THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATION COUNCIL

DIPLOMA IN SECONDARY EDUCATION EXAMINATION

733/1 **BIOLOGY 1**

Time: 3 Hour. **ANSWERS** **Year: 2002**

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. Mention four functions of the human liver.

The liver stores glucose in the form of glycogen, helping regulate blood sugar levels.
It detoxifies harmful substances such as alcohol and drugs from the bloodstream.
The liver produces bile, which aids in the emulsification and digestion of fats.
It plays a role in synthesizing blood proteins like albumin and clotting factors necessary for circulation and healing.

2. List four differences between plant and animal cells.

Plant cells have a rigid cell wall made of cellulose, while animal cells lack a cell wall.
Chloroplasts are present in plant cells for photosynthesis, but absent in animal cells.
Plant cells contain large central vacuoles for storage and support; animal cells have small or no vacuoles.
Centrioles are found in animal cells for cell division, but are typically absent in most plant cells.

3. Give four examples of sexually transmitted infections (STIs).

HIV/AIDS, which weakens the immune system and has no cure.
Syphilis, caused by *Treponema pallidum*, which progresses through stages if untreated.
Gonorrhea, caused by *Neisseria gonorrhoeae*, affecting the reproductive and urinary systems.
Genital herpes, caused by the herpes simplex virus, leading to painful sores.

4. State four importance of mitosis in living organisms.

Mitosis allows for growth by increasing the number of body cells.
It helps in the repair and replacement of worn-out or damaged cells.
Mitosis ensures that each new cell has the same genetic material as the parent cell.
It is vital for asexual reproduction in organisms like bacteria and some plants.

5. List four features of insect-pollinated flowers.

Brightly colored petals attract insects for pollination.
They produce nectar as a reward to attract pollinators.
Flowers often have a sweet scent to lure insects.
Stamens and stigma are enclosed within the flower, facilitating contact with visiting insects.

6. State four factors that affect enzyme activity.

Temperature affects the kinetic energy of molecules; very high temperatures may denature enzymes.
pH levels influence enzyme shape and reactivity; each enzyme works best at an optimal pH.
Substrate concentration affects the rate; higher concentration can increase reaction rate up to a point.
Enzyme concentration also influences the rate of reaction, assuming sufficient substrate is present.

7. Give four examples of diseases caused by protozoa.

Malaria, caused by *Plasmodium* species, transmitted by mosquitoes.
Amoebic dysentery, caused by *Entamoeba histolytica*, through contaminated water.
Sleeping sickness, caused by *Trypanosoma brucei*, transmitted by the tsetse fly.
Giardiasis, caused by *Giardia lamblia*, leading to diarrhea and intestinal discomfort.

8. Mention four functions of the mammalian circulatory system.

It transports oxygen and nutrients to body tissues.
The system removes waste products like carbon dioxide and urea.
It distributes hormones from glands to target organs.
The circulatory system also plays a role in body temperature regulation and immune defense.

9. State four characteristics of a good scientific experiment.

It must be repeatable to verify results.
The experiment should have a clear and testable hypothesis.
It must include a control setup for comparison.
Variables should be clearly defined and controlled where necessary.

10. List four methods used in controlling pests in crop farming.

Chemical control using pesticides to kill or repel pests.
Biological control through natural predators or parasites.
Cultural methods such as crop rotation and proper spacing.
Mechanical control using traps or manual removal of pests.

SECTION B (30 Marks)

Answer two questions from this section.

11. Describe the nitrogen cycle, highlighting four key processes.

The nitrogen cycle is the natural process through which nitrogen is converted into various chemical forms as it circulates among the atmosphere, soil, and living organisms. One key process is nitrogen fixation, where nitrogen gas from the atmosphere is converted into ammonia by nitrogen-fixing bacteria found in the soil or in root nodules of legumes.

The second process is nitrification, where ammonia is converted into nitrites and then nitrates by nitrifying bacteria in the soil. These nitrates can be absorbed by plants and used to form proteins and other nitrogen-containing compounds.

Another important process is assimilation, where plants absorb nitrates from the soil and incorporate them into organic compounds like amino acids. When animals eat these plants, they assimilate the nitrogen into their own bodies.

The fourth process is denitrification. In this step, denitrifying bacteria convert nitrates back into nitrogen gas, releasing it into the atmosphere and completing the cycle.

12. Explain the adaptations of the eye to seeing in dim and bright light.

In dim light, the pupil dilates (enlarges) to allow more light into the eye. This is controlled by the radial muscles of the iris contracting and the circular muscles relaxing. Additionally, rod cells in the retina, which are more sensitive to low light, become more active and help the eye detect shapes and movement.

In bright light, the pupil constricts (gets smaller) to reduce the amount of light entering the eye. This is achieved when the circular muscles contract and the radial muscles relax. Cone cells in the retina become more active, allowing the eye to perceive color and fine detail.

The switch between rod and cone cell activity allows the human eye to adapt to different lighting conditions and maintain visual accuracy.

13. Discuss the effects of smoking on the human respiratory system.

Smoking introduces harmful substances such as nicotine, tar, and carbon monoxide into the lungs. Tar coats the lining of the respiratory tract, damaging the cilia that normally sweep mucus and pathogens out of the airways. This leads to the accumulation of mucus and a higher risk of infections like bronchitis.

Carbon monoxide from smoke binds to hemoglobin more readily than oxygen, reducing the oxygen-carrying capacity of blood and resulting in shortness of breath and fatigue.

Prolonged smoking causes inflammation of the bronchi and destruction of alveolar walls, leading to emphysema. This reduces the surface area for gas exchange and can severely impair breathing.

Smoking is also the leading cause of lung cancer, as carcinogens in tobacco smoke cause mutations in the lung cells, leading to uncontrolled growth and tumors.

14. Describe the importance of photosynthesis to life on Earth.

Photosynthesis provides the primary source of energy for almost all living organisms. It enables green plants to convert sunlight, water, and carbon dioxide into glucose, which serves as food for herbivores and, indirectly, for carnivores.

It produces oxygen as a by-product, which is essential for the respiration of most living organisms, including humans.

Photosynthesis helps regulate the level of carbon dioxide in the atmosphere, playing a critical role in controlling global temperatures and combating climate change.

It also forms the basis of most food chains and ecosystems, supporting biodiversity and ecological balance on Earth.

SECTION C (40 Marks)

Answer two questions from this section.

15. A teacher used a complex diagram of the human ear in a Form One class, and most learners failed to understand. Suggest six ways the teacher could have improved the use of this diagram.

First, the teacher could have simplified the diagram by using only basic, clearly labeled parts relevant to the learners' level to avoid overwhelming them with detail.

Second, they could break the diagram into parts and introduce each one gradually while explaining its function, rather than presenting the full image all at once.

Third, the teacher could use color coding to differentiate parts such as the outer, middle, and inner ear, making it easier for learners to follow the structure.

Fourth, they could complement the diagram with a physical model or 3D animation so learners could see how the parts connect in space, improving understanding.

Fifth, the teacher could involve students in drawing a simplified version of the diagram step by step as a class activity to reinforce identification and labeling.

Lastly, they could provide follow-up questions and group tasks using the diagram to promote discussion, clarification, and active engagement with the material.

16. A Biology teacher discovers during revision that learners have persistent misconceptions about photosynthesis. Describe six strategies to correct and prevent such misconceptions.

First, the teacher should identify the specific misconceptions by asking learners to explain their understanding or answer diagnostic questions.

Second, they should clarify the concept using concrete examples, such as comparing photosynthesis to cooking food using ingredients (light, water, carbon dioxide) to make energy (glucose).

Third, they could use concept mapping to visually organize the correct steps and components of photosynthesis, helping learners see the logical flow.

Fourth, they could encourage peer teaching where students explain the process to each other in their own words, with guidance and correction from the teacher.

Fifth, they should use formative assessments like quick quizzes or exit tickets to check whether the new explanation was understood correctly.

Lastly, the teacher should revisit the topic periodically and link it to new content (e.g., respiration, food chains) to reinforce accurate understanding over time.

17. During a lesson on ecology, students are unable to interpret a population graph provided in the textbook. As a Biology teacher, explain six ways you would teach graph interpretation skills effectively.

First, I would begin by reviewing the key components of a graph: title, axes labels, units, and data points, ensuring all students understand the basic structure.

Second, I would model the process of interpreting a simple graph step-by-step, explaining aloud how to extract meaning from each part.

Third, I would provide learners with partially completed graphs and ask them to fill in the missing labels or data points as a practice activity.

Fourth, I would use real-life scenarios, like changes in fish population or human birth rates, to make the graphs more relatable and meaningful.

Fifth, I would engage learners in small group discussions to interpret different graphs and present their understanding to the class for feedback.

Lastly, I would assign graph interpretation tasks regularly in homework and exams to build and reinforce their data literacy and analytical skills.

18. A school has very limited resources for Biology practicals. Suggest six creative strategies a teacher can use to deliver effective practical learning under these constraints.

First, the teacher can use improvised materials from the local environment, such as using maize stalks to teach plant anatomy or home tools for experiments on levers.

Second, they can prepare well-organized demonstrations, where the teacher performs the practical while learners observe closely, take notes, and analyze results.

Third, they can rotate learners through workstations in small groups to ensure all students get hands-on experience using limited materials.

Fourth, the teacher can use drawings, charts, or videos to simulate practical procedures when physical materials are unavailable.

Fifth, they can involve students in collecting local specimens like leaves, insects, or soil samples, making the lesson more interactive and resource-efficient.

Lastly, the teacher can use low-cost teaching aids like cardboard models or printed worksheets that guide students through virtual or theoretical practicals.