objects or toxic substances used in models or specimens need to be checked to ensure student safety.

It allows the teacher to prepare adequately. By reviewing the aid beforehand, the teacher becomes familiar with it, ensuring smooth integration into the lesson and effective delivery.