**THE UNITED REPUBLIC OF TANZANIA**

**NATIONAL EXAMINATION COUNCIL**

**DIPLOMA IN SECONDARY EDUCATION EXAMINATION**

**733/1** **BIOLOGY 1**

**Time: 3 Hour.** **ANSWERS** **Year: 2001**

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**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 major components of blood and state one function of each.**

Red blood cells are responsible for transporting oxygen from the lungs to the body tissues. They contain hemoglobin, which binds oxygen molecules and releases them to cells during respiration.

White blood cells help defend the body against infections and foreign invaders. They perform phagocytosis and also produce antibodies to destroy pathogens.

Platelets are involved in blood clotting. They accumulate at the site of injury and help form a clot to prevent excessive blood loss and seal wounds.

Plasma is the liquid part of blood that carries dissolved substances such as glucose, amino acids, hormones, and waste products. It also helps in the distribution of heat throughout the body.

**2. Mention four organs of the human excretory system.**

The kidneys are the main excretory organs responsible for filtering blood, removing urea, and maintaining the balance of salts and water in the body.

The lungs expel carbon dioxide and water vapor, which are waste products of cellular respiration, through the process of exhalation.

The skin excretes waste through sweat glands. It removes excess salts, water, and small amounts of urea in the form of sweat.

The liver plays a role in excretion by breaking down excess amino acids through deamination and detoxifying harmful substances such as drugs and alcohol.

**3. State four functions of the cell membrane.**

The cell membrane controls the movement of substances into and out of the cell. It is selectively permeable, allowing only specific molecules to pass.

It provides protection by enclosing the contents of the cell and separating it from the external environment.

The membrane contains receptor proteins that help in cell communication by receiving signals such as hormones.

It provides structural support by anchoring the cytoskeleton, helping maintain the shape and stability of the cell.

**4. Mention four characteristics of insect vectors.**

Insect vectors possess specialized mouthparts that enable them to bite and suck blood from hosts, allowing pathogens to enter or leave the bloodstream.

They are highly mobile and can travel between hosts or areas, which increases the spread of infectious diseases.

Many insect vectors reproduce rapidly, which increases their population and the likelihood of disease transmission within a short period.

They often harbor pathogens without being affected themselves, allowing the pathogens to multiply and survive within the vector until they are transferred to a new host.

**5. List four environmental factors that affect the rate of transpiration.**

Temperature influences transpiration because higher temperatures increase evaporation of water from leaf surfaces, thus increasing the rate of transpiration.

Humidity affects transpiration since high humidity reduces the concentration gradient between leaf and air, slowing down water vapor loss.

Wind speed plays a role by removing the humid air around the leaf surface and replacing it with drier air, thus increasing the rate of transpiration.

Light intensity causes the stomata to open wider during the day to allow gas exchange, which also increases water vapor loss through the stomata.

**6. State four advantages of vegetative reproduction in plants.**

Vegetative reproduction allows plants to reproduce quickly without the need for seeds, enabling rapid expansion and colonization of an area.

It results in offspring that are genetically identical to the parent plant, preserving desirable traits such as disease resistance or high yield.

Plants can reproduce successfully even in the absence of pollinators or when environmental conditions are not favorable for seed production.

The new plants mature faster and begin producing earlier compared to those grown from seeds, making the process more time-efficient.

**7. Mention four adaptations of red blood cells to their function.**

Red blood cells are biconcave in shape, which increases their surface area for efficient oxygen absorption and diffusion.

They lack a nucleus, allowing more space for hemoglobin and thus more capacity to carry oxygen.

Their flexible membrane allows them to squeeze through narrow capillaries without bursting, ensuring delivery of oxygen to all tissues.

They contain hemoglobin, a red pigment that binds and transports oxygen from the lungs to body tissues and returns with carbon dioxide.

**8. Give four methods used to preserve food.**

Drying removes moisture from food, which prevents the growth of bacteria and fungi that cause spoilage.

Salting draws water out of food and microorganisms through osmosis, creating conditions that inhibit microbial growth.

Refrigeration slows down the metabolic rate of spoilage-causing microorganisms by maintaining low temperatures.

Canning involves heating food to kill microorganisms and then sealing it in airtight containers to prevent recontamination.

**9. State four advantages of using models in Biology teaching.**

Models help simplify complex biological structures or processes, making them easier for learners to visualize and understand.

They allow learners to interact with and observe representations of concepts that are too small, large, or abstract to see directly.

Using models increases student engagement by involving them in hands-on learning, which can improve concentration and interest.

Models support memory retention by creating strong visual and spatial impressions that help learners recall the information more effectively.

**10. Mention four differences between arteries and capillaries.**

Arteries have thick, muscular walls that can withstand high pressure from the heart's pumping action, whereas capillaries have very thin walls made of a single cell layer.

Arteries transport blood away from the heart at high pressure, while capillaries operate under low pressure as they connect arteries and veins.

The walls of arteries do not permit the exchange of materials, but capillary walls allow for the diffusion of oxygen, nutrients, and waste products between blood and tissues.

Arteries have a relatively narrow lumen compared to the wall thickness to help maintain pressure, whereas capillaries have a very small lumen just wide enough for red blood cells to pass through one at a time.

## SECTION B (30 Marks)

Answer two questions from this section.

**11. Explain the process of digestion of a piece of bread from the mouth to the small intestine.**

Digestion begins in the mouth where the bread is chewed by the teeth, breaking it into smaller pieces to increase surface area. Saliva, secreted by salivary glands, contains the enzyme salivary amylase, which starts breaking down starch in the bread into maltose.

The chewed bread forms a bolus and is swallowed, passing through the pharynx and esophagus via peristalsis — a wave-like muscular movement — until it reaches the stomach.

In the stomach, mechanical digestion continues through churning. Although no further digestion of starch occurs here due to the acidic environment, proteins in other foods would begin digestion with the enzyme pepsin.

The partially digested bread then moves into the small intestine (specifically the duodenum), where it is mixed with pancreatic juice and bile. The pancreas releases pancreatic amylase to continue starch breakdown. The intestinal lining secretes maltase, which converts maltose into glucose.

Glucose is then absorbed through the walls of the small intestine into the bloodstream for distribution to body cells.

**12. Describe four factors that affect the rate of photosynthesis.**

Light intensity is one of the most important factors. As light increases, the rate of photosynthesis increases up to a certain point, beyond which it plateaus due to saturation.

Carbon dioxide concentration also influences photosynthesis. More carbon dioxide increases the rate until the enzymes responsible for fixing carbon are fully active.

Temperature affects the activity of enzymes involved in photosynthesis. As temperature rises, the rate increases until the enzymes begin to denature at high temperatures.

Availability of water is critical because it is a raw material in photosynthesis. Water stress can cause stomata to close, limiting carbon dioxide intake and reducing the photosynthetic rate.

**13. Explain the structure and function of the human kidney.**

Each human kidney is bean-shaped and made up of an outer cortex, a middle medulla, and an inner pelvis. The cortex contains numerous nephrons, which are the functional units of the kidney.

The nephron begins with Bowman's capsule, which surrounds the glomerulus — a capillary network where filtration of blood takes place. The filtrate contains water, glucose, salts, and urea.

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

The remaining fluid, now called urine, contains waste products like urea and excess salts. It is transported to the bladder via the ureter for excretion.

Overall, kidneys filter blood, remove metabolic waste, maintain water and salt balance, and regulate blood pressure.

**14. Describe four differences between monocotyledonous and dicotyledonous plants.**

Monocotyledons have one seed leaf (cotyledon) in their seeds, while dicotyledons have two seed leaves.

Leaf venation in monocots is parallel, meaning the veins run in straight lines, whereas in dicots, veins are netlike or reticulate.

Monocots have scattered vascular bundles in the stem cross-section, whereas dicots show vascular bundles arranged in a ring.

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

## SECTION C (40 Marks)

Answer two questions from this section.

**15. During a lesson on respiration, a student insists that breathing and respiration mean the same thing. As a teacher, explain six actions you would take to correct this misconception and improve understanding.**

First, I would begin by acknowledging the student's contribution to create a supportive environment, then gently explain that the two terms are often confused but have different meanings.

Second, I would define both terms clearly. Breathing is a physical process involving inhalation and exhalation of air, while respiration is a chemical process that occurs in cells to release energy.

Third, I would use a chart to compare the two processes side by side, showing their differences in location, purpose, and results.

Fourth, I would involve learners in a demonstration—such as measuring breathing rate versus discussing energy release—to help them see the difference in function and scale.

Fifth, I would encourage students to give real-life examples, like breathing heavily after exercise, and link it to how energy is required and released during respiration.

Finally, I would reinforce the lesson with a short written task or quiz that requires distinguishing between the two concepts in given scenarios, ensuring the misconception is addressed.

**16. You are teaching reproduction in Form Two, and you realize learners feel shy discussing reproductive organs. Describe six strategies you would use to teach the topic confidently and respectfully.**

First, I would establish classroom rules for respectful language and behavior to create a safe environment for open learning.

Second, I would use correct biological terms consistently to normalize scientific vocabulary and discourage slang or laughter.

Third, I would start with less sensitive subtopics like plant reproduction or asexual reproduction before moving into human reproduction.

Fourth, I would make use of diagrams and models instead of direct verbal descriptions to reduce discomfort while maintaining clarity.

Fifth, I would encourage anonymous question slips, allowing students to express their concerns or questions without fear of embarrassment.

Lastly, I would be confident and professional in my delivery, showing that reproduction is a normal part of Biology and human development, which builds trust and seriousness in learners.

**17. In a practical lesson on photosynthesis, only one microscope is available for 40 students. Explain six strategies you would use to make the practical effective for all learners.**

First, I would divide the class into small groups and assign each group a specific time slot to use the microscope while others do related activities.

Second, I would set up a rotation system where other groups complete written tasks, drawings, or discuss procedures while waiting for their turn.

Third, I would prepare diagrams or photographs of microscopic views in advance to ensure learners who don't get enough time still see the key structures.

Fourth, I would assign roles within groups—like observer, recorder, and presenter—so each learner has a responsibility and remains engaged even if not looking into the microscope.

Fifth, I would demonstrate the use of the microscope to the whole class before individual observations, maximizing understanding and minimizing time wasted.

Lastly, I would summarize the practical in a discussion afterward, ensuring all learners share findings and reflect on what they observed or learned indirectly.

**18. A Biology teacher gives students a test with unfamiliar practical diagrams, and many fail. What six actions should the teacher take to improve learners' ability to interpret diagrams?**

First, I would review the failed diagrams with the class, explaining each part carefully and highlighting where students commonly went wrong.

Second, I would teach diagram analysis explicitly, showing students how to read titles, labels, magnification, and symbols step by step.

Third, I would regularly include varied diagrams in daily lessons and exercises to build familiarity and reduce fear of unfamiliar visuals.

Fourth, I would engage learners in drawing and labeling biological diagrams from memory to improve recognition and comprehension.

Fifth, I would organize peer discussion or group work where students interpret diagrams together and explain them to one another.

Lastly, I would offer additional practice through homework or revision booklets focusing specifically on interpreting unfamiliar diagrams, reinforcing this skill before future assessments.