

**PRESIDENT’S OFFICE**  
**REGIONAL ADMINISTRATION AND LOCAL GOVERNMENT**  
**ADVANCED CERTIFICATE OF SECONDARY EDUCATION EXAMINATION**  
**FORM FIVE EXAMINATION**

**133/1**

**BIOLOGY 1**  
(For Both School and Private Candidates)

**Time: 3 Hours**

**May**

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**Instructions**

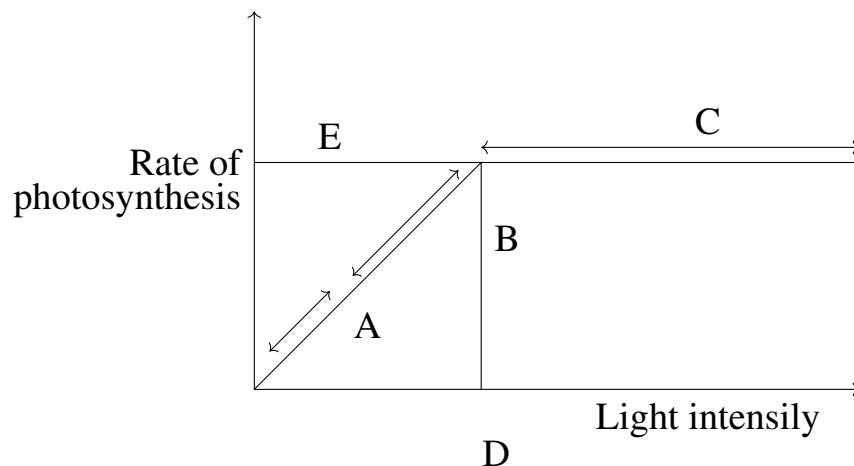
1. This paper consists of two sections A and B with a total of **ten (10)** questions.
2. Answer **all** questions in section A and any **two (02)** questions from section B.
3. Section A carries **seventy (70)** marks and section B carries **thirty (30)** marks.
4. Except for diagrams that must be drawn in pencil, all writing should be in blue or black ink.
5. Cellular phones and any unauthorized materials are **not** allowed in the examination room.
6. Write your **Examination Number** on every page of your answer booklet(s).

This paper consists of four (04) printed pages

## SECTION A (70 marks)

Answer all questions in this section.

1. (a) An organism X has a scientific name Canica papaya
  - (i) Name the system used to assign the name of the organisms.
  - (ii) State any four (4) rules that might have been used to assign name to the organism X above.
- (b) How does prokaryotic cell differs from eukaryotic cells? Give any four points.
2. (a) Mr Gregory carried out an experiment to test for protein in a given solution using Biuret test. In his experiment the results showed that the colour of the solution turned into purple or violet.
  - (i) Identify the suitable reagent for the test
  - (ii) Outline the procedures he followed during his experiment.
- (b) What is the basis for positive results?
3. (a) Next to the stomach there is a large gland which has the group of cells that produce a variety of digestive enzymes. Name the gland and five (5) digestive enzymes it produces with clear functions when it acts as exocrine gland
- (b) Consider the figure below.



Answer the following questions;

- (i) What is the limiting factors in region A?
  - (ii) What is represented by the curve B and C.
  - (iii) What does the point D represent on the curve?
  - (iv) What does the point E represent in the curve?
4. (a) How does nervous coordination differ from the hormonal coordination?
- (b) Explain how the nervous tissue are adapted to conduct the nerve impulse? Give five (5) points.

5. (a) Draw a diagram to show the structure of a cell membrane and label the following parts using letters
  - A: Phospholipid with hydrophilic (heads) and hydrophobic (tails)
  - B: Proteins shown in the bilayer
  - C: Glycoproteins
  - D: Glycolipid
  - E: Thickness shown as 10nm
  - F: Phospholipid bilayer
- (b) State one difference between cell wall and cell surface membrane based on the following guideline
  - (i) Stability
  - (ii) Permeability
6. (a) (i) How does competitive inhibitors of an enzyme takes place?  
 (ii) How are enzymes inhibitor important in Biochemical pathway of the cell
- (b) (i) Distinguish between Prosthetic group and Coenzymes  
 (ii) Identify the chemical composition of ATP
7. (a) (i) Explain the features that characterize the respiratory surface.  
 (ii) What are factors influence breathing? Give any three factors.
- (b) Oxygen enters the human body from the atmosphere through the nostril to the lungs and then it is transported to other parts of the body. Identify two ways through which oxygen is transported.

### SECTION B (30 marks)

Answer **any two** (02) questions in this section.

8. (a) There are three stages in the release of energy from the molecule of Glucose, Glycolysis, Krebs's cycle and electron transport system. What are essential features of each of these processes?
- (b) (i) State the role played by oxygen in aerobic respiration.  
 (ii) In aerobic cellular respiration the pyruvate undergoes a series of reactions in the citric acid cycle to yield energy. Briefly explain major products of citric acid cycle.

9. (a) (i) Explain why objects are seen more clearly at night by not looking directly at them
- (ii) Mammals have myelinated axons where as invertebrates such as squids have non-myelinated axons. Explain the advantages of having myelinated axons.
- (b) In Tanzania, agriculture is one of the important sectors in the development of the national economy in which about 80% of population are involved in crop production. Explain how synthetic plant hormones can be effectively used for large scale production in Agriculture.
10. (a) Give two reasons, explain how photosynthesis is important to the life of living organism on earth.
- (b) Describe how plants obtain light energy and convert it to biochemical molecules such as  $\text{NADPH} + \text{H}^+$  and ATP

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**133/3**

**BIOLOGY 3**

(For Both School and Private Candidates)

**(ACTUAL PRACTICAL)**

**LIST OF SPECIMENS, CHEMICALS AND APPARATII**

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**1.0 IMPORTANT:**

The Joint Examination has prepared a checklist of apparatii and chemicals for Biology actual practical. As Head of school, **make sure that all the Specimens, apparatii and chemicals** indicated in this checklist are available in the laboratory. Some of these chemicals and Apparatii will be used for Joint Examination Southern Zone (Mtwara and Lindi) (ACSEE) May, 2023 Biology practical. The 3 hours advance instructions will be provided.

**2.0 LIST OF SPECIMENS, APPARATII AND CHEMICALS:**

In addition to the normal fitting and reagents of an ACSEE Biology laboratory, each candidate will require some of the listed Specimens, apparatii and chemicals as will be prescribed in the 3 hours advance instructions:

**2.1 SPECIMENS**

The students will require the following specimens

- Fresh toad/Frog..... 1 per candidate
- Fresh killed cockroach .....1 per candidates
- Moss plant.....shared by 4 candidate
- Fern plant..... shared by 4 candidate
- Mushroom ..... shared by 4 candidate
- Maize grain..... 1 per candidate
- Bean seed ..... 1 per candidates
- Millipede..... 1 shared by 4 candidates
- Centipede..... .....1 shared by 4 candidates
- Crab .....1 shared by 4 candidates
- Honey bee .....1 shared by 4 candidates
- Yeast cells .....5gms per candidates

- Grasshopper .....1 shared by 4 candidates
- Spider .....1 shared by 4 candidates
- Raw cassava .....10cm piece per candidates

## 2.2 CHEMICALS AND REAGENTS

Each candidate will require the following reagents and solution

- Hydrogen peroxide
- 5mls of Iodine solution
- 10mls of Benedict's solution
- 5mls of copper II sulphate
- 5mls of Hydrochloric acid.
- 5mls of sodium hydroxide solution.
- 5gms os Egg Albumen
- 5gms of starch powder.
- 5gms of sucrose
- 5gms of Glucose
- 200mls of Distilled water.

## 2.3 APPARATII AND EQUIPMENTS

Each candidate will require

- 4 test tube
- 1 test tube rack
- 1 test tube holder
- 1 test tube brush
- Source of heat shared by 4 candidates
- 1 motor and pestle
- 1 sieve
- 2 beakers
- 5 petridishes/watch glass
- 1 scapel/knife
- 1 Dissecting dish
- 1 Dissecting kit.

## 2.4 OTHER REQUIREMENTS PER CANDIDATE

- piece of cotton wool
- 1 pair of gloves
- Dissecting pins
- Fine sand
- Masking tape

## 2.4 LABELS

Prepare the following standby labels per candidate  
A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R

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**133/3A**

**BIOLOGY 3A**  
(For Both School and Private Candidates)  
**(ACTUAL PRACTICAL A)**

**TIME: 3:20 HOURS**

**May 2023**

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**Instructions**

1. This paper consists of **three (3)** questions.
2. Answer **all** questions.
3. Question **one (1)** carries **twenty (20)** marks and other two carries **fifteen (15)** marks each.
4. All writings should be in blue or black ink, except for diagrams which must be drawn in pencil.
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This paper consists of three (03) printed pages



1. You have been provided with specimen J, Dissect it fully to display the Urinogenital system.

**LEAVE YOUR DISSECTION PROPERLY DISPLAYED FOR ASSESMENT**

- (a) Draw a large, neat and well labelled diagram of your dissection.
  - (b) Give the importances of the named system to the organism
  - (c) With reasons name the sex of your specimen.
  - (d) State how specimen J adapted to its environment.
2. You have been provided with specimen K, test tubes, beakers, sieve, measuring cylinder, test tube rack and table reagents.  
Using the reagent provided carry out experiment as per instruction provided.

- (i) Take specimen K, peel off to remove the outer cover.
- (ii) Cut specimen K into small pieces.
- (iii) Grind the pieces of specimen K using mortal and pestle to obtain the paste.
- (iv) Add a little amount of water in a paste
- (v) Filter the mixture using sieve to obtain solution K.
- (vi) Using the reagent provide carry out the biochemical test to identify the food substance present in solution K

**Questions:**

- (a) Record your result as shown in a table bellow

TEST FOR	PROCEDURE	OBSERVATION	INFERENCE

- (b) Identify the food substance present in solution K.
- (c) Give the roles of the identified food substance in human body. Two (2) points each.
- (d)
  - (i) Name the storage form of the identified food substance in human body
  - (ii) Name the substance used to convert the utilizable form to the storage form of the identified food.

3. You have been provided with specimen L, M, N and O observe them carefully and then answer the questions that follows.
- (a) Identify specimen L, M, N and O using their common names.
  - (b) Classify specimen L, M, N and O to phylum/Division level.
  - (c) State the habitat of specimen L and O.
  - (d) State two (2) characteristics of the class that specimen L and M labeling.
  - (e) Give two economic importance of specimen N and O
  - (f) Name and define the type of Germination exhibited by specimen M
  - (g) State why class of specimen N is said to be more successful in the world.

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**133/1**

**BIOLOGY 1**

**MARKING SCHEME**

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1. (a) (i) Binomial nomenclature **(02 marks)**
- (ii) \* Scientific name must compose of two names that is generic name and a specific name
- \* The generic name must begin with a capital letter, then specific name must follow with a small letters
- \* The scientific name should be latinized
- \* The scientific name should be underlined separately
- (Any four 04 marks)**

2. (a) (i) He used 1% copper II sulphate solution **(01 mark)**

(ii) Procedure

He used the following procedures

\* 2ml of solution was put into a test tube. 2ml of sodium hydroxide(NaOH) solution added. **(02 marks)**

\* Then to test tube, three drops of 1% copper II sulphate solution added while shaking after each addition. **(02 marks)**

Observation

\* The solution turned into purple colour or violet. **(02 marks)**

(b) The basis for the positive results

– In alkaline solution, the nitrogen atoms in the peptide bonds form a purple complex with copper II ions. **(03 marks)**

3. (a) (i) Name of the gland is Pancrease (01 mark)
- (ii) Five (5) digestive enzymes produced are;
- \* **Trypsinogen**
    - activated to an enzyme trypsin by non-digestive enzyme called enterokinase
    - Trypsin breaks protein into peptide.
  - \* **Chymotrypsinogen**
    - which is activated to chymotrypsin by trypsin that also split protein into peptide
  - \* **Procarboxypeptidase**
    - This activated to enzyme carboxypeptidase by trypsin
    - It convert large peptide (polypeptide) into smaller peptides and amino acids.
  - \* **Pancreatic amylase**
    - This complete the digestion of starch into maltose which started in the mouth
  - \* **Pancretic Lipase**
    - Hydrolyses lipids(fat and oil) into fatly acid and glycerol
  - \* **Nuclease**
    - catalyse the break down of nucleic acid into their constituents nucleotides
- (Any five 05 marks)
- (b) (i) In region A light intensity is the limiting factor
- (ii) In region B both light intensity and the other factor(s) are limiting  
In region C light intensity is no longer a limiting factor.
- (iii) Point D represent saturation point for light intensity under these condition that is the point beyond which an increase in light intensity will cause no further increase in the rate of photosynthesis
- (iv) In point E the maximum rate of photosynthesis attainable under the condition of the experiment. (@01 = 04 marks)

4. (a) The difference between nervous coordination and hormonal coordination

S/No	Nervous coordination	Hormonal coordination
(i)	Electrical impulse are the messenger in the nervous system	Hormones are the chemical messengers in the endocrine system that target cells through the blood stream.
(ii)	Nerve impulses are transmitted through neurons	Hormones are transmitted through blood vessels
(iii)	Nerve impulses make use of the neurotransmitters at synaptic clefts and sodium and potassium channels and enter the target cells	The hormones enter into the target cells by diffusing through the plasma membrane or by binding to the cell receptor.
(iv)	Response are localized	Response are widespread
(v)	The signal transmission process is fast	The signal transmission process is slow.

**(Any five points @01 = 05 marks)**

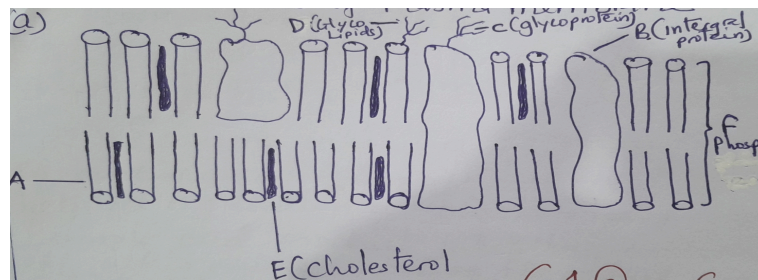
(b) Adaptations of the nerve tissue

- (i) They have nerve cells(neurons) that receive information from sensory parts and send or transmit it to the CNS for interpretations and then to the effector for a response.
- (ii) The cells of the nervous tissue are tightly packed for effective working of the tissue
- (iii) They have neuroglia (glia cells) that provide protection and support to the tissue
- (iv) Nerve cells or Neurons have nodes of ranvier and fatty myelin sheath which facilitate rapid transmission of impulses.
- (v) The cells in the nervous tissue produce neurotransmitter chemicals which act as conveyors that carry impulses from one neurone to another across the synaptic gap.

**(Any five points @01 = 05 marks)**

5. (a) The structure of Plasma membrane

(06 marks)



1

(b) Difference

Criteria	Cell wall	Cell membrane
Stability	very stable due to presence of thickening materials such as legnin and cellulose	Less stable due to lack of thickening material
Permeability	less permeable as it depend on plasmodesmata	More permeable as it has smaller pores together with protein receptors

(04 marks)



6. (a) (i) Competitive inhibitor take place when substrate and inhibitors compete for the active site of an enzyme. **(02 marks)**
- (ii) Enzyme inhibitors are important in biochemical pathways because they help in regulation of biochemical pathway example end product inhibition can switch off certain metabolic reaction if products are in higher concentration. **(02 marks)**
- (b) (i) Prosthetic group is the type of enzyme cofactors that slightly and permanently bind to an enzyme to help catalysis eg FAD while coenzymes are type of cofactor which are not remain attached to the enzyme between reaction eg NAD, NADP, COA **(03 marks)**
- (ii) Chemical composition of ATP
- \* Adenine (organic base) **(01 mark)**
  - \* Ribose (pentose sugar) **(01 mark)**
  - \* 3-phosphate molecules **(01 mark)**

7. (a) (i) Features of Respiratory surface

- \* It has thin epithelium to facilitate rapid diffusion of the gases.
- \* It has permeable membrane to allow the passage of gases
- \* It has larger surface area to volume ratio for maximum diffusion of the gases
- \* It has moist to allow the passage of gases in a solution form
- \* It has blood capillaries for transportation of diffused gases.

(Any three points @01 = 03 marks)

(ii) Factors influencing Breathing

\* **Concentration of carbon dioxide**

If there is high concentration of carbon dioxide blood the rate of gaseous exchange increase in order to provide the tissue with enough oxygen

\* **Physical activities**

Rate of gaseous exchange increase when there is increased physical activities as here is large increase of carbon dioxide and oxygen is also needed for tissue respiration

\* **Age**

Breathing rate of young people is higher than old people because young people are generally more active

\* **And other related factors such as smoking,  $H^+$  concentration in the blood, stretching of the thoracic and pulmonary walls and oxygen saturation in the blood.**

(Any three points @01 = 03 marks)

(b) Ways through which oxygen is transported

- As a mixture of gases from the atmosphere to the nostril to the lungs.
- As dissolved in solution from the lungs to other part of the body
- By combination with Haemoglobin from the lungs to other parts of the body.

(Any two points @02 = 04 marks)

8. (a) Summary of essential features of each stage.

(i) Summary of essential features of glycolysis

- \* Phosphorylation of sugar. This activate the sugar making it more reactive, the process uses ATP
- \* Splitting of the 6C sugar into 3C sugar phosphate
- \* Oxidation by dehydrogenation ( 03 marks)

(ii) Essential features of Kreb's Cycle

- \* The citrate is oxidized in many stages to produce carbon dioxide and energy in form of ATP and FAD
- \* Acetyl group(2C) enter the cycle by combining with 4C compound (oxaloacetate) to form a 6C compound(Citrate) ( 03 marks)

(iii) Essential features of Electron transport chain

- \* Energy in the form of hydrogen atoms from the Kreb's cycle is converted to ATP
- \* Hydrogen atom are carried by hydrogen carries NAD and FAD to other carriers
- \* As the hydrogen is passed from one carrier and energy is released in form of ATP ( 03 marks)

(b) (i) Role played by oxygen in Respiration

- \* Oxygen is an electron acceptor within the electron transport chain which synthesizes ATP from nutrients. ( 02 marks)

(ii) Kreb's Cycle products

Note that prior to Kreb's Cycle 2 molecules of Acetyl COA are produced from oxidative decarboxylation of 2 pyruvate so two cycles are required per glucose molecules.

Therefore, in each citric acid cycle forms the following products

(i) 4 molecules of CO<sub>2</sub> are released. Removal of CO<sub>2</sub> or decarboxylation of citric acid takes place at two places

- In the conversion of isocitrate (6C) to  $\alpha$ -ketoglutarate (5C)
- In the conversion of  $\alpha$ -Ketoglutarate to Succinyl COA(4C) ( 01 mark)

(ii) 2 ATP are produced directly in the conversion of Succinyl COA to Succinate. ( 01 mark)

(iii) 6 reduced NAD are produced by reduction of NAD<sup>+</sup> to NADH in the following reactions.

- Isocitrate to  $\alpha$ -Ketoglutarate
- $\alpha$ -Ketoglutarate to Siccinyl COA
- Malate to oxaloacetate ( 01 mark)

- (iv) 2 FADH are produced by the reduction of  $\text{FAD}^+$  to  $\text{FADH}_2$  in the conversion of succinate to fumarate. ( **01 mark**)

9. (a) (i) Objects are seen more clearly at night by not looking at them because in dim light only are activated
- \* Rods are more distributed over the retina but none of them found at the fovea where as cones are at greater concentration.
  - While** looking directly to the object at night photoreceptor cells from fovea are to be poor vision in dim light that why you can see less clearly
  - \* **While** Not looking directly to the object at night the photoreceptor cells away from the region of fovea centralis are to be used of which are rods, these rods have good vision in dim light that why you can see more clearly. **( 05 marks)**
- (ii) Advantages of Myelinated Axon
- \* It increase the transmission speed of the impulse since impulse jump from one node of Ranvier to another.
  - \* It protects the inner part of the axon from the mechanical injury **( 03 marks)**
- (b) Synthetic plant hormones can be effectively used in different ways for large scale production in agriculture as follows.
- (i) **Gibberellins**
- \* Promote fruit setting
  - \* Enhance seed production
  - \* Bolting and flowering in long-day plants
  - \* Breaking seed dormancy
- (ii) **Auxins**
- \* Root initiation in cutting
  - \* Initiation of flowering
  - \* Promote fruit setting without fertilization
  - \* Selective of weed killer
  - \* Prevention of leaf and premature fruit fall
- (iii) **Ethylene**
- \* It promote fruit ripening
  - \* It induce flowering in pineapple
  - \* It stimulates the latex flow in rubber
  - \* It induces the sprouting of storage organs
- (iv) **Cytokinin**
- \* Delay of leaf senescence
  - \* Break seed dormancy
  - \* Prolong shelf life

**(Any seven @01 = 07 marks)**

10. (a) The process of photosynthesis is important to the life of living on earth in the following ways
- Photosynthesis is essential for the existence of all life on earth surface because plays a role in the food chain.
  - Photosynthesis responsible for oxygen production which is needed by most organism
  - Photosynthesis balances the amount of carbon dioxide. ( 03 marks)
- (b) Plant obtain light energy by absorbing light through pigment called chlorophyll. The chlorophyll consist of reaction centres
- The reaction centres are called photosystems
  - There are two types of photosystem

(i) **Photosystem I**

Photosystem I contain chlorophyl called p700. In the reaction center of PSI, the light absorbing pigment is a specialized chlorophyll a molecule that absorb red light of 700nm wavelength most efficiently, hence the name p700.

(ii) **Photosysytem II**

Photosystem II contains chlorophll a called p680. The PSII reaction center chlorophyll molecules absorb maximally at 680nm and are therefore named P680

**Mechanism of converting light to energy to  $\text{NADPH} + \text{H}^+$  and ATP**

- Absorption of light excites an electrons to higher energy level there by converting the sunlight energy to potential chemical energy
- The photosynthesis pigment are organized into photocenters in the thylokoid membrane each of which contain hundreds of pigments
- The many pigment molecules in each photocenter act as antennae to absorb light.
- The reaction center chlorophyll then transfer its high energy electron to an acceptor molecules in an electron transport chain.
- High energy electrons are then transferred through a series of membrane carries coupled to the synthesis of ATP and NADPH
- During the process electrons lost by p680(PSII) are taken up by P700(PSI) and do not get back to P680 that is unidirectional and hence it is called non-cyclic phosphorylation.
- Electrons given out by P700 are taken by the primary acceptor and are ultimately passed on to NADP. The electron combine with  $\text{H}^+$  and reduce NADP to  $\text{NADPH} + \text{H}^+$ . The hydrogen ions also called protons are made available by spilting up water.

- The excited electrons from the PSI are taken by PSI electron acceptor and instead of sending them to NADPH deposits them in the electron chain between PSII and PSI and they flow down along of the 2 scheme

( **12 marks**)