Candidate's No……

THE UNITED REPUBLIC OF TANZANIA

MINISTRY OF EDUCATION AND CULTURE

FORM TWO SECONDARY EDUCATION EXAMINATIONS, 2003

BIOLOGY

TIME: 2 HOURS. **ANSWERS**

INSTRUCTIONS

1. This paper consists of sections A, B and C.
2. Answer ALL questions from sections A and B and ONE question from section C.
3. All answers for sections A and B must be written in the space provided for each question.
4. Answers for section C should be written in the paper provided.
5. Write your examination number on the top right hand corner of every page.
6. All writing must be in blue/black ink or ball point pens.

FOR EXAMINER'S USE ONLY		
QUESTION NUMBER	**SCORE**	**INITIALS OF EXAMINER**
1.		
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Candidate's No……

SECTION A

1. Questions (i) - (x) are multiple choice items. Select the best answer in each case and write its letter in the box provided.

(i) The scientific study of living organisms and their environment is called:
A. Zoology
B. Biology
C. Botany
D. Ecology
E. Physiology
Correct Answer: B
Reason: Biology is the scientific study of living organisms and their interactions with the environment, encompassing all aspects of life, unlike the more specific fields like zoology or botany.

(ii) Which of the following is a function of the vacuole in a plant cell?
A. Controls cell activities
B. Stores water and nutrients
C. Produces energy
D. Synthesizes proteins
E. Regulates light
Correct Answer: B
Reason: The vacuole in plant cells primarily stores water, nutrients, and waste products, maintaining turgor pressure, unlike other organelles responsible for control, energy, or protein synthesis.

(iii) The type of respiration that occurs without oxygen is called:
A. Aerobic respiration
B. Anaerobic respiration
C. Cellular respiration
D. Oxidative respiration
E. Gaseous respiration
Correct Answer: B
Reason: Anaerobic respiration occurs in the absence of oxygen, producing energy with limited byproducts like lactic acid or ethanol, unlike aerobic respiration which requires oxygen.

(iv) The part of the digestive system where most nutrient absorption occurs is:
A. Stomach
B. Oesophagus
C. Small intestine
D. Large intestine
E. Rectum
Correct Answer: C
Reason: The small intestine, with its large surface area due to villi, is the primary site for nutrient absorption, unlike the stomach (digestion) or large intestine (water absorption).

(v) Which of the following is a characteristic of arthropods?
A. Presence of feathers

B. Segmented body with jointed legs
C. Soft body with a shell
D. Backbone
E. Gills for respiration
Correct Answer: B
Reason: Arthropods, like insects and crustaceans, have segmented bodies and jointed legs, supported by an exoskeleton, distinguishing them from vertebrates or mollusks.

(vi) A disease caused by a deficiency of vitamin D in children is:
A. Beriberi
B. Scurvy
C. Rickets
D. Pellagra
E. Night blindness
Correct Answer: C
Reason: Rickets is caused by a deficiency of vitamin D, leading to weak bones in children, unlike other deficiency diseases linked to different vitamins (e.g., scurvy for vitamin C).

(vii) The test for lipids in a food sample involves:
A. Adding iodine solution
B. Using Sudan III stain
C. Mixing with Biuret solution
D. Boiling with Benedict's solution
E. Adding sodium hydroxide
Correct Answer: B
Reason: Sudan III stain turns red in the presence of lipids, confirming their presence, while other reagents test for different substances (e.g., iodine for starch, Biuret for protein).

(viii) Which chamber of the heart pumps blood into the aorta?
A. Right atrium
B. Left atrium
C. Right ventricle
D. Left ventricle
E. Pulmonary vein
Correct Answer: D
Reason: The left ventricle pumps oxygenated blood into the aorta for distribution to the body, unlike other chambers or vessels with different roles in circulation.

(ix) The process by which plants lose water through stomata is called:
A. Translocation
B. Transpiration
C. Diffusion
D. Osmosis
E. Absorption
Correct Answer: B
Reason: Transpiration is the loss of water vapor through stomata, aiding in cooling and nutrient transport, distinct from translocation (sugar transport) or other processes.

(x) Which of the following is a unicellular organism?
A. Hydra
B. Amoeba
C. Earthworm
D. Mushroom
E. Fern
Correct Answer: B
Reason: Amoeba is a unicellular organism, consisting of a single cell, unlike Hydra, earthworm, mushroom, or fern, which are multicellular.

2. The following statements are either TRUE or FALSE. In the spaces provided write TRUE if the statement is correct and FALSE if the statement is not correct.

(i) All bacteria are harmful to humans. FALSE

(ii) The liver produces bile for fat digestion. TRUE

(iii) Sponges belong to the Kingdom Plantae. FALSE

(iv) The heart is an organ made up of muscle tissue. TRUE

(v) Photosynthesis produces glucose and carbon dioxide. FALSE

(vi) Blood group O is a universal donor. TRUE

(vii) The trachea is lined with cilia to trap dust particles. TRUE

(viii) All animals have a closed circulatory system. FALSE

(ix) Cholera is caused by a virus. FALSE

(x) The cell wall in plants is made of cellulose. TRUE

2. The following are matching items. Match the phrase or term in List A with that in List B by writing its letter in the spaces provided in the table at the end of the question.

LIST A	LIST B
(i) Protects the leaf from water loss	A. Cuticle
(ii) Disease transmitted through contaminated water	B. Cholera
(iii) Organelle for photosynthesis	C. Chloroplast

(iv) Carries oxygenated blood to the body	D. Aorta
(v) Organisms that produce their own food	E. Autotrophs
(vi) Deficiency disease due to lack of vitamin A	F. Night blindness
(vii) Enzyme that digests starch in the mouth	G. Amylase
(viii) Structure for locomotion in Paramecium	H. Cilia
(ix) Process of removing metabolic wastes	I. Excretion
(x) Blood component that clots blood	J. Thrombocytes

Answers:

LIST A	i	ii	iii	iv	v	vi	vii	viii	ix	x
LIST B	A	B	C	D	E	F	G	H	I	J

SECTION B

3. (a) Define the term "tissue".
Answer: A tissue is a group of similar cells that work together to perform a specific function in an organism.

(b) Name three types of animal tissues and their functions.
(i) Epithelial tissue
Function: Covers surfaces and protects underlying tissues
(ii) Muscle tissue
Function: Enables movement through contraction
(iii) Connective tissue
Function: Supports and binds other tissues

(c) State one difference between a tissue and an organ.
Answer: A tissue is a group of similar cells with a specific function, while an organ is a structure made of different tissues working together for a complex function.

4. (a) What is meant by the term "gaseous exchange"?
Answer: Gaseous exchange is the process by which oxygen is taken into an organism and carbon dioxide is released, occurring across specialized surfaces.

(b) Draw a labelled diagram of a leaf cross-section showing the structures involved in gaseous exchange.

(c) List two factors that affect the rate of gaseous exchange in plants.
(i) Stomatal opening size
(ii) Environmental humidity

5. (a) Define the term "circulatory system".
Answer: The circulatory system is a network of organs and vessels that transports blood, nutrients, oxygen, and wastes throughout the body.

(b) Complete the table below showing the components of blood and their functions.

Blood Component	Function
(i) Erythrocytes	Transport oxygen
(ii) Leucocytes	Fight infections
(iii) Thrombocytes	Clot blood

(c) Name one disease that affects the circulatory system.
Answer: Hypertension

- (a) What is a "pathogen"?
  Answer: A pathogen is a microorganism, such as a virus, bacterium, or fungus, that causes disease in its host.

(b) List three ways pathogens can enter the human body.
(i) Through contaminated food or water
(ii) Via respiratory droplets
(iii) Through cuts or wounds

(c) Name two diseases caused by bacteria.
(i) Tuberculosis
(ii) Cholera

6. (a) Define the term "food chain".
Answer: A food chain is a linear sequence of organisms showing the transfer of energy from producers to consumers, with each level feeding on the one below.

(b) Construct a food chain with four trophic levels starting with a green plant.
Answer: Grass → Grasshopper → Frog → Snake

(c) Explain two roles of decomposers in an ecosystem.
(i) Break down dead organic matter, recycling nutrients
(ii) Prevent accumulation of waste, maintaining ecosystem balance

SECTION C

9. Write an essay on tuberculosis using the following guidelines:

Essay on Tuberculosis

Causative Agent

Tuberculosis, commonly known as **TB**, is a contagious and potentially life-threatening disease caused by a bacterium called **Mycobacterium tuberculosis**. This bacterium primarily affects the lungs but can also spread to other parts of the body such as the kidneys, spine, and brain.

Modes of Transmission

Tuberculosis is mainly spread through the **airborne droplets** released when an infected person coughs, sneezes, talks, or spits. When another person breathes in these droplets, they can become infected. TB is especially likely to spread in **crowded or poorly ventilated environments**, where people are in close contact for extended periods.

Symptoms

The symptoms of tuberculosis may develop slowly over weeks or months. The most common signs include:

- A **persistent cough** lasting more than two weeks, sometimes with blood.
- **Chest pain** while breathing or coughing.
- **Unexplained weight loss**.
- **Fever** and chills.
- **Night sweats**.
- Loss of appetite and general body weakness.

If left untreated, TB can become severe and life-threatening.

Effects on the Body

Tuberculosis primarily **damages the lungs**, causing cavities and scar tissue. In advanced cases, the disease can spread to other organs such as the bones, kidneys, liver, and brain. It also **weakens the immune system**, making it harder for the body to fight other infections. If untreated, TB can cause serious health complications and even death.

Prevention and Control Measures

Several measures can help prevent and control the spread of tuberculosis:

- **Vaccination**: The **Bacille Calmette-Guérin (BCG)** vaccine provides protection against severe forms of TB, especially in children.
- **Early Diagnosis and Treatment**: Detecting TB early through medical check-ups and providing a full course of **antibiotics** can cure the disease and prevent its spread.
- **Improving Ventilation**: Ensuring good airflow in crowded public places and homes reduces the risk of inhaling infectious droplets.

- **Public Awareness Campaigns**: Educating people about TB transmission, symptoms, and the importance of completing treatment encourages early medical attention and reduces stigma.

Conclusion

Tuberculosis remains a major global health concern, but with effective prevention, early detection, and proper treatment, it is a disease that can be controlled and cured. Public awareness and responsible health practices are key to reducing its spread and protecting communities from this infectious disease.

10. Write an essay on the importance of water in living organisms using the following guidelines:

Essay on the Importance of Water in Living Organisms

Water is one of the most essential substances for the survival of all living organisms. It plays a critical role in various biological processes that keep life functioning smoothly. Without water, life as we know it would not exist. The importance of water in living organisms can be understood through the following roles:

Role of Water in Cells

Inside living cells, water acts as a **solvent**, allowing different chemical reactions to take place. Many essential molecules and ions dissolve in water, making it easier for them to move and interact within the cell. Additionally, water helps **maintain the shape and structure of cells**, providing support to plant cells and contributing to the flexibility and function of animal cells.

Importance in Digestion

Water plays a vital role in the **digestion of food**. It facilitates the action of digestive enzymes that help break down large, complex food substances into smaller, absorbable nutrients. Without enough water, these enzymes cannot work effectively. Water also helps soften food, making it easier to swallow and move through the digestive tract.

Role in Transport Systems

In both plants and animals, water serves as a **medium for transporting nutrients, gases, and waste products**. In animals, blood — which is largely made up of water — carries oxygen, nutrients, hormones, and waste materials to and from different parts of the body. In plants, water carries dissolved minerals from the roots to the leaves and transports food produced in the leaves to other parts of the plant through the **xylem and phloem**.

Regulation of Body Temperature

Water is crucial for **regulating body temperature**. In animals, when body temperature rises, water is lost through **sweating and evaporation**, which helps cool the body down. In plants, water escapes through tiny pores in leaves in a process known as **transpiration**, which helps to maintain an ideal internal temperature and prevents overheating, especially in hot conditions.

Conclusion

In conclusion, water is indispensable for life. It plays multiple vital roles — from acting as a solvent in cells and aiding digestion to enabling transportation of essential substances and regulating temperature. The importance of water in living organisms highlights the need to conserve and use this valuable resource wisely to ensure the continued survival and health of all forms of life on Earth.