

THE NATIONAL EXAMINATIONS COUNCIL OF TANZANIA



**STUDENTS' ITEM RESPONSE ANALYSIS REPORT
FOR THE FORM TWO NATIONAL
ASSESSMENT (FTNA) 2019**

033 BIOLOGY

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FOREWORD

The National Examinations Council of Tanzania is delighted to issue this report on Students' Item Response Analysis (SIRA) in Biology for the Form Two National Assessment (FTNA) 2019. The FTNA assesses the competence gained by students after two years of study. The scores obtained in the FTNA are used as part of continuous assessment in Certificate of Secondary Education Examination.

This report provides feedback to students, teachers, parents, policy makers and the public in general on the performance of the students. It highlights the factors that contributed to the achievements of the students as well as the challenges that the students faced in attempting the questions. The analysis shows that the good performance of students in some topics was contributed by the ability to understand the demand of the question and adequate knowledge of the topics. The weak performance of students in some topics was attributed to the inadequate knowledge of the topics tested and failure to understand the demand of the question.

It is expected that the feedback will enable teachers and other stakeholders to take appropriate measures to improve the teaching and learning of Biology. In addition, the Council hopes that the measures that will be taken will improve performance not only on FTNA but also on NECTA examinations at higher levels.

Finally, the National Examinations Council of Tanzania is grateful to all stakeholders who provided valuable assistance in the preparation of this report in various capacities.



Dr. Charles E. Msonde
EXECUTIVE SECRETARY

1.0 INTRODUCTION

This report is an analysis of responses by the students who sat for the Biology FTNA in November 2019. There was a total of 609,355 registered students. Among them, 570,673 sat for the assessment and only 367,488 (64.40%) passed. This performance is lower by 4.44 percent when compared to the 2018 Biology FTNA on which 346,866 (68.84%) passed.

The FTNA Biology paper was set in accordance with the NECTA format issued in 2017. The questions were composed to assess the biological competences anticipated after the completion of the Form One and Two Biology syllabus of 2010.

The paper consisted of eleven (11) questions in Section A, B and C. Section A comprised four (4) questions: Multiple choice, True and False, Matching and Completion of the statement items. In section A, questions One (1) and Two (2) carried ten (10) marks each. Question three (3) and four (4) carried five (5) marks each. Section B had five short answer questions which carried ten (10) marks each. Section C had two (2) essay questions, each carrying twenty (20) marks. The students were required to answer all questions in sections A and B and opt for only one (1) question in section C.

The report begins by explaining what the questions required of the students and proceeds to analyse the students' performance. Performance on a particular question was considered to be good, average or poor if the percentage of the students who scored 30 percent or above the marks allocated to the question fell within the range of 65 to 100 (green), 30 to 64 (yellow) and 0 to 29 (red) respectively. It proceeds with highlighting the challenges that the students faced in responding to the questions and identifies the possible reasons as to why they occurred. Extracts from the students' scripts have been presented to show how they responded to the questions in view of the demand of each item. Additionally, some charts and graphs are used to illustrate the students' performance on each question.

Finally, the report ends by giving a conclusion and some recommendations. In due regard, it is expected that teachers, students and educational stakeholders will utilize these findings to identify areas in which students

had weakness and, in so doing, use the information to improve the teaching and learning of the Biology subject.

2.0 ANALYSIS OF STUDENTS' PERFORMANCE PER QUESTION

In this section, the analysis of a question is done by describing the demand of the question, the number of students who responded to the question, their performance and the challenges they faced in responding to the question. In addition, charts and extracts are used to illustrate students' performance and responses respectively.

2.1 Section A: Objective questions

This section comprised four (4) questions, which were Multiple choice, True and False, Matching and Completion of the statement items. The students were required to attempt all the questions mentioned above.

2.2.1 Question 1: Multiple Choice Items

The question had ten multiple choice items, which carried a total of ten marks. For each item (i) to (x), the students were required to choose the correct answer from the given four alternatives and write the letter of the correct response in the space provided. The items were composed from seven topics, namely *Introduction to Biology, Cell Structure and Organization, Safety in Our Environment, Health and Immunity, Nutrition, Transport of Material in Living Things* and *Classification of Living Things*.

The analysis of the students' performance indicates that, out of 571,101 students who attempted this question, 6.4 percent scored from 0 to 2 marks out of the 10 marks allocated to this question. The students who scored from 3 to 6 marks were 70.5 percent and those who scored from 7 to 10 marks were 23.1 percent. Figure 1 summarizes their performance on this question.

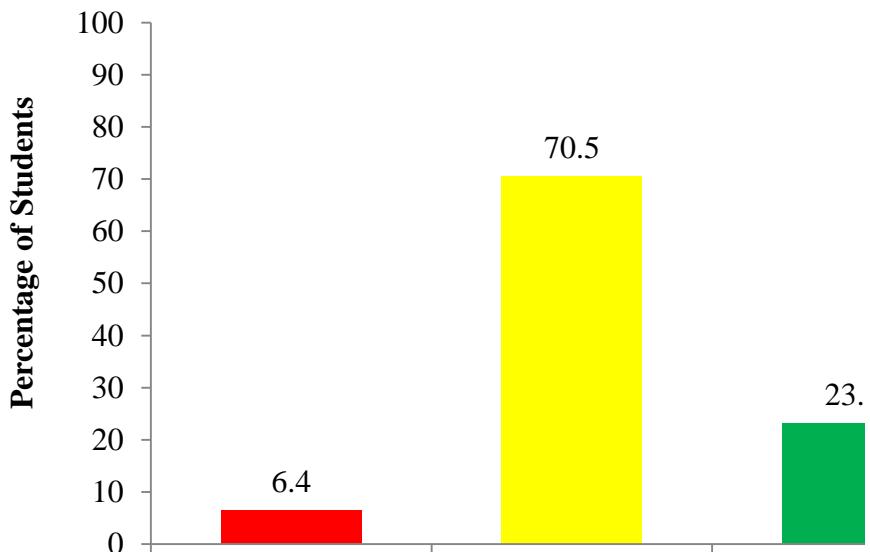


Figure 1: Students' performance on question 1

Figure 1 indicates that the students' performance on this question was good since 93.6 percent of them scored from 3 to 10 marks. This indicates that the students had an adequate knowledge of the topics tested. Those who performed poorly (0–2 marks) failed to give correct responses as per the requirements of the question. The analysis of the item responses is presented below.

Item (i): The branch of science which deals with the study of living things is known as

- | | |
|--------------|--------------|
| A Biology | B Ecology |
| C Botany | D Zoology |

The correct answer for this item was *A, Biology*. The students who chose *A* were familiar with the basic concepts and terminologies of Biology. Those who chose incorrect response *B, Ecology* did not understand that Ecology is the study of the relationship between organisms and their environment. Those who chose incorrect responses *C, Botany* and *D, Zoology* did not understand that *Botany* is the study of plants while *Zoology* is the study of animals.

Item (ii): Which of the following structure controls the movement of substances in and out of the cell?

- | | |
|-----------------|---------------|
| A Nucleus | B Chloroplast |
| C Cell membrane | D Vacuole |

The correct answer for this item was *C, Cell membrane*. Those who chose *C, Cell membrane* were familiar with the functions of different parts of the cell. Those who chose incorrect response *A, Nucleus* did not understand that the nucleus controls all the life processes of the cell. Those who chose incorrect response *B, Chloroplast* did not understand that the role of chloroplast is to manufacture food for a plant. Likewise, those who chose *D, Vacuole* did not understand the role of vacuole is to create pressure exerted on the cytoplasm and cell wall making the plant cell turgid (firm and strong).

Item (iii): The following are solid wastes **except**

- | | |
|------------|---------|
| A Paper | B Urine |
| C Plastics | D Cans |

The correct answer for this item was *B, Urine*. The students who chose *B, Urine* had an adequate knowledge about the types of wastes. Therefore, it was easy for them to identify the correct response. Those who chose incorrect response *A, Paper; C, Plastics* and *D, Cans* did not understand that these are hard waste materials.

Item (iv): Which of the following is a symptom of Tuberculosis?

- | | |
|-------------------|---------------|
| A Curved legs | B Diarrhoea |
| C Prolonged cough | D Skin rashes |

The correct answer for this item was *C, Prolonged cough*. The students who chose *C, Prolonged cough* had an adequate knowledge about infections and diseases. Those who chose incorrect response *A, Curved legs* failed to understand that this occurs due to the deficiency of vitamin D in the body. Those who chose *B, Diarrhoea* failed to understand that diarrhoea is a symptom of cholera and *D, Skin rashes* is a symptom of HIV/AIDS.

Item (v): The part of the alimentary canal which rolls the chewed food into bolus is called

- | | |
|--------------|-----------------|
| A Tongue | B Oesophagus |
| C Pharynx | D Epiglottis |

The correct answer for this item was *A, Tongue*. The students who chose *A* were familiar with the role of different parts of the human digestive system, specifically the tongue. Those who chose incorrect responses *B, Oesophagus* and *C, Pharynx* did not understand that the oesophagus is a muscular tube that conveys food bolus from the pharynx to the stomach while the pharynx is a cavity behind the mouth. Likewise, those who chose *D, Epiglottis* failed to understand that it prevents food from entering the trachea during swallowing.

Item (vi): What will happen when a red blood cell is placed in a more concentrated solution?

- | | |
|-----------------|------------------|
| A Crenation | B Turgidity |
| C Haemolysis | D Plasmolysis |

The correct answer for this item was *A, Crenation*. The students who chose *A* were familiar with the effects of osmosis on living organism. Those who chose incorrect response *B, Turgidity* did not understand that turgidity is a state when the vacuole of a plant cell is full of water after being placed in a hypotonic solution. Those who chose *C, Haemolysis* did not understand that haemolysis is the process in which an animal cell bursts due to the excessive absorption of water when placed in a hypotonic solution. Likewise, those who chose *D, Plasmolysis* failed to understand that it is the process in which a plant cell loses water when placed in a hypertonic solution.

Item (vii): A room specifically designed for carrying out scientific experiments is known as

- | | |
|----------------|-------------------|
| A classroom | B fume chamber |
| C library | D laboratory |

The correct answer for this item was *D, laboratory*. The students who chose *D, laboratory* were familiar with the Biology laboratory. Therefore, it was easy for them to distinguish between the biology laboratory and other school facilities. Those who chose incorrect response *B, fume chamber* failed to understand that fume chamber is designed to capture and

remove hazardous or toxic substances generated during laboratory experiments. Those who chose incorrect response *A*, *classroom* and *C*, *library* failed to understand that a classroom is a room with chairs and desks where students are taught while the library is a room with a variety of reading materials.

Item (viii): The lowest rank of classification is called

- | | |
|-----------|-----------|
| A Class | B Kingdom |
| C Species | D Genus |

The correct answer for this item was *C, Species*. The students who chose *C, Species* had an adequate knowledge about the concept of Classification; therefore, it was easy for them to identify the correct rank. Those who chose incorrect responses *A, Class*; *B, Kingdom* and *D, Genus* did not understand that Class is the second rank, Genus is the sixth rank and Kingdom is the highest rank of classification.

Item (ix): Which of the following blood group is a universal donor?

- | | |
|------|-----|
| A B | B A |
| C AB | D O |

The correct answer for this item was *D, O*. The students who chose *D, O* were knowledgeable about blood groups and blood transfusion. Those who chose incorrect response *A, B* failed to understand that blood group B can donate blood to B and AB only. Those who chose *B, A* failed to understand that blood group A can donate blood to A and AB only. On the other hand, those who chose *C, AB* failed to understand that blood group AB can only donate blood to blood group AB.

Item (x): Which one of the following is recommended as a First Aid procedure for a victim who has been stung by a bee?

- A sitting quietly
- B giving huge amount of water to the victim
- C applying baking soda paste on the bee stung area
- D leaving the cotton on the stung area for few minutes

The correct answer for this item was *C, applying baking soda paste on the bee stung area*. The students who chose *C, applying baking soda paste on the bee stung area* had an adequate knowledge about First Aid. Those who chose incorrect response *A, sitting quietly*; *B, giving huge amount of water*

to the victim and D, leaving the cotton on the stung area for few minutes did not understand the procedures for giving First Aid to the victim who has been stung by a bee. They failed to recognize that baking soda has (sodium bicarbonate) an alkaline which can neutralize high body acidity fluid caused by the poison from a bee.

2.2.2 Question 2: True and False Items

The question comprised ten (10) statements composed from eight (8) topics, namely *Safety in Our Environment, Health and Immunity, Classification of Living Things, Gaseous Exchange and Respiration, Balance of Nature, Transport of Material in Living Things, Introduction to Biology and Nutrition*. The students were required to write ‘True’ for a correct statement and ‘False’ for an incorrect statement.

The data revealed that, out of 571,099 students who responded to this question, 2.6 percent scored from 0 to 2 marks. The students who scored from 3 to 6 marks were 63.7 percent, and those who scored from 7 to 10 marks out of the 10 marks allocated to this question were 33.7 percent. Figure 2 summarizes the students’ performance on this question.

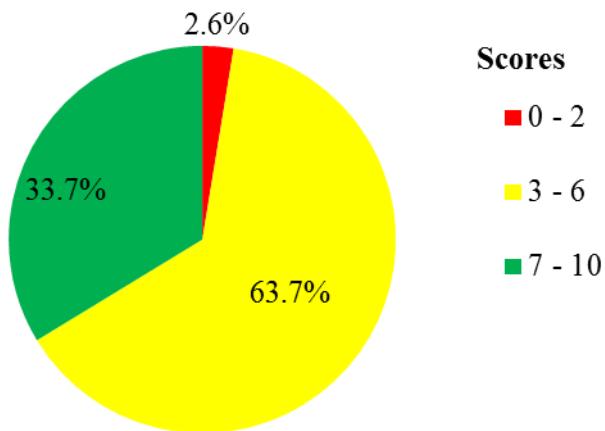


Figure 2: Students’ performance on question 2

Figure 2 indicates that the students’ performance on this question was good as 97.4 percent performed well. Those who performed well comprehended all or most of the biological concepts tested in this question. They managed to identify the correct and incorrect statements. Extract 2.1 is a sample of a student’s good response.

2. For each of the items (i) - (x), write **True** if a statement is correct or **False** if a statement is not correct in the space provided.
- (i) A good mannered person will always greet others...**TRUE**.....
 - (ii) Petrol, diesel and other chemicals can be kept in soda bottles and stored in cup boards at home only.**FALSE**.....
 - (iii) One of the symptoms of cholera is diarrhoea.**TRUE**.....
 - (iv) Natural classification is based on evolutionary relationships.**TRUE**.....
 - (v) Respiration takes place in animal only while photosynthesis takes place in plants.
FALSE.....
 - (vi) In ecosystem, herbivores feed on primary consumers..**FALSE**.....
 - (vii) Xylem vessels transport water from the roots to the leaves.**TRUE**.....
 - (viii) Anaerobic respiration is one of the causes of muscle fatigue.**TRUE**.....
 - (ix) All living things can reproduce.**TRUE**.....
 - (x) Photosynthesis is important because it releases carbon dioxide in the atmosphere.
FALSE.....

Extract 2.1 is a sample of a student's good response to question 2

Extract 2.1 shows a sample of response from a student who correctly responded to all items. These responses signify that the student had a sufficient knowledge of the concepts tested.

Those who performed poorly (0–2 marks) failed to give correct responses as per the requirements of the question. The analysis of the item responses is presented below.

Item (i) stated that *A good mannered person will always greet others*. The correct answer was *True*. The students who opted for *False* failed to recognize that greeting others is one of the principles of good manners.

Item (ii) stated that *Petrol, diesel and other chemicals can be kept in soda bottles and stored in cupboards at home only*. The correct answer was *False*. The students who opted for *True* were not aware that petrol, diesel and other chemicals are poisonous substances if swallowed or inhaled. Therefore, they should not be kept in soda bottles and stored in cupboards. In addition, they are flammable. They can thus catch fire easily and cause accidents.

Item (iii) stated that *One of the symptoms of cholera is diarrhoea*. The correct answer was *True*. The students who opted for *False* failed to recognize that eating food or water contaminated with bacteria which cause cholera may result into diarrhoea and other symptoms.

Item (iv) stated that *Natural classification is based on evolutionary relationship*. The correct answer was *True*. The students who opted for *False* failed to recognize that natural system of classification seeks to show true relationship by considering many features including the evolutionary history, internal as well as the external features.

Item (v) stated that *Respiration takes place in animals only while photosynthesis takes place in plants*. The correct answer was *False*. The students who opted for *True* failed to recognize that respiration occurs in both plants and animals but photosynthesis occurs in plants only.

Item (vi) stated that *In ecosystem, herbivores feed on primary consumers*. The correct answer was *False*. The students who opted for *True* failed to recognize that primary consumers are herbivores which feed on producers specifically green plants.

Item (vii) stated that *Xylem vessel transport water from the roots to the leaves*. The correct answer was *True*. The students who opted for *False* failed to recognize that roots absorb water and mineral salts then xylem vessels transport them to the other parts including the leaves.

Item (viii) stated that *Anaerobic respiration is one of the cause of muscle fatigue*. The correct answer was *True*. The students who opted for *False* failed to recognize that when glucose is broken down anaerobically in animals it produces lactic acid. The accumulation of the lactic acid in the muscles results to muscle fatigue.

Item (ix) stated that *All living things can reproduce*. The correct answer was *True*. The students who opted for *False* failed to recognize that all living things are able to produce new individuals of their own kind.

Item (x) stated that *Photosynthesis is important because it releases carbon dioxide in the atmosphere*. The correct answer was *False*. The students who opted for *True* failed to recognize that carbon dioxide is used during photosynthesis and oxygen is released in the atmosphere. The incorrect response in this item shows that the students had inadequate knowledge

about the concepts tested. Extract 2.2 is a sample of students' poor responses.

2. For each of the items (i) - (x), write **True** if a statement is correct or **False** if a statement is not correct in the space provided.
- (i) A good mannered person will always greet others..... **FALSE**
 - (ii) Petrol, diesel and other chemicals can be kept in soda bottles and stored in cup boards at home only..... **TRUE**
 - (iii) One of the symptoms of cholera is diarrhoea..... **FALSE**
 - (iv) Natural classification is based on evolutionary relationships..... **FALSE**
 - (v) Respiration takes place in animal only while photosynthesis takes place in plants.
..... **TRUE**
 - (vi) In ecosystem, herbivores feed on primary consumers..... **TRUE**
 - (vii) Xylem vessels transport water from the roots to the leaves..... **FALSE**
 - (viii) Anaerobic respiration is one of the causes of muscle fatigue..... **FALSE**
 - (ix) All living things can reproduce..... **FALSE**
 - (x) Photosynthesis is important because it releases carbon dioxide in the atmosphere.
..... **TRUE**

Extract 2.2 is a student's poor response to question 2

Extract 2.2 shows a sample of responses from a student who failed to correctly respond to all items. This implies the student lacked content knowledge about the concepts tested.

2.2.3 Question 3: Gaseous Exchange and Respiration

This question consisted of five matching items derived from the topic of Gaseous exchange and Respiration. In this question, students were required to match biological phrases given on list A with responses on list B by writing the letter of the correct responses against the item number in the table provided. The question asked: "Match the phrase in **List A** with responses in **List B** by writing the letter of the correct response in **List B** below the corresponding phrase number of **List A** in the table provided". The items were:

List A	List B
(i) The structure used for gaseous exchange in human being	A Larynx
(ii) The structure which prevent food from entering the trachea during swallowing	B Yeast
(iii) The structure which trap dust in the trachea	C Bronchioles
(iv) The process which release energy in absence of oxygen	D Cilia
(v) Organism which break down sugars to carbon dioxide and alcohol	E Alveoli
	F Epiglottis
	G Aerobic respiration
	H Anaerobic respiration

The analysis indicates that, out of 571,090 students who responded to this question, 56 percent scored from 0 to 1 out of the 5 marks allocated to the question. The students who scored from 1.5 to 3 marks were 32.7 percent, and the students who scored from 4 to 5 marks were 11.3 percent. Figure 3 summarizes the performance on this question.

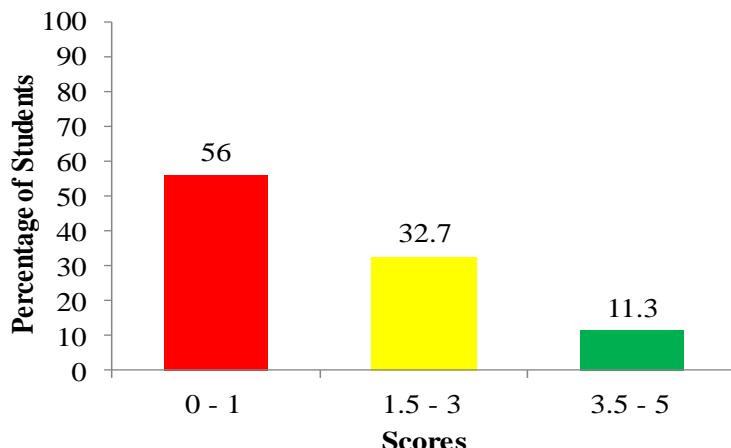


Figure 3: Students' performance on question 3

The performance trend in Figure 3 shows that the students' performance was average since 44 percent of them scored 1.5 to 5 marks out of the 5 marks allocated to this question. This shows that the students had an adequate knowledge about the topic of Gaseous exchange and respiration.

Therefore, they managed to correctly match the items given. Extract 3.1 illustrates a response from a student who matched the phrases correctly.

Answer					
List A	(i)	(ii)	(iii)	(iv)	(v)
List B	E	F	D	H	B

Extract 3.1 is a student's good response to question 3

Extract 3.1 is a sample response from a student who matched all items in the question correctly. These responses signify that the student had a sufficient knowledge of the topic tested.

Those who scored lower (0–2) marks failed to give correct responses as per requirements of the question. The analysis of the students responses to the items is as follows:

In item (i), the students were required to select the response which correctly matches the description of the structure used for gaseous exchange in human beings. The correct answer was *E, Alveoli*. Most students matched it correctly, showing that they had an adequate knowledge of the various organs used for gaseous exchange in living organisms, specifically human beings.

In item (ii), the students were required to select a response which correctly matches with a description of the structure which prevents food from entering the trachea during swallowing. The correct answer was *F, Epiglottis*. Most of the students got it right. However some of the students lacked the knowledge about the role of the parts of the respiratory system. Accordingly, they incorrectly matched the items.

In item (iii), the students were required to select a response which correctly matches with the description of the structure which traps dust in the trachea. The correct answer was *D, Cilia*. Most of the students wrote *C, Bronchioles*. These students failed to understand that cilia are hairs which trap dust and microorganisms in the nose, nasal cavity and trachea while bronchioles have rings of cartilage tissue which prevents collapse of the respiratory tract.

In item (iv), the students were asked to select a response which correctly matches with the description of the process which releases energy in the absence of oxygen. Most of the students selected option *G, Aerobic respiration* instead of option *H, Anaerobic respiration* which is the correct answer. The students failed to recognize that, even if energy is released in

both processes, aerobic respiration takes place in the presence of oxygen while anaerobic respiration takes place in the absence of oxygen. The incorrect matching shows that the students could not distinguish between the aerobic and anaerobic respiration processes.

In item (v), the students were required to select a response which correctly matches with the description of the organisms which breakdown sugars to carbon dioxide and alcohol. The correct answer was *B, Yeast*. Some of the students incorrectly matched with *H, Anaerobic respiration*, showing that they did not understand that yeast is an organism responsible for anaerobic respiration in plants. Extract 3.2 is a sample of poor responses from students who failed to match all the items correctly.

Answer

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

Extract 3.2 is a students' poor response to question 3

Extract 3.2 is a sample response from the student who failed to match all the items of the question. These responses signify that the student had insufficient knowledge about the tested topic.

2.2.4 Question 4: Balance of Nature

This question required the students to complete statements by writing the correct answer in the spaces provided in each item. The question consisted of five items from the topic of Balance of Nature, and it had a total of five (5) marks.

Data indicate that, out of 571,092 students who responded to this question, 79 percent scored from 0 to 1 mark, 17.7 percent scored from 2 to 3 marks, whereas 3.3 percent scored from 4 to 5 marks. Figure 4 summarizes the students' performance on this question.

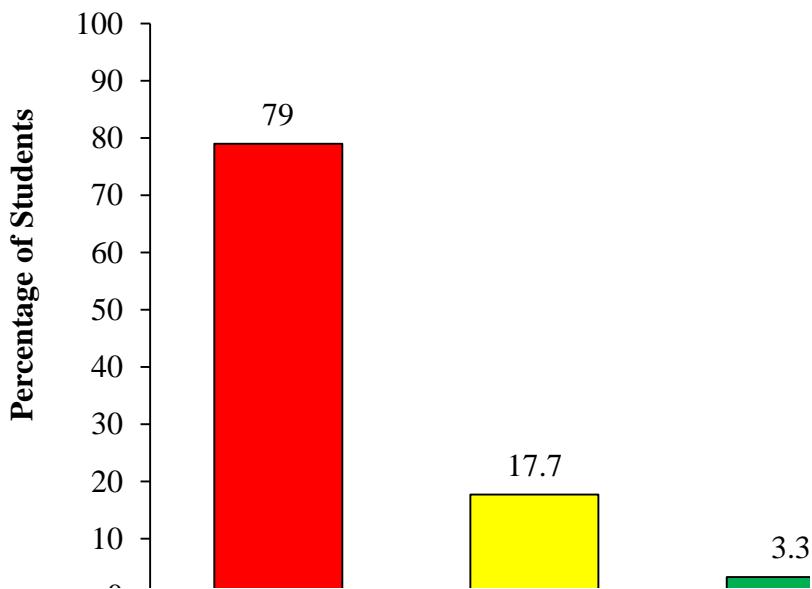


Figure 4: Students' performance on question 4

Figure 4 shows that the students' performance on this question was poor since 79 percent scored low (0 - 1) mark. It was observed that most of the students who scored low marks had inadequate knowledge about the topic of Balance of Nature. For example, in response to item (i), which required the students to complete the statement *The linear flow of energy and nutrient in the ecosystem is known as _____*, the correct answer was *food chain*. However, most of the students wrote *food web*. Their responses show that they lacked clear understanding of food chain and food web.

Item (ii) required the students to complete the statement *The living component of an environment is known as _____*. The correct answer was *biotic component*; however most of the students failed to distinguish the living and the non living component of the environment. Therefore, they wrote the abiotic component, which is an incorrect response.

Item (iii) required the students to complete the statement *Organisms which rely on other organisms for foods in the ecosystem are called _____*. The correct answer was *consumers*, but most of the students wrote the incorrect response *producers*. Others wrote *parasites*. These responses show that they failed to understand that producers are organisms that manufacture their own food while consumers feed on the already manufactured food.

Item (iv) required the students to complete the statement *A group of interdependent organisms living in an environment is called _____*. The correct answer was *community*, but most of the students wrote the incorrect response *population*. The response shows that the students failed to understand that *community* is a group of different species living in the same area while *population* is a group of the same species living in the same area.

Item (v) required the students to complete the statement *The environment and all its interacting components is called _____*. The correct answer was *ecosystem*, but most of the students wrote the incorrect response *ecology*. The response shows that the students lacked clear understanding of the topic of Balance of Nature. Extract 4.1 is an example of an incorrect response.

4. Complete each of the following statements by writing the correct answer in the space provided.
- (i) The linear flow of energy and nutrient in the ecosystem is known as.....Nutrition.....
 - (ii) The living component of an environment is known as.....houses.....
 - (iii) Organisms which rely on other organisms for food in the ecosystem are called.....food chain.....
 - (iv) A group of interdependent organisms living in an environment is called.....amoeba.....
 - (v) The environment and all its interacting components is called.....land.....

Extract 4.1: Student's poor response to question 4

Extract 4.1 shows a poor response by the students who demonstrated lack of knowledge about the topic of Balance of Nature. For example, the student wrote *nutrition* instead of *food chain* and *houses* instead of *biotic component*.

Besides the poor performance on this question, 3.3 percent of the students had a sufficient knowledge of the topic; they performed well. Extract 4.2 is a sample of a student's good response to the question.

4. Complete each of the following statements by writing the correct answer in the space provided.
- (i) The linear flow of energy and nutrient in the ecosystem is known as.....Food chain.....
 - (ii) The living component of an environment is known as.....Biotic component.....
 - (iii) Organisms which rely on other organisms for food in the ecosystem are called.....Consumers.....
 - (iv) A group of interdependent organisms living in an environment is called.....Community.....
 - (v) The environment and all its interacting components is called.....Ecosystem.....

Extract 4.2 students' good responses in question 4

Extract 4.2 shows correct responses from a student who had a sufficient knowledge of the concepts tested under the topic of the Balance of Nature.

2.2 Section B: Short Answer Questions

This section consisted of five (5) short answer questions, each carrying ten (10) marks.

2.2.1 Question 5: Cell Structure and Organization

The question had three parts: (a), (b) and (c). In part (a), the students were required to mention four types of organs found in the animal body. In part (b), they were required to briefly explain two differences between a plant cell wall and a cell membrane. In part (c), the students were required to outline two similarities between animal and plant cells.

The analysis indicates that, out of 571,099 students who responded to this question, 65.4 percent of the students scored from 0 to 2.5 marks, 31.7 percent scored from 3 to 6 marks whereas 2.9 percent scored from 6.5 to 10 marks out of the 10 marks allocated to this question. Figure 5 summarizes the students' performance on this question.

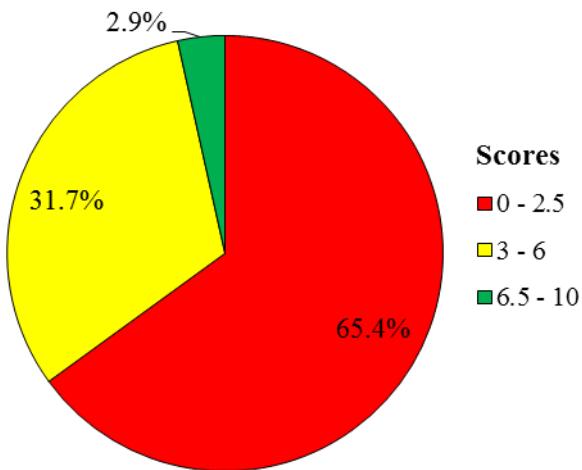


Figure 5: Students' performance on question 5

The analysis shows that the students' performance on this question was average (34.6%). The students who performed well (2.9%) in part (a) correctly mentioned four types of organs found in an animal's body. In part (b), the students correctly explained briefly two differences between a plant cell wall and a cell membrane. In part (c), they correctly outlined two similarities between animal and plant cells. These responses show that they had an adequate knowledge about the topic of Cell Structure and Organization. Extract 5.1 illustrates a response from a student who answered the question correctly.

5. (a) Mention four types of organs found in animal body.
- Sensory organs example skin, nose, ears and tongue.
 - Excretory organs example kidney.
 - Blood circulatory organs example the heart.
 - Reproductive organs example penis.
- (b) Briefly explain two differences between a plant cell wall and a cell membrane.
- A plant cell wall is made up of non-living materials while cell membrane is made up of living materials.
 - A plant cell wall allows free movement of materials in and out of the cell while cell membrane is selective to the materials entering in and out of the cell.
- (c) Outline two similarities between animal and plant cells.
- They both have cytoplasm.
 - They both have a nucleus.

Extract 5.1 shows an example of students' good responses to question 5

Extract 5.1 exhibits a sample of responses from a student who mentioned the types of organs found in an animal's body in part (a). The student correctly explained the differences between a plant cell wall and a cell membrane in part (b). In addition he/she managed to correctly give two similarities between plant and animal cells.

However, 65.4 percent of the students scored from 0 - 2.5 marks on this question. Some of the students failed to correctly mention the types of organs found in the animal's body. For example, in part (a), some students mentioned *nucleus*, *chloroplast* and *mitochondrion* instead of the types of organs. Others mentioned tissues such as *nerve*, *blood*, *muscles*. Others mentioned the systems such as *the digestive system*, *the respiratory system* and *the reproductory system*. These responses show that the students lacked clear understanding of cell differentiation.

Likewise, in part (b), some students failed to differentiate the plant cell wall and cell membrane. They wrote the differences between the plant and animal cells as *plant cell has chloroplast while animal cell do not have*. These responses indicate that such students lacked clear understanding of the structures of plant and animal cells.

In part (c), some students gave the differences between plant and animal cells instead of the similarities. For example, one student wrote, *Plant cell has regular shape* while *animal has irregular shape*. Others wrote incorrect similarities as *Both have chloroplast*, *Both have cell wall*. This shows that they had insufficient knowledge about the topic of Cell Structure and Organization. Extract 5.2 is a sample of student's poor responses to this question.

5.	(a) Mention four types of organs found in animal body.
	(i) <u>Tissue</u>
	(ii) <u>Organism</u>
	(iii) <u>Blood</u>
	(iv) <u>Organism system</u>
	(b) Briefly explain two differences between a plant cell wall and a cell membrane.
	(i)
	<u>PLANT CELL</u> <u>CELL MEMBRANE</u>
	Have a cell wall Have not cell wall
	(ii)
	Have regular shape Have irregular Shape
	(c) Outline two similarities between animal and plant cells.
	(i) <u>Have a cell wall</u>
	(ii) <u>Have a system</u>

Extract 5.2 shows a student's poor response to question 5

Extract 5.2 shows a response from a student who mentioned *tissue*, *organism*, *blood* and *organ system* instead of the types of organs in part (a). The student incorrectly differentiated a plant cell wall and a cell membrane in part (b). Likewise, he/she wrote incorrect response in part (c).

2.2.2 Question 6: Introduction to Biology

The question had parts (a) and (b). In part (a), the students were required to list six characteristics common to all living things. In part (b), the students were required to name the instruments used to measure the following parameters: (i) Temperature (ii) Length (iii) Time (iv) Mass.

The analysis indicates that, out of 571,102 students who responded to this question, 32.6 percent scored from 0 to 2.5 marks out of the 10 marks

allocated to this question. The students who scored from 3 to 6 marks were 33.9 percent, whereas those who scored from 6.5 to 10 marks were 33.5 percent. Figure 6 summarizes the students' performance on this question.

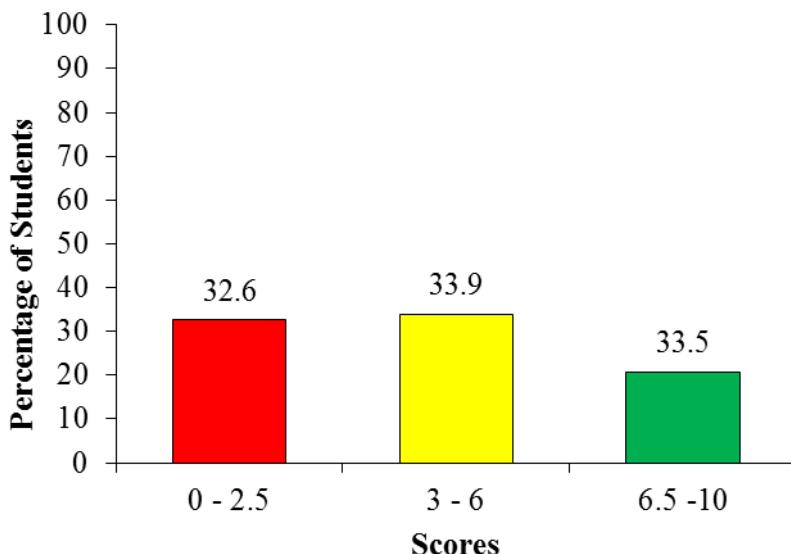


Figure 6: Students' performance on question 6

Figure 6 shows that the analysis of students performance on this question was good since 67.4 percent of the students scored 30 percent or above of the 10 marks allocated to this question. The students who performed well gave correct responses to almost all parts of the question. These students correctly listed six characteristics common to all living things in part (a). In addition, they correctly named the instruments used to measure (i) Temperature (ii) Length (iii) Time (iv) Mass. These responses show that the students had an adequate knowledge about the the topic of Introduction to Biology. Extract 6.1 illustrates a sample of a correct response to the question.

6.	(a)	List six characteristics common to all living things.
	(i)	Reproduction.....
	(ii)	Respiration.....
	(iii)	Growth.....
	(iv)	Locomotion or movement.....
	(v)	Nutrition.....
	(vi)	Irritability.....
	(b)	Name the instruments used to measure the following parameters:
	(i)	Temperature Thermometer.....
	(ii)	Length Metre rule or tape measure.....
	(iii)	Time Stop watch.....
	(iv)	Mass Beam balance or electronic beam balance.....

Extract 6.1 shows students' good responses to question 6

Extract 6.1 illustrates a sample of a response from a student who correctly listed six characteristics common to all living things in part (a). Likewise, he/she correctly named the instruments used to measure (i) Temperature, (ii) Length, (iii) Time and (iv) Mass.

Despite the good performance, 32.6 percent of the students scored low (0 - 2.5) marks. Most of these students failed to list six characteristics common to all living things in part (a). For instance, some students wrote classification ranks such as *Kingdom*, *Phylum* and *class*. Another student mentioned the steps used by scientists when conducting scientific investigation such as *problem identification, asking questions, formulating hypothesis, experimentation, observation and data interpretation*. Others wrote the names of living things such as *lion, cat, rat, cow elephant* and *zebra* instead of characteristics common to all living things.

In part (b), some of the students failed to correctly name the instruments used to measure (i) Temperature, (ii) Length, (iii) Time and (iv) Mass. Some students named units such as *Degrees Celsius, Kilometer, Seconds* and *Gram*. These students failed to differentiate units and instruments. Others defined the parameters instead of naming the instruments. These responses indicate that the students lacked clear understanding of the

scientific processes in Biology. Extract 6.2 shows a poor response by one of the students.

6.	(a)	List six characteristics common to all living things.
	(i)	<i>Ecology</i>
	(ii)	<i>Zoology</i>
	(iii)	<i>Biology</i>
	(iv)	<i>Botany</i>
	(v)	<i>Natural Classification</i>
	(vi)	<i>Rainfall</i>
	(b)	Name the instruments used to measure the following parameters:
	(i)	Temperature <i>kelvin (K)</i>
	(ii)	Length <i>length (L)</i>
	(iii)	Time <i>second (S)</i>
	(iv)	Mass <i>Kilogram (kg)</i>

Extract 6.2 exemplifies students' poor responses to question 6

Extract 6.2 is a sample of an incorrect response. In part (a), he/she wrote the branches of biology such as *Ecology*, *Zoology* and *Botany*, instead of the characteristics common to all living things. In part (b) (i), (iii) and (iv), the student wrote units of measurements instead of the instruments used to measure the parameters.

2.2.3 Question 7: Health and Immunity

The question had parts (a), (b) and (c). In part (a), the students were required to give their understanding of the term “water borne diseases” as used in Biology. In part (b), the students were required to name any three water borne diseases. In part (c), they were required to explain what would happen to a health person when she/he drinks unboiled water contaminated with (i) *Salmonella typhii* and (ii) *Entamoeba histolytica*.

The analysis revealed that, out of 571,096 students who responded to this question, 84.8 percent scored from 0 to 2.5 marks, 11.1 percent scored from

3 to 6 marks, whereas 4.1 percent scored from 6.5 to 10 marks. Figure 7 summarizes the performance of the students on this question.

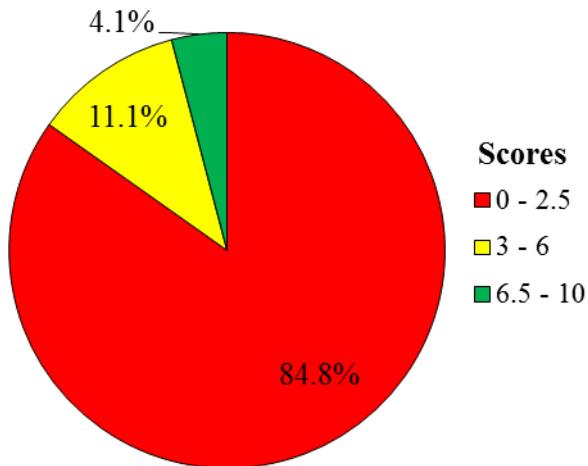


Figure 7: The students' performance on question 7

In general, Figure 7 indicates that the students' performance on this question was poor since 84.8 percent scored from 0 to 2.5 marks out of 10 marks allocated to this question. In part (a), most of the students wrote incorrect explanation of water borne diseases. Examples of incorrect responses are *diseases due to drinking large amount of water*, *Disease transmitted through contaminated air*, *Diseases which are caused by water*. Likewise, in part (b), the students wrote *endemic disease*, *pandemic disease* and *epidemic disease*. Others wrote *tuberculosis*, *meningitis* and *flu* which are air borne diseases. These responses indicate that the students had inadequate knowledge of the ways diseases are transmitted.

In part (c) (i), some students wrote incorrect responses such as *the person will get a disease known as syphilis* and *the person will get a disease known as diarrhoea*. Likewise in part (c) (ii), some students wrote the effects of tuberculosis as *lung damage* and *bone infections*. Others wrote, *he will happen to get the disease called bilharzia*. These responses indicate that students had inadequate knowledge about the causes and transmission of diseases. Extract 7.1 is a sample of incorrect responses by a student who attempted to answer this question.

7. (a) What do you understand by the term “water borne diseases” as used in Biology?

Water borne diseases - ~~Are~~ Are diseases that are the water which contaminated with the microorganism that can cause disease

(b) Name any three water borne diseases.

(i) *Cancer*

(ii) *Diarrhoea*

(iii) *Syphilis*

(c) What would happen if a health person drinks unboiled water contaminated with the following?

(i) *Salmonella typhi.*
When a person / Health person drinks unboiled water Contaminated with salmonella typhi with the person will be likely to get a disease called syphilis.

(ii) *Entamoeba histolytica.*
when a health person drinks unboiled water Contaminated with Entamoeba histolytica is likely to get a disease called histolytica disease.

Extract 7.1: Student's poor response to question 7

Extract 7.1 is a sample from a student who wrote incorrect responses to all parts of the question. For example, he/she wrote *cancer*, *diarrhoea* and *syphilis* instead of water borne diseases. Likewise, he/she gave incorrect justification in part (c).

Despite the poor performance, 4.1 percent of the students performed well. They correctly explained the term “water borne diseases” as used in Biology in part (a). In part (b), the students named three water borne diseases. In part (c), they explained what would happen to a health person when she/he drinks unboiled water contaminated with (i) *Salmonella typhi* and (ii) *Entamoeba histolytica*. Extract 7.2 shows a sample of a student’s good response to the question.

7. (a) What do you understand by the term "water borne diseases" as used in Biology?
 Water borne diseases are the diseases which are transmitted through contaminated water.

(b) Name any three water borne diseases.
 (i) Cholera.....
 (ii) Bilharzia.....
 (iii) Typhoid.....

(c) What would happen if a healthy person drinks unboiled water contaminated with the following?
 (i) *Salmonella typhi*.
 He or she after drinking unboiled water containing salmonella typhi will get typhoid because Salmonella typhi is a bacteria causing typhoid diseases thus getting it.
 (ii) *Entamoeba histolytica*.
 When a person drinks unboiled water containing Entamoeba histolytica will get amoebic dysentery because the bacteria causes the disease when entered in the body of the person.

Extract 7.2 shows a sample of a student's good response

Extract 7.2 show that the student had a good understanding of water borne diseases, and all the justifications provided in parts (a) (b) and (c) were correct.

2.2.4 Question 8: Classification of Living Things

The question had two parts: (a) and (b). In part (a), the students were required to draw a diagram of a fern plant and label four parts. In part (b), they were required to outline three advantages of the fern plant.

The analysis indicates that, out of 571,096 students who responded to this question, 73.2 percent scored from 0 to 2.5 marks. The students who scored from 3 to 6 marks were 21.1 percent whereas those who scored from 6.5 to 10 marks were 5.7 percent as shown in Figure 8.

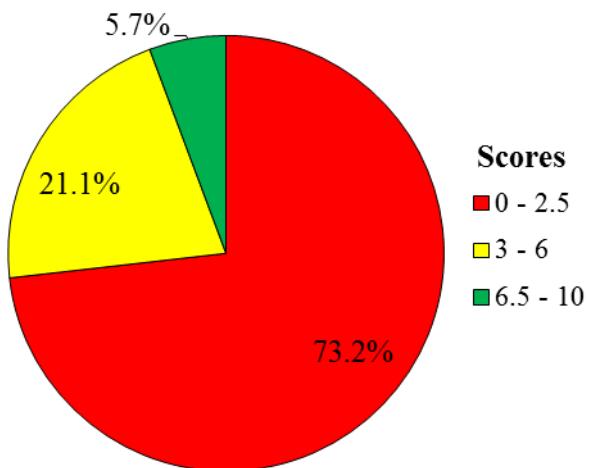


Figure 8: Distribution of students' scores on question 8

Figure 8 shows that the students' performance on this question was poor since 73.2 percent scored from 0 to 2.5 marks out of 10 marks allocated to this question. Most of students failed to understand the demand of the question as they rushed into answering the question before reading it carefully. In part (a), they drew the diagram of *plant cell*, *bread mould*, *mushroom*, *leaf* and *liverwort* instead of a fern plant. Other students drew a diagram of a fan which is used for domestic air cooling instead of the diagram of a fern plant. These responses imply that the students lacked clear knowledge about the topic of Classification of Living Things. This equally implies that, the teaching methods used to teach these concepts were not effectively utilized. Thus, they did not enable the students to understand the concepts of Division Pteridophyta. In short, for students to full understand Division Pteridophyta, teachers were supposed to teach practically by providing them with fern plants to observe and draw well labeled diagrams of fern plants. They were also supposed to discuss the general and distinctive features as well as the advantages and the disadvantages of the plants. Failure to do so might have led the students to draw the cooling fan at home instead of the fern plant.

Likewise, in part (b), most of the students failed to outline three advantages of a fern plant. Some of them wrote incorrect responses as *they are used to make vaccine; they are used to study cellular and molecular biology; they prevent soil erosion and it help to grow plants such as mushroom*. Others wrote the general characteristics of Division Pteridophyta instead of the advantages of the fern plant. The responses *they are eukaryotic; they store*

food in form of starch; they can manufacture their own food; they are multicellular organisms were noticed in students' scripts. These responses indicate that the students had inadequate knowledge about Division Pteridophyta which is taught under the topic of Classification of Living Things. Extract 8.1 is a sample of a student's poor response to this question.

8. (a) Draw a diagram of a fern plant and label four parts.

Diagram of a fern plant

(b) Outline three advantages of a fern plant.

- Fern plants it is important in transportation
For animals and other living things
- Fern Plant it is important to reproduction
of living things
- Fern Plant it is important for growth
animal and other living things

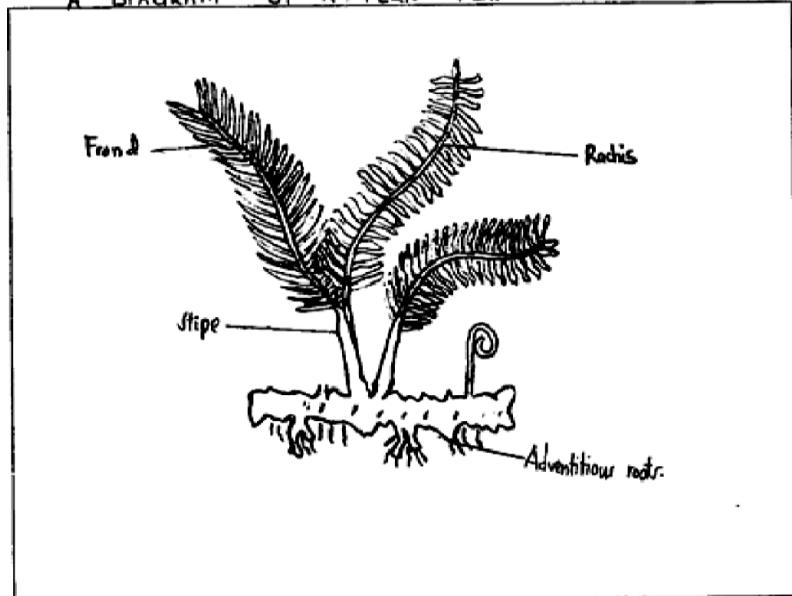
Extract 8.1 is a student's poor response to question 8

Extract 8.1 is a response of a student who drew a moss plant instead of a fern plant in part (a). Likewise he/she incorrectly outlined three advantages of the fern plant in part (b).

Despite the poor performance, 5.7 percent of the students performed well. They correctly drew and labeled four parts of the fern plant in part (a). In addition, they correctly outlined three advantages of the fern plant in part (b). These responses imply that the students had an adequate knowledge about the topic of Classification of Living Things. Extract 8.2 is illustrative.

8. (a) Draw a diagram of a fern plant and label four parts.

A DIAGRAM OF A FERN PLANT



(b) Outline three advantages of a fern plant.

- (i) fern plant is a source of food to animals especially herbivores
- (ii) fern plant produce oxygen gas used for respiration in human being and other organisms
- (iii) It used as ornament in our home and office.

Extract 8.2 illustrate a student's good response to the question

Extract 8.2 is a response of a student who drew a moss plant in part (a). Likewise, he/she correctly outlined three advantages of the fern plant in part (b).

2.2.5 Question 9: Safety in Our Environment

The question had three parts: (a), (b) and (c). In part (a), the students were required to list five accidents which are common at school and home. In part (b), they were required to differentiate the term waste from waste disposal. In part (c), students were required to briefly explain why it is not healthy advised to give alcohol to a snake bite victim.

Data show that, out of 571,082 students who responded to this question, 55.8 percent scored from 0 to 2.5 marks. The students who scored from 3 to 6 marks were 30.4 percent whereas those who scored from 6.5 to 10 marks were 13.8 percent as shown in Figure 9.

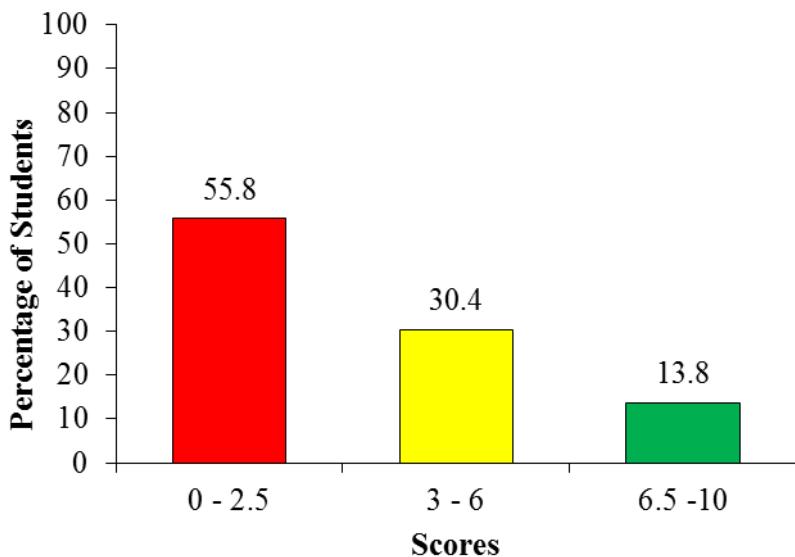


Figure 9: Distribution of students' performance on question 9

Figure 9 shows that the students' performance on this question was average since 44.2 percent of the students scored 30 percent or above of the 10 marks allocated to this question. Despite the average performance, 13.8 percent of the students performed well on this question as they gave correct responses to almost all parts of the question. In addition, the students correctly listed five accidents which are common at school and home in part (a). They correctly differentiated the term “waste” from “waste disposal” in part (b) and gave correct explanation on why it is not healthy advised to give alcohol to a snake bite victim in part (c). These responses show that these students had an adequate knowledge about the topic of Safety in Our Environment. Extract 9.1 illustrates a sample of a student's good response to the question.

9.	(a) List five accidents which are common at school and home.
	(i) <u>Fainting</u>
	(ii) <u>Cuts</u>
	(iii) <u>Burns</u>
	(iv) <u>Poisoning</u>
	(v) <u>Nose bleeding</u>
	(b) Differentiate the term waste from waste disposal.
	<u>Waste is anything that is worthless</u> <u>of no use, rejected</u> <u>while waste disposal is the act of</u> <u>getting rid of wastes.</u>
	(c) Why it is not healthy advised to give alcohol to a snake bite victim? Briefly explain.
	<u>Alcohol increases the rate of</u> <u>heartbeat due to this it increases the rate of</u> <u>spread of poison from parts to other body parts</u>

Extract 9.1: Student's good response in question 9

Extract 9.1, the student correctly listed the common accidents at school and home in part (a). Likewise, in part (b) he/she correctly differentiated the term “waste” from “waste disposal” and gave a correct explanation in part (c).

However, most of the students who scored low marks provided incorrect responses to almost in all parts of the question. For example in part (a), some students wrote the causes of accidents instead of the accidents which are common at home and school such as *carelessness of cooks* and *fighting*. Others wrote ways on how to prevent accidents such as *Always walk carefully; do not irritate animals* and *do not run in the laboratory*.

Similarly, in part (b), some students wrote the types of wastes as *solid wastes* and *liquid wastes*. Others wrote methods of waste disposal as *landfill, incineration, tipping* and *recycling* instead of elaborating the term “waste disposal”. In addition, in part (c), some students wrote an incorrect response like alcohol is *poisonous* and *alcohol can cause death*. This indicates that the students lacked adequate knowledge about the topic of Safety in Our Environment. Extract 9.2 illustrates a sample of a student’s poor response to the question.

9. (a) List five accidents which are common at school and home.

(i) Sick Victim

(ii) Electric Victim

(iii) Sick Snake

(iv) Cutting Victim

(v) Sick head

(b) Differentiate the term waste from waste disposal.

Waste - Refer to the waste material that are solid waste liquid waste and gaseous waste.

Waste disposal - Refer to the ways in which we get the rid of wastes material.

(c) Why it is not healthy advised to give alcohol to a snake bite victim? Briefly explain.

Because alcohol that can manufacture by fermentation to produce yeast so alcohol is something of health treatment in the victim.

Extract 9.2 is a student's poor response to question 9

Extract 9.2 is a response by the student who listed *sick victim*, *electric victim* and *sick snake* instead of the common accidents at school and home in part (a). In addition, he/she referred to the term “waste” as solid, liquid and gaseous waste in part (b). Likewise, he/she provided incorrect responses in part (c).

2.3 Section C: Essay Questions

This section consisted of two (2) essay type questions. The students were asked to choose and answer only one question.

2.3.1 Question 10: Nutrition

This question required the students to explain six factors which affect the rate of the photosynthesis process in plants.

The analysis indicates that 385,893 (67.6%) students attempted this question. Among them, 92 percent scored from 0 to 5.5 marks, 6.5 percent scored from 6 to 12 marks while 1.5 percent scored from 13 to 20 marks. Figure 10 summarizes the performance of the students on this question.

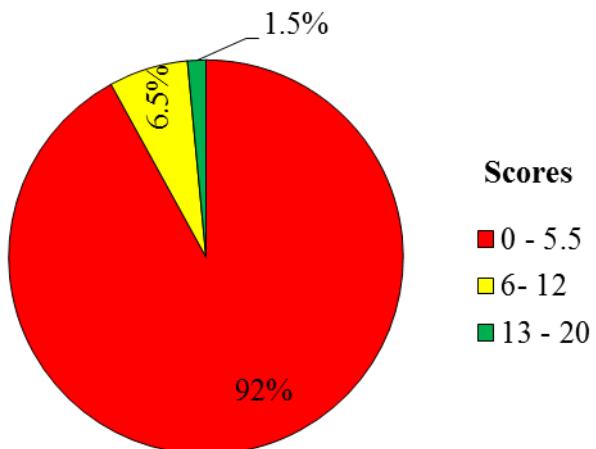


Figure 10: Students' performance on question 10

Figure 10 shows that 92 percent of the students who attempted this question scored low (0–5.5) marks. Most students failed to score full marks because they lacked essay writing skills which require them to clearly show the introduction, main body and conclusion.

In the introduction, some of the students failed to describe the term “photosynthesis”. For example, some students described it as respiration; they wrote *photosynthesis is a breakdown of glucose to release energy*. Others referred to it as Biology because they wrote *photosynthesis is the branch of science which deals with study of living things*.

In the main body, they were required to explain the factors which affect the rate of photosynthesis by outlining the points and giving explanations. However, most of the students simply outlined the points without explanation. Others wrote correct points but failed to score full marks due to lack of clarity. Some of the students wrote incorrect responses by explaining the importance of photosynthesis; they wrote *food production* and *energy conversion*. Others wrote products of photosynthesis as *oxygen* and *water*. Others explained the factors that affect the rate of breathing such as *physical activity, altitude, age, and health status of the body*. These responses indicate that students had inadequate knowledge about the topic of Nutrition, specifically Photosynthesis. This also implies that the teaching methods used in teaching these concepts were not effectively utilized. For the students to gain more understanding the teachers were supposed to design and conduct experiments to verify factors which affect rate of

photosynthesis. Failure to do so might have misled the students into writing the importance of photosynthesis instead of the factors that affect the rate of the photosynthesis process in plants. The students also wrote incorrect conclusions. Extract 10.1 illustrates a student's poor response to this question.

10. Explain six factors which affect the rate of photosynthesis process in plants.

Photosynthesis is the process by which plants use water in form of raw materials. In photosynthesis there are three necessary things, the first one is Product which are water and carbon dioxide the second one is condition here we have sunlight and chlorophyll and the third one we have end product of it. Here we have water, oxygen and Now the following are six factors affect the rate of photosynthesis.

The first one is chlorophyll, here says that the rate change of chlorophyll it can cause the rate affect photosynthesis process in plants.

The second is osmotic pressure. Here the pressure of osmotic can affect the rate of photosynthesis process in plants due to the low and high of the pressure.

The third one Xylem. Here this is the one of the factor that affect the rate of photosynthesis in the way that when it closed the rate of water to enter in the plant.

The forth one is Phloem the rate of photosynthesis can be affected due to the phloem thus when phloem open the rate of photosynthesis can take place.

Another factor is the diffusion here is the one of the factor for the rate of photosynthesis to take place due to the movement of molecules from high concentration react to the low concentration region.

The sixth one and the lastly is stomata this is due to opening and closing of stomata when stomata to be closed there will be any effect of photosynthesis process to the plants.

Generally I am concluding by saying the rate of photosynthesis process in plant it can cause the plant to make its own food.

Extract 10.1 shows a student's poor response to question 10

Extract 10.1 shows a response from a student who explained *diffusion*, *phloem*, and *osmotic pressure* instead of the factors affecting the rate of the photosynthesis process in plants.

However, 1.5 percent of the students performed well on this question. Those who performed well on the question managed to correctly explain six factors which affect the rate of photosynthesis in plants. They organized their essays logically with the introduction, main body and the conclusion parts well presented. They also showed good mastery of the English language. The response indicates that the student had good writing skills as displayed in extract 10.2.

10. Photosynthesis is the process by which green plants, some bacteria and some protista make their own food by using sunlight. Examples: mango tree.
The following are the factors which affect the rate of photosynthesis process in plants.
Temperature: This means that when the temperature is high or is low it can affect photosynthesis process. The temperature must be moderate in order a plant or protista to undergo photosynthesis process.
Leaf age: In order photosynthesis process to take place the leaf must be green, because when the leaf is green means that the chlorophyll is present and when the leaf is old can affect photosynthesis process.
Presence of minerals: Photosynthesis process requires minerals for chlorophyll formation, the presence or absence of minerals can affect the rate of photosynthesis process.
Carbon dioxide concentration: due to carbon dioxide absence the photosynthesis process can't take place. This is because carbon dioxide is the raw materials of photosynthesis.
The light intensity: The higher the light intensity the higher the rate of the photosynthesis process. This is because the light is the condition for photosynthesis process so the light is very important in this process from the sun and green pigment must be there in order to take place.
Presence of water: due to the presence of water photosynthesis can take place in the plant, some bacteria and some protista because water is the raw material of photosynthesis process.
Generally the photosynthesis process it take place only in plants and it cannot take place in animals because it requires sunlight and chlorophyll in order to take place.

Extract 10.2 illustrate a student's good response to question 10

Extract 10.2 is a response from a student who correctly explained the factors affecting the rate of photosynthesis. The student had good English language proficiency and good essay writing skills.

2.3.2 Question 11: Transport of Materials in Living Things

The question required the students to explain six factors which affect the rate of transpiration in plants.

Data indicates that 185,209 (32.4%) of the students attempted this question. Among them, 78.6 percent scored from 0 to 5.5 marks, 14.2 percent scored from 6 to 12 marks, while 7.2 percent scored from 13 to 20 marks. Figure 11 summarizes the performance of the students on this question.

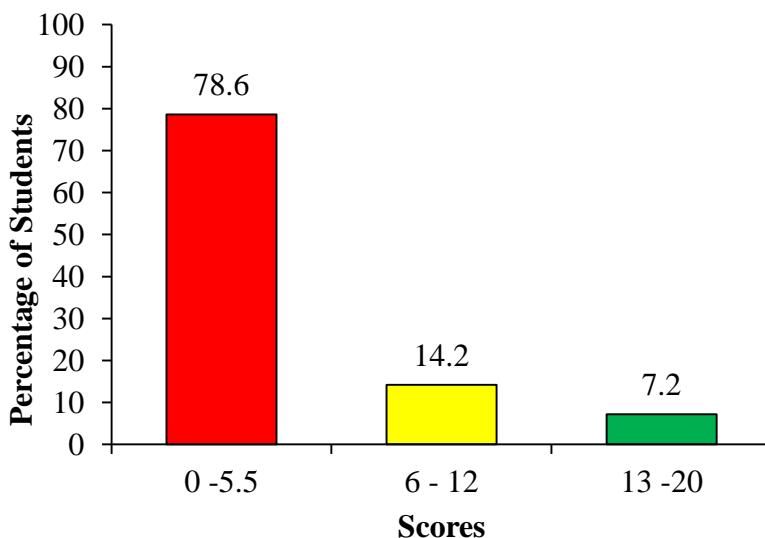


Figure 11: Students' performance on question 11

Figure 11 shows that the performance on this question was poor since 78.6 percent scored low (0–5.5) marks out of the 20 marks allocated to this question. These students failed to explain the factors which affect the rate of transpiration. In the introduction, some of them wrote incorrect responses. For example, some students defined transpiration as *transportation is the transfer of materials from the environment to the organism*.

Moreover, some students failed to understand the demand of the question. They explained the importance of transpiration instead of the factors that affect transpiration. For example, they wrote *it helps to cool the plants; it*

helps the transportation of water and mineral salts in the plant and it enables the plant to lose excess water. Others wrote the factors which affect rate of breathing as they wrote age, health of the body and physical activity. These responses imply that, students had inadequate knowledge about the topic of Transport of Materials in Living Things. This also implies that the teaching methods used to teach these concepts were not effective. For the students to understand better, the teachers were supposed to guide them through carrying out experiments to investigate the effects and factors affecting the rate of transpiration in plants and to record their observations. Failure to do so might have led the students into writing the importance of transpiration instead of the factors that affect the rate of transpiration in plants. Extract 11.1 illustrates a student's poor response to the question.

.....Transpiration- Is the movement of ^{Transport} manufacturing food material interact in a plant from the site of manufa-

.....The following are the factors which affect the rate of transpiration in the plant

.....A thin to facilitate diffusion: this is the factors which affecting the rate of transpiration in which the improvement in this secretion of is the movement of manufacturing food material interact in a plant from the site of manufa and other the productivity and the component of the environment in which the infer the living organism in living in the environment

.....moist and the other the material in the component of the living organism in which the long and have no longer needed in the organism in which the improvement of transpiration and the promote the large area surface A thin to facilitate diffusion have a good netwur and moist is the movement of manufacturing food material interact in a plant from

.....Have large area surface is the movement of transport manufacturing food material in plant from size of manufa of the following are the factors which affecting the rate of transport in the plant environment and all its interacting components and the translocation and transpiration

.....Have a good network: the unity of transpiration is Have a good network and the other commodities in the transpiration

.....A group of interdependent organisms living in an environment in a organism which rely on other organism for food

.....In the Ecosystem is the ability of a body Infection and disease..

Extract 11.1 is a student's poor response to question 11

Extract 11.1 is a response from a student who defined transpiration as translocation. In addition, he/she explained features of respiratory surfaces instead of factors which affect the rate of transpiration.

Despite the poor performance on this question, 7.2 percent of the students scored good (13-20) marks. They correctly explained the factors which affect the rate of transpiration. This indicates that the students had an adequate knowledge about the topic of Transport of Materials in Living Things. These students also demonstrated a good command of the English language and essay writing skills. Extract 11.2 is a sample of a student's good response to this question.

III. FACTORS AFFECTING THE RATE OF TRANSPERSION IN PLANTS

Transpiration is the process by which plants loose water in the atmosphere through water vapour. There are three major types of transpiration which include cuticular transpiration, stomatal transpiration and lenticular transpiration. Cuticular and transpiration from stomata takes place in the leaves while lenticular transpiration takes place in the stem of the plant. However there are various factors which may lead to the increase or the decrease of transpiration rate. These are the factors:-

Temperature. It is the degree of hotness or coldness in a given environment at a particular time. The amount of temperature can determine the rate of transpiration because when there is high temperature, the leaves are too much heated leading to the removal of water in order to cool the plant. When there is low temperature, the leaves close to prevent themselves from cold and the behaviour of folding itself prevents the loss of water through stomata and cuticle.

Amount of humidity. Humidity is the amount of water vapour or moisture present in the atmosphere. When the atmosphere is dry and contains less moisture, it can make the plant to remove water so that to have equal concentration of water between the inner parts of the leaf and the surrounding environment. When there is high amount of humidity in the surrounding environment then the stamata and all pores or holes which removes water will not loose water.

Wind. Wind is air in motion. Wind is mostly caused by difference in pressure of the air or atmosphere from one place to another. It blows from high pressure to low pressure areas. When winds blow, they cause transfer of moisture from one place to another. This moisture carried by wind leads to the decrease of moisture at the place where the moisture has been taken from and thus leading to the increase of the rate of transpiration. The following are leaf factors affecting rate of transpiration:-

Leaf size and shape. The size and shape of the leaf determines the number of the stomata it has. When the leaf is large in size then there will be many stomata which will lead to the increase rate of transpiration. Another thing is the shape. Example the dicot leaves have a large and broad shape than those of a monocot leaves this makes the large shape to have many stomata and large cuticle which favours the increase of transpiration rate.

Number of stomata. The number of stomata present in a leaf determines the amount of water which has been lost in the atmosphere. Example, when a leaf has many numbers of stomata and the one with less stomata then the water loss will be according to the number or degree of the water lost. Also when there are many stomata, then the leaf will have to remove much water so that it can cool itself and all other parts of the plant. The following is the environmental factor which affect rate of transpiration :-

Amount of water in the soil. When the plant does not obtain much water from the ground, then the plant will not be able to transpire by removing excess water in the plant. But when there is plenty of water in the soil then only much or excess water will be given out in the plant because the plants obtain water and other needed mineral salts from the ground through absorption by roots and transport by the xylem vessels to the upper parts of the plant that is the leaves and the stem.

Conclusively, transpiration has got some importances to the plant these include cooling the plant during the time of high temperature, it helps the plant also to excrete excess water which are present in the plant. To the plant it causes also some disadvantages, these include wilting. It is the process by which a plant loses all water and thus becomes dried up which after sometimes it can lead to death of plants. Transpiration brings an advantage to humans because it leads to rain formulation through water cycle.

Extract 11.2 illustrates a student's good response to question 11

Extract 11.2 is a response from the student who correctly explained the factors that affect the rate of transpiration. The student demonstrated good English language proficiency.

3.0 ANALYSIS OF STUDENTS' PERFORMANCE PER TOPIC

The analysis of the students' performance topic-wise shows that, out of the 9 topics that were assessed in the Biology FTNA 2019, the good performance of 97.4 percent was noticed on question 2, which consisted of True and False items. These items were derived from the topics of *Introduction to Biology, Safety in Our Environment, Health and Immunity, Nutrition, Transport of Material in Living Things, Classification of Living Things, Gaseous Exchange and Respiration* and *Balance of Nature*. Another good performance of 93.6 percent was noticed on question (1) which consisted of Multiple Choice Items derived from the topics of *Introduction to Biology, Cell Structure and Organization, Safety in Our Environment, Health and Immunity, Nutrition, Transport of Material in Living Things* and *Classification of Living Things*. This was followed by question (6) from the topic of *Introduction to Biology*, with the performance of 67.4 percent.

The topics that were averagely performed were *Safety in Our Environment* (44.2%), *Gaseous exchange and respiration* (44%) and *Cell Structure and Organization* (34.6) respectively.

The topics on which the students demonstrated poor performance were *Classification of Living Things* (26.8%), *Transport of Material in Living Things* (21.4%), *Balance of Nature* (21%), *Health and Immunity* (15.2%) and *Nutrition* (8%) respectively. Appendix I present a summary of the students' performance on the FTNA 2019, where poor performance is represented by red color, average performance by yellow color and good performance by green color with the percentage of the students who scored from 30 percent or above the marks allocated to the question ranging from 0-29%, 30-64% and 65-100% respectively.

4.0 CONCLUSION AND RECOMMENDATIONS

4.1 Conclusion

The analysis of students' responses reveals a number of factors which might have affected the performance. These factors include:

- (a) Failure of students to understand the demands of the questions: Some students rushed into attempting the questions before reading them carefully.
- (b) Lack of adequate knowledge about the topics tested: It is evident that the students did not revise Form One and Form Two topics before they sat for the FTNA assessment.
- (c) Most students performed poorly in question number 8, 10 and 11. This indicated that teachers do not use enough laboratory work, discussion methods, and field projects in the teaching and learning process.

4.2 Recommendations

Based on the observations made through the Students' Items Response Analysis report, the following recommendations are given to improve performance in the Biology subject at schools:

- (a) Students are argued to read the question(s) carefully before answering them. This will help them to understand the demand of question and how to correctly attempt it;
- (b) Teachers are advised to apply various teaching and learning methods/materials which instill deeper understand of the content matter for their students to learn in an inquiry oriented way;
- (c) For the students to acquire enough content knowledge about the topics that were poorly performed, the following should be done:
 - (i) In the topic of Nutrition, teachers should lead students in groups to discuss the process of photosynthesis, design and conduct experiments to verify the factors that affect the rate of photosynthesis.
 - (ii) In the topic of *Health and Immunity*, teachers should use charts, pictures, and video /radio tapes on causes, symptoms,

modes of transmission and effects to guide their students through investigating the common infections and diseases in their community. They should also guide students to local health facility to investigate the common infections and diseases.

- (iii) In the topic of *Classification of Living Things*, teachers should guide students in groups through observing a variety of organisms belonging to Division Pteridophyta and discuss their general and distinctive features as well as the advantages and disadvantages of ferns. Such students should share their findings and draw well labelled diagrams. Equally importantly, teachers should make necessary clarifications. This will help the students to correctly remember what they are taught.
- (iv) In the topic of *Transport of Materials in Living Things*, teachers should guide students in groups through carrying out experiments to investigate the effects and factors affecting the rate of transpiration in plants and to record their observations. Additionally, the teachers should make necessary clarifications and conclusions.

Appendix I

Students' Performance per Topic in FTNA – 2019

S/N	Topic	FTNA 2019		
		Question Number	Percentage of Students who Scored from 30% and above	Remarks
1	Introduction to Biology, Safety in Our Environment, Health and Immunity, Nutrition, Transport of Material in Living Things, Classification of Living Things, Gaseous Exchange and Respiration and Balance of Nature	2	97.4	Good
2	Introduction to Biology, Cell Structure and Organization, Safety in Our Environment, Health and Immunity, Nutrition, Transport of Material in Living Things and Classification of Living Things	1	93.6	Good
3	Introduction to Biology	6	67.4	Good
4	Safety in Our Environment	9	44.2	Average
5	Gaseous Exchange and Respiration	3	44	Average
6	Cell Structure and Organization	5	34.6	Average
7	Classification of Living Things	8	26.8	Poor
8	Transport of Materials in Living Things	11	21.4	Poor
9	Balance of Nature	4	21	Poor
10	Health and Immunity	7	15.2	Poor
11	Nutrition	10	8	Poor

