

**THE UNITED REPUBLIC OF TANZANIA**  
**NATIONAL EXAMINATIONS COUNCIL**  
**CERTIFICATE OF SECONDARY EDUCATION EXAMINATION**  
**BIOLOGY 1**

(For Both School and Private Candidates)

**Time: 3 Hours**

**Year: 2022**

**Instructions**

1. This paper consists of FIFTEEN questions.
2. Answer all questions in section A and B and two questions from section C.

1. For each of the items (i) - (x), choose the correct answer from among the given alternatives and write its letter beside the item number in the answer booklet provided.

- (i) Which component of the nervous system receives impulses from receptors? A  
Response  
B Effector  
C Relay  
D Motor  
E Coordinator

Answer: C Relay

Reason: Relay neurons (interneurons) receive impulses from receptors via sensory neurons and pass them to motor neurons.

- (ii) Which of the following is the proper method for disposing plastic bottles?  
A Landfill  
B Incineration  
C Burying  
D Recycling  
E Pit latrine

Answer: D Recycling

Reason: Recycling plastic bottles reduces pollution and allows reuse of materials instead of harming the environment.

- (iii) An individual who is riding a bicycle can waste a lot of water through sweating. Which of the following organs is responsible for the water loss?  
A Stomach  
B Kidney  
C Skin  
D Liver  
E Lungs

Answer: C Skin

Reason: Sweat glands in the skin are responsible for releasing water and salts during sweating to regulate body temperature.

- (iv) In the cowshed, a red furred cow mates with a white furred bull. In F<sub>1</sub> generation all cows were red furred. What does this suggest about fur colour in cow?  
A Incomplete dominance  
B Co-dominance  
C Multiple allelism  
D Complete dominance

E Partial dominance

Answer: D Complete dominance

Reason: All offspring having red fur shows that the red fur allele is dominant over the white fur allele.

(v) Which of the following parts allow water to enter into the seed before germination? A

Testa

B Plumule

C Radicle

D Cotyledon

E Micropyle

Answer: E Micropyle

Reason: The micropyle is a small pore in the seed coat through which water enters the seed to initiate germination.

(vi) In natural selection, which types of characteristics are affected?

A Inherited

B Acquired

C Survived

D Dominant

E Recessive

Answer: A Inherited

Reason: Natural selection acts on inherited traits that offer survival or reproductive advantages.

(vii) Which process allows absorption of water and mineral salts from the soil in plants? A

Diffusion

B Osmosis

C Irritability

D Mass flow

E Regulation

Answer: B Osmosis

Reason: Osmosis is the movement of water from a region of higher water potential to a lower water potential through a semi-permeable membrane in plant roots.

(viii) Why spiders and scorpions are placed in the same class?

A They have three pairs of legs

B They have a pair of wings

C They have a pair of chelicerae

D They have three body parts

E They have two pairs of antennae

Answer: C They have a pair of chelicerae

Reason: Both spiders and scorpions belong to the class Arachnida and have chelicerae used for feeding.

(ix) Straightening and bending of the arm involve contraction of the biceps and triceps muscles. Which of the following alternatives describes the state of muscles when human arm is bent?

- A Biceps muscles contract while triceps relax
- B Triceps muscles contract while biceps relax
- C Both the biceps and triceps muscles relax
- D Biceps muscles relax while triceps contract
- E Both biceps and triceps muscles contract

Answer: A Biceps muscles contract while triceps relax

Reason: When the arm is bent, the biceps contract to pull the forearm upward while the triceps relax.

(x) Which features are found in both plant and animal cells?

- A Chloroplast, cell wall and cell membrane
- B Cell membrane, nucleus and cytoplasm
- C Vacuole, cell membrane and cell wall
- D Cell wall, chloroplast and vacuole
- E Chloroplast, nucleus and cell wall

Answer: B Cell membrane, nucleus and cytoplasm

Reason: Both plant and animal cells share these basic components that carry out vital cellular functions.

2. Match the uses of apparatuses in List A with the corresponding apparatuses in List B by writing the letter of the correct response beside the item number in the answer booklet provided.

List A

- (i) An apparatus used for heating substance in the laboratory.
- (ii) An apparatus used for storing test tubes so that they do not roll or break.
- (iii) An apparatus used for measuring volume of liquids.
- (iv) An apparatus used to magnify specimens.
- (v) An apparatus used for keeping live aquatic animals in the laboratory.

List B

- A Bunsen burner
- B Aquarium
- C Measuring cylinder
- D Hand lens
- E Spatula
- F Test tube rack
- G Filter funnel

## H Test tube holder

Answers:

- (i) A
- (ii) F
- (iii) C
- (iv) D
- (v) B

3. “Animals cannot survive without moving from one place to another.” Justify this statement by giving three points with one example in each.

Animals move to search for food. Movement helps them to access new areas where food is available, especially when the current location lacks enough nutrition. For example, deer migrate to regions with greener vegetation during dry seasons to avoid starvation.

Animals move to escape from predators and danger. This allows them to survive by avoiding being caught or injured. For instance, a gazelle runs away from a chasing lion, increasing its chance of survival through rapid movement.

Animals move to search for mates during reproduction. Movement enables them to find partners and ensure the continuity of their species. For example, male frogs move closer to water bodies and call females during the breeding season to attract mates.

4. Mr. Shamba got a car accident and was badly injured. During the First Aid process Mr. Sai put on gloves, took a cotton wool and gave him painkillers. What was the use of;

(a) gloves?

To protect both the first aider and the patient from cross-infection by creating a barrier between the wound and the first aider’s hands. Gloves help reduce the risk of transmitting infections such as HIV or Hepatitis B.

(b) cotton wool?

To clean the wound or absorb blood and other fluids from the injured area. It can be used to apply antiseptics or to cover the wound before dressing it.

(c) pain killer?

To relieve the pain caused by the injury and help keep the patient calm and comfortable until further medical attention is provided. Painkillers help reduce stress and shock in injured persons.

5. How is the human urinary system adapted to perform its roles effectively? Give four points.

The kidneys have many nephrons, which are specialized structures for filtering blood and forming urine efficiently. This large number increases the kidney's ability to remove waste products and excess substances.

The ureters have muscular walls that contract in waves (peristalsis) to push urine from the kidneys to the bladder without relying on gravity. This ensures continuous flow of urine.

The bladder is elastic and expandable, allowing it to store urine temporarily before it is excreted. This helps maintain continence and avoids constant urination.

The urethra has a sphincter muscle that controls the release of urine from the bladder. This helps regulate urination voluntarily and prevents accidental leakage.

6. (a) Briefly explain the ways through which communicable diseases are transmitted from one person to another. Give three points.

Through direct physical contact such as touching, kissing, or sexual contact. Diseases like gonorrhea and herpes are transmitted this way.

Through airborne particles when an infected person coughs or sneezes. Diseases like tuberculosis and influenza spread through inhalation of contaminated droplets.

Through contaminated food and water. Cholera and typhoid are transmitted when people consume food or water containing pathogens.

(b) Why is it healthy advised to boil drinking water? Give a reason.

Boiling water kills bacteria, viruses, and parasites that cause waterborne diseases, making the water safe for drinking.

7. Briefly explain the following terms and give one example for each.

(a) Competition

This is the interaction between organisms where they compete for limited resources such as food, water, or space. For example, lions and hyenas compete for prey in the same habitat.

(b) Mutualism

This is a type of symbiotic relationship where both organisms benefit. For example, the relationship between bees and flowers, where bees get nectar and flowers get pollinated.

(c) Predation

This is a biological interaction where one organism (predator) kills and feeds on another organism (prey). For example, a lion preying on a zebra.

8. (a) Differentiate the term hyperglycaemia from hypoglycaemia.

Hyperglycaemia refers to a condition where there is an excessive amount of glucose in the blood, common in diabetes mellitus.

Hypoglycaemia refers to a condition where there is an abnormally low level of glucose in the blood, which can cause fainting or seizures.

(b) Give four symptoms of a person suffering from diabetes mellitus.

Frequent urination (polyuria)

Excessive thirst (polydipsia)

Unusual weight loss

Slow healing of wounds

9. (a) Why is it impossible for a locust to die when its head is held under water?

Locusts breathe through spiracles located on the sides of their bodies, not through their heads. As long as the spiracles remain above water, they can continue to breathe and survive.

(b) Why do people breathe more when they run fast?

When running, the body's muscles require more oxygen to produce energy. To meet this demand, the breathing rate increases to supply more oxygen and remove excess carbon dioxide produced during vigorous activity.

10. Briefly explain how the nervous system and the adrenal gland work together to bring about a response when a person is threatened by a lion.

When a person sees a lion, sensory organs send signals to the brain via sensory nerves. The brain interprets the danger and sends a message through motor neurons to the adrenal glands. The adrenal glands then release adrenaline into the bloodstream. Adrenaline increases the heart rate, breathing rate, and muscle strength, preparing the body to either fight or flee (fight or flight response).

11. Why is transpiration important to plants? Give three reasons.

It helps in the upward movement of water and mineral salts from the roots to other parts of the plant through the transpiration stream.

It cools the plant as water evaporates from the leaf surfaces, preventing overheating.

It maintains the turgor pressure in cells, which helps keep the plant upright and supports growth.

12. A heterozygous normal skinned man married a heterozygous normal skinned woman. They gave birth to three normal skinned children and one albino child. The father complained that the albino child was not his. As a biologist use genetic cross to find out whether the albino child belongs to the father or not.

Let A = normal skin allele, a = albinism allele.

Father's genotype: Aa

Mother's genotype: Aa

Punnett square:

A	a	
		A
AA   Aa		
a   Aa   aa		

From the cross:

75% chance (AA or Aa) for normal skin children

25% chance (aa) for an albino child

Conclusion: It is genetically possible for two heterozygous normal skinned parents to produce an albino child. Therefore, the albino child can belong to the father.

13. Explain four family planning methods and indicate one disadvantage of each.

The use of condoms is a common family planning method that provides a physical barrier to prevent sperm from entering the uterus. This method also protects against sexually transmitted infections. A disadvantage of condoms is that they can sometimes break or slip off during intercourse, reducing their effectiveness.

Oral contraceptive pills are taken daily by women to prevent ovulation. These pills contain hormones such as estrogen and progesterone that regulate the menstrual cycle and prevent pregnancy. One disadvantage is that they must be taken consistently at the same time every day, and missing a dose can reduce their effectiveness.

Intrauterine devices (IUDs) are small, T-shaped devices inserted into the uterus to prevent implantation of a fertilized egg. They can last for several years and are highly effective. However, a disadvantage is that they can cause side effects such as cramps, irregular bleeding, or in rare cases, uterine perforation.

The rhythm method involves avoiding sexual intercourse during the woman's fertile period based on the menstrual cycle. This method does not involve any drugs or devices. A disadvantage is that it requires accurate tracking and is less reliable, especially for women with irregular menstrual cycles.

14. Why is it important for plants to carry out photosynthesis? Explain by giving four reasons.

Photosynthesis allows plants to produce their own food using carbon dioxide, water, and sunlight. The glucose formed is used to support growth and energy needs. For example, crops like maize grow and produce grains as a result of photosynthesis.

Photosynthesis releases oxygen into the atmosphere as a by-product. This oxygen is essential for the survival of animals and humans, who depend on it for respiration. Forests play a major role in maintaining oxygen levels on Earth.

Through photosynthesis, plants help to remove carbon dioxide from the atmosphere, reducing the effects of global warming and climate change. For instance, planting trees in urban areas helps to improve air quality and lower temperature.

Photosynthesis forms the basis of food chains. Plants are primary producers, and all other organisms, including herbivores and carnivores, depend directly or indirectly on the food produced by plants. For example, cows eat grass, and humans eat cow products, all linked back to photosynthesis.

15. Many people believe that insects are harmful to man hence they find poisonous chemicals to eradicate them. Giving examples, explain four ways in which insects are useful to man.

Insects such as bees are important pollinators, helping plants to produce fruits and seeds. This supports agriculture and ensures food security. For example, bees pollinate crops like sunflowers, apples, and coffee plants, increasing their yield.

Some insects like silkworms are used in industries. Silkworms produce silk, a valuable material used in making clothing and textiles. This supports economic activities and provides jobs in silk-producing regions.

Insects such as termites and beetles help in decomposing dead organic matter. They break down plant and animal remains into simpler substances, enriching the soil and maintaining ecological balance. This contributes to nutrient cycling in ecosystems.

Certain insects serve as a source of food for humans and animals. In many cultures, edible insects like grasshoppers, crickets, and caterpillars are consumed as a rich source of protein. For example, in parts of Tanzania, fried grasshoppers are considered a delicacy.