THE UNITED REPUBLIC OF TANZANIA
MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY
NATIONAL EXAMINATIONS COUNCIL OF TANZANIA

STUDENTS' ITEM RESPONSE ANALYSIS REPORT FOR THE FORM TWO NATIONAL ASSESSMENT (FTNA) 2020

BIOLOGY

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033 BIOLOGY

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FOREWORD

The National Examinations Council of Tanzania is delighted to issue the report on Students' Item Response Analysis (SIRA) in Biology subject for the Form Two National Assessment (FTNA) 2020. The FTNA assesses the competencies gained by students after two years of study. The scores obtained in 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 factors which contributed to the achievements of the students as well as the challenges which the students faced in attempting the questions correctly. The analysis shows that good performance of students in some topics was contributed by: ability to understand the demand of the questions and adequate knowledge of the topics. The poor performance of students in some topics was attributed to inadequate knowledge of the tested topics and failure to understand the demand of the question.

It is expected that, the feedback provided in this report will enable teachers and other educational stakeholders to take appropriate measures in order to improve the teaching and learning of Biology subject. In addition, the Council hopes that the appropriate measures that will be taken by teachers and students will improve performance not only in FTNA but also in 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

The report presents the analysis of responses provided by the students who sat for the Biology FTNA in November 2020. The FTNA Biology paper was set in accordance with the NECTA format issued in the year 2017. The questions were composed to assess the biological competencies anticipated after completion of Form One and Two Biology syllabus of 2010.

The data show that a total of 646,196 students were registered of whom 601,300 sat for the assessment and 369,612 (61.52%) passed. This performance is lower by 2.88 percent when compared to 2019 Biology FTNA where 367,488 (64.40%) students passed.

This report analyses the students' responses in eleven questions that were divided into sections A, B and C. It begins by explaining what the questions required from the students and proceeds to analyse the students' performance. The national assessment results are based on the scores intervals; 75 – 100 (excellent), 65 – 74 (very good), 45 – 64 (good), 30 – 44 (satisfactory) and 0 – 29 (fail), respectively. For the purpose of this report, the analysis of students' responses to a particular question were considered to be good, average or weak if: the percentage of the students who scored 30 percent or above of the marks allocated to the question fell within the range of 65 to 100, 30 to 64 and 0 to 29, respectively. It proceeds with highlighting the challenges that the students faced in responding to the questions and suggests the plausible reasons as to why they occurred. Extracts of responses 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 in each question. The green, yellow and red colours in charts and appendices represent good, average and weak performance, respectively.

Finally, the report ends by giving a conclusion and some recommendations. In due regard, it is expected that teachers, students and educational stakeholders, will take advantage of the report findings to identify areas in which students had weakness and in so doing use the information to improve the teaching and learning in Biology subject.

2.0 ANALYSIS OF THE STUDENTS' PERFORMANCE PER QUESTION

2.1 Section A: Objective Ouestions

This section consisted of four (4) questions which were; Multiple choices, True and False items, Matching items and Completion of the statements items. Students were required to answer all questions in this section.

2.1.1 Question 1: Multiple Choice Items

In this question there were ten (10) multiple choice items carrying a total of ten (10) marks. For each of the items (i) to (x), the students were required to choose the correct answer from among the given four (4) alternatives and write the letter of the correct response in the box provided. The items in this question were extracted from seven (7) topics, which are: Transport of Materials in Living Things, Nutrition, Gaseous Exchange and Respiration, Classification of Living Things, Balance of Nature, Safety in Our Environment and Health and Immunity.

A total of 601,277 students attempted this question. The analysis of students performance shows that 56,520 (9.4%) students scored from 0 to 2 marks out of the 10 marks allocated to this question. Students who scored from 3 to 6 marks were 399,849 (66.5%) and those who scored from 7 to 10 marks were 144,908 (24.1%). Figure 1 summarizes the students' performance in question 1.

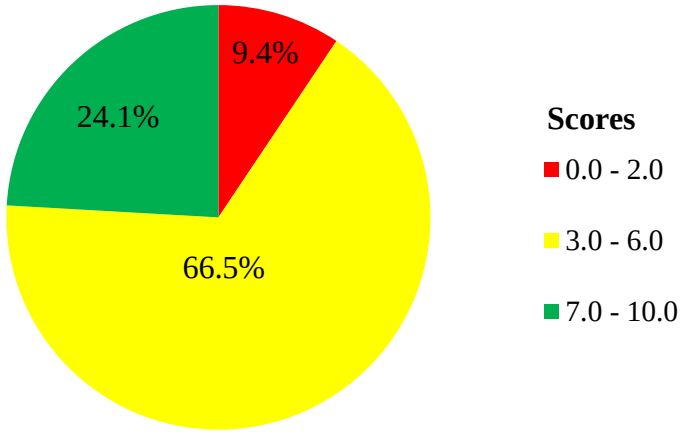


Figure 1: *Summary of the students' performance in question 1.*

Figure 1 shows that students' performance in this question was good since 90.6 percent of them scored from 3 to 10 marks. This indicates that they had adequate knowledge of the tested topics. The analysis of the items are presented hereunder.

Item (i) *Which condition occurs when a plant cell is immersed in highly concentrated solution?*

A	*Turgidity*	*B*	*Crenation*
C	*Plasmolysis*	*D*	*Haemolysis*

The correct response for this item was alternative *C, Plasmolysis.* The students who chose *C, Plasmolysis* were familiar with the effects of osmosis in living organisms. On the other hand, those who chose incorrect response *A, Turgidity,* failed to understand that Turgidity is a condition which occurs when a plant cell absorbs water after it has been placed in hypotonic solution (solution with less solute concentration). Students who chose incorrect response *B, Crenation,* failed to understand that, Crenation is a condition which occurs when an animal cell loses water by osmosis and shrinks after it has been placed in hypertonic solution (highly concentrated solution). Those who chose incorrect response *D, Haemolysis* failed to understand that, Haemolysis occurs when an animal cell absorbs water and bursts due to lack of cell wall after it has been placed in hypotonic solution.

Item (ii) *The process by which green plants and other organisms use sunlight energy to manufacture their own food is known as*

A	*respiration*	*B*	*digestion*
C	*photosynthesis*	*D*	*nutrition.*

The correct response for this item was alternative *C, photosynthesis.* The students who chose *C, photosynthesis* had adequate knowledge about the process of photosynthesis. Those who selected *A, respiration* failed to understand that respiration is a process by which food is broken down to release energy. Those who chose *B, digestion*, did not understand that, it is a process of breaking down food into small particles which can easily be absorbed and assimilated into the body. Moreover, those who chose *D, nutrition* failed to understand that it is a process whereby an organism takes in food from the environment.

Item (iii) *Which storage organ does sugarcane stores its food after photosynthesis?*

A	*Stem*	*B*	*Root tuber*
C	*Tap root*	*D*	*Rhizome*

The correct response for this item was alternative *A, Stem.* The students who chose the correct response were familiar with types of food storage organs in plants. Those who selected incorrect response *B, Root tuber* and *D, Rhizome* did not understand that root tuber and rhizome are underground storage organs in some plants like cassava, sweet potatoes and ginger. On the other hand, those who chose *C, Tap root* did not understand that Tap root is a storage organ in carrots.

Item (iv) *The following are the end products of anaerobic respiration in plants* ***except***

A	*energy.*	*B*	*lactic acid.*
C	*carbon dioxide.*	*D*	*alcohol.*

The correct response for this item was *B, lactic acid*. The students who chose the correct response had sufficient knowledge on the types of respiration therefore it was easy to recognize that lactic acid is an end product of anaerobic respiration in animals and not in plants. Those who selected incorrect response, *C, carbondioxide* and *D, alcohol* failed to understand that these are the end products of anaerobic respiration in

plants. Likewise, those who chose alternative *A, energy* failed to recognize that energy is a product of respiration (aerobic or anaerobic).

Item (v) *Which organisms belong to Kingdom Plantae?*

A	*Fern and amoeba*	*B*	*Moss and mucor*
C	*Liverwort and yeast*	*D*	*Fern and moss*

The correct response for this item was alternative *D, Fern and moss*. Students who chose the correct response had adequate knowledge of Kingdom plantae particularly Division Filicinophyta and Bryophyta to which *fern* and *moss* belong, respectively. Those who chose alternative *A, Fern and amoeba*, failed to understand that though fern belongs to Kingdom Plantae, amoeba belongs to Kingdom Protoctista. Those who chose alternative *B, Moss and mucor,* and *C, Liverwort and yeast* failed to understand that though moss and liverwort belong to Kingdom Plantae, mucor and yeast belong to Kingdom Fungi.

Item (vi) *Bacteria and fungi are ecologically reffered as*

A	*producers*	*B*	*decomposers*
C	*parasites*	*D*	*predators*

The correct response for this item was alternative *B, decomposers.* Students who chose *B, decomposers* had clear understanding of the role of the two organisms that they decompose dead and decaying organic matter. Those who chose *A, producers,* did not understand that *producers* are organisms which make their own food and they are the main source of food to all organisms in the ecosystem. On the other hand, those who chose *C, parasites* failed to understand that these are organisms which live in or on another organism called host. Likewise, those who chose *D, predators* did not understand that these are organisms which hunt, kill and eat the prey.

Item (vii) *Unexpected event which can cause injury and sometimes death is called*

A	*accident*	*B*	*emergency*
C	*outbreak*	*D*	*disaster*

The correct answer for this item was *A, an accident.* Students who chose *A, accident* had sufficient knowledge of the subtopic of safety at home and school. Those who chose *B, emergency,* did not recognize it is an

unplanned event that may be good or bad thus cannot necessarily cause injuries. Those who chose *C, outbreak* did not recognize that it is a sudden occurence of something unwelcomed such as a disease and war. Moreover, students who chose *D, disaster* did not recognize that disaster is a harmful natural event such as flooding, earthquake and volcanism.

Item (viii) *The liquid induced into the body of an organism so as to increase antibody production is known as*

A	*tissue fluid*	*B*	*lymph*
C	*vaccine*	*D*	*plasma*

The correct response for this item was *C, vaccine*. Students who chose *C* were familiar with the concept of health and immunity. Those who chose *A, tissue fluid*, did not understand that it is a fluid that naturally occurs in the body which bathes all the cells of the body. Those who chose *B, Lymph* and *D, plasma* failed to recognize that lymph is a pale yellow fluid in the lymphatic ducts while *plasma* is a pale yellow fluid which forms the bulk of the blood.

Item (ix) *People with talking behaviour while eating are considered to have*

A	*bad manner.*	*B*	*table manner.*
C	*talking manner.*	*D*	*chatty manner.*

The correct response for this item was *A, bad manner*. Students who chose *A, bad manner* had a clear understanding on the topic of Health and Immunity particularly good manners. Those who chose *B, table manner*, failed to understand that table manner is a collection of all the behaviours a person should observe during eating which can be good or bad for example, eating at a reasonable pace, chewing with the mouth closed, do not talk while the food is in the mouth etc. On the other hand, those who chose *C, talking manner* and *D, chatty manner* did not understand that these are examples of bad manners which should not be displayed during eating.

Item (x) *Arteries have thick muscular walls because they transport blood*

A	*at low pressure*	*B*	*at high pressure*
C	*towards the heart*	*D*	*away from the heart*

The correct response for this item was *B, at high pressure*. Students who chose *B at high pressure* had clear knowledge on the adaptations of the parts of the mammalian heart to their functions. Those who chose *A, at low*

pressure, failed to understand that veins are the ones which transport blood at low pressure since they have thin muscular walls. Those who chose *C, towards the heart* did not recognize that although this feature is related to arteries and that all arteries carry oxygenated blood to the heart except pulmonary artery but it is not an adaptive feature for thick muscular walls. On the other hand, those who chose *D, away from the heart* did not realize that veins are the ones which carry deoxygenated blood to the heart except pulmonary vein.

2.1.2 Question 2: True and False Items

This question consisted of ten (10) statements related to nine (9) topics which are: Cell Structure and Organisation, Health and Immunity, Gaseous Exchange and Respiration, Transport of Material in Living Things, Introduction to Biology, Nutrition, Balance of Nature, Classification of Living Things and Safety in Our Environment. Students were required to write **True** if the statement is correct or **False** if the statement is not correct in the spaces provided.

Data show that out of 601,273 students who attempted this question, 17,437 (2.9%) scored from 0 to 2 marks. The students who scored from 3 to 6 marks were 364,973 (60.7%) whereas 218,863 (36.4%) scored from 7 to 10 marks. Figure 2 summarizes the students' performance in question 2.

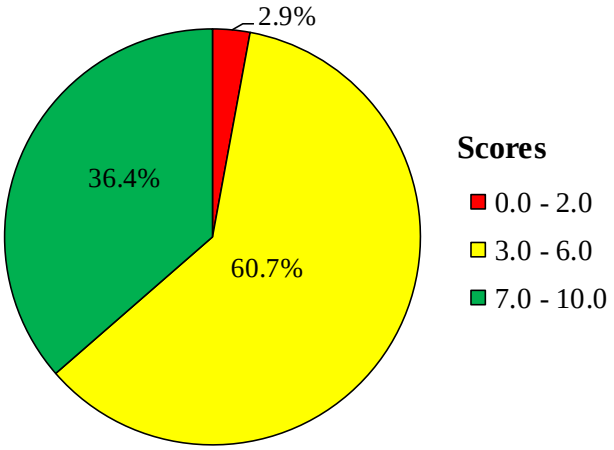
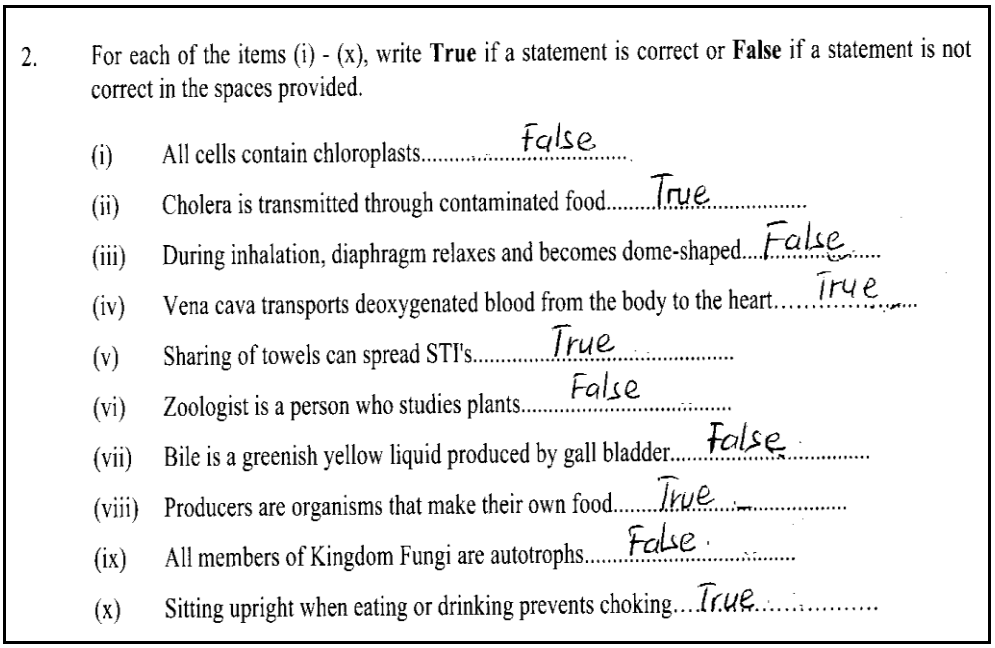


Figure 2: *Summary of the students' performance in question 2.*

Figure 2 shows that students' performance in this question was good since 97.1 percent of them scored 3 marks and above. The students who performed well in this question had sufficient knowledge of most biological concepts tested. They were able to identify the correct and incorrect statements accordingly. Extract 1.1 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 spaces provided.

(i) All cells contain chloroplasts.....False.....

(ii) Cholera is transmitted through contaminated food.....True.....

(iii) During inhalation, diaphragm relaxes and becomes dome-shaped.....False.....

(iv) Vena cava transports deoxygenated blood from the body to the heart.....True.....

(v) Sharing of towels can spread STI's.....True.....

(vi) Zoologist is a person who studies plants.....False.....

(vii) Bile is a greenish yellow liquid produced by gall bladder.....False.....

(viii) Producers are organisms that make their own food.....True.....

(ix) All members of Kingdom Fungi are autotrophs.....False.....

(x) Sitting upright when eating or drinking prevents choking....True.....

Extract 1.1: An example of student's good response in question 2.

Extract 1.1 shows a sample of response from the student who correctly responded to all items. These responses indicate that the student had adequate knowledge of the tested concepts.

Those who performed poorly (0 – 2 marks) failed to give correct responses as per requirements of the question. These students had inadequate knowledge of the tested concepts as the following analysis shows:

Item (i) asked that, *All cells contain chloroplasts*. The correct response to this item was *False*. The students who opted for *True* failed to understand that chloroplast is a part found in plants cells but not in animals cells.

Item (ii) asked that, *Cholera is transmitted through contaminated food*. The correct response to this item was *True*. The students who opted for *False*

failed to understand that if a person takes food or water contaminated with the bacteria that causes cholera he/she will get the disease.

Item (iii) asked that, *During inhalation, diaphragm relaxes and becomes dome-shaped.* The correct response to this item was *False*. The students who opted for *True* did not recognize that diaphragm relaxes and becomes dome-shaped during exhalation.

Item (iv) asked that, *Vena cava transports deoxygenated blood from the body to the heart.* The correct answer to this item was *True*. Students who opted for *False* failed to understand that vena cava is the main vein that carries deoxygenated blood from the body to the heart.

Item (v) asked that, *Sharing of towels can spread STI's.* The correct response to this item was *True*. The students who opted for *False* failed to recognize that STI's stands for sexually transmitted infections. These are infections which are spread through sexual intercourse such as gonorrhea and syphilis. Therefore if uninfected person shares a towel with an infected one, the person will get the infection.

Item (vi) asked that, *Zoologist is a person who studies plants*. The correct answer to this item was *False*. The students who opted for *True* failed to understand that a person who studies about plants is called botanist.

Item (vii) asked that, *Bile is a greenish yellow liquid produced by gall bladder*. The correct answer to this item was *False*. The students who opted for *True* did not recognize that bile is produced by the liver and stored in the gall bladder.

Item (viii) asked that, *Producers are organisms that make their own food.* The correct response to this item was *True*. The students who opted for *False* failed to understand that producers are green plants which have chlorophyll and therefore can manufacture food using carbon dioxide and water in the presence of sunlight.

Item (ix) asked that, *All members of Kingdom Fungi are autotrophs*. The correct answer to this item was *False*. The students who opted for *True* failed to understand that autotrophs are organisms that can manufacture their own food using chlorophyll. Fungi cannot manufacture their own food due to lack of chlorophyll and therefore are termed saprophytes.

Item (x) asked that, *Sitting upright when eating or drinking prevents choking*. The correct answer to this item was *True*. The students who opted for *False* failed to understand that choking is an accident which can be prevented by maintaining good posture when eating or drinking. Extract 1.2 is a sample of a student's poor 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 spaces provided.

(i) All cells contain chloroplasts.....TRUE.....

(ii) Cholera is transmitted through contaminated food.....FALSE.....

(iii) During inhalation, diaphragm relaxes and becomes dome-shaped.....TRUE.....

(iv) Vena cava transports deoxygenated blood from the body to the heart.....FALSE.....

(v) Sharing of towels can spread STI's.....FALSE.....

(vi) Zoologist is a person who studies plants.....TRUE.....

(vii) Bile is a greenish yellow liquid produced by gall bladder.....TRUE.....

(viii) Producers are organisms that make their own food.....FALSE.....

(ix) All members of Kingdom Fungi are autotrophs.....TRUE.....

(x) Sitting upright when eating or drinking prevents choking.....FALSE.....

Extract 1.2: An example of student's poor response in question 2.

In Extract 1.2, the student wrote incorrect responses in all the items. This indicates that the student had inadequate knowledge of tested topics.

2.1.3 Question 3: Health and Immunity

The question consisted of five (5) matching items derived from the topic of Health and Immunity. In this question, students were required to match phrases provided in **List A** with the responses in **List B** by writing the letter of the correct response below the corresponding item number in a table provided.

List A		List B	
(i)	*Ability of the body to resist infection and disease.*	*A*	*Disease*
		B	*Vaccination*
(ii)	*The invasion of pathogens into the body of living things.*	*C*	*Infections*
		D	*Vectors*
(iii)	*A process of inducing antigens into a health person.*	*E*	*Immunity*
		F	*Endemic*
(iv)	*A condition that affects the health of the body and is characterized by certain symptoms.*	*G*	*Antibodies*
		H	*Pandemic*
(v)	*Agents which spread pathogens in the community.*		

Data show that out of 601,060 students who attempted this question, 204,962 (34.1%) scored from 0 to 1 out of 5 marks allocated to this question. The students who scored from 2 to 3 marks were 252,445 (42.0%) whereas 143,653 (23.9%) scored from 4 to 5 marks. Figure 3 summarizes the students' performance in question 3.

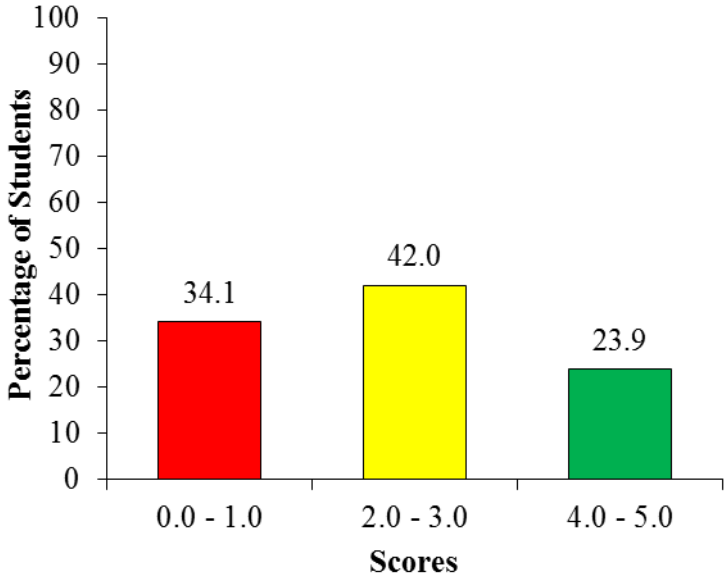


Figure 3*: Summary of the students' performance in question 3.*

Figure 3 shows that students' performance in question 3 was good as more than a half; 396,098 (65.9%) scored 30 percent or above of the total marks allocated to this question. The students who scored full marks (5) in this question had sufficient knowledge of the topic of Health and Immunity. Extract 2.1 shows a response from a student who matched the phrases correctly.

Answers

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

Extract 2.1: An example of student's good response in question 3.

In Extract 2.1, the student correctly matched the phrases and thus scored full marks. This indicates that the student had adequate knowledge of the tested concepts.

Those who scored lower (0 – 1) marks failed to give correct responses as per requirements of the question signifying lack of knowledge on the tested concepts. The analysis of the item responses is presented hereunder as follows:

Item (i) required the students to select a response which correctly matches the description of the ability of the body to resist infection and disease. The correct answer was *E, Immunity.* Most students matched it correctly showing that they had adequate knowledge of the concept of health and immunity.

Item (ii) required the students to select a response which correctly matches with a description of the invasion of pathogens into the body of living things. The correct answer was *C, Infection*. Most of the students wrote alternative *A, Disease.* These students failed to understand that infection means microorganism invasion into the body that can cause disease while disease is a condition that occurs after a body is infected with microorganism.

Item (iii) required the students to select a response which correctly matches with a description of a process of inducing antigens into a health person. The correct answer was *B, Vaccination.* Most of the students got it right. However, some lacked the knowledge of the concept of health and immunity and hence chose an incorrect match.

Item (iv) required the students to select a response which correctly matches with a description of a condition that affects the health of the body and is characterized by certain symptoms. Most of the students selected option *C, Infection* instead of the correct option *A, Disease.* The incorrect matching shows that the students could not dfferentiate between infections and diseases.

In item (v), the students were required to select a response which correctly matches the description of agents which spread pathogens in the community. The correct answer was *D, Vectors.* Most students matched it correctly showing that they had adequate knowledge of the ways pathogens can be spread from one person to another. Extract 2.2 is a sample of a student's poor response.

Answers

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

Extract 2.2: An example of student's poor response in question 3.

In Extract 2.2, the student failed to match all the items of the question correctly. These responses imply that the student had insufficient knowledge of the tested concepts.

2.1.4 Question 4: Gaseous Exchange and Respiration

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

Data show that out of 591,498 students who attempted this question 501,590 (84.8%) scored from 0 to 1 out of 5 marks allocated to this question. The students who scored from 2 to 3 marks were 69,205 (11.7%) whereas 20,703 (3.5%) scored from 4 to 5 marks. Figure 4 summarizes the students' performance in question 4.

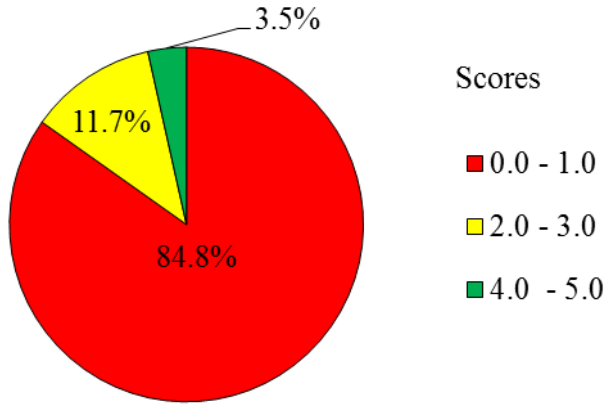


Figure 4: *Summary of the students' performance in question 4.*

Figure 4 shows that the general performance in this question was poor because the majority (84.8%) of the students scored from 0 to 1 out of the 5 marks allocated to this question. The analysis of the students' responses shows that poor performance was attributed to inadequate knowledge of the topic of Gaseous Exchange and Respiration. The analysis of the item responses is presented hereunder:

Item (i) required the students to complete the statement: *The sticky fluid in the nose that help to trap dust is known as* _____. The correct response was *mucus,* but most of the students wrote *hairs.* These students failed to differentiate *mucus* from *hairs.* They did not recognize that although *hairs* and *mucus* help to trap dust in the nose, hairs are cilia (hair like structures) and mucus is a fluid which is sticky. Others wrote *nose cavity.* Other students had the correct answer but misspelt *mucus* as *mucor* a fungus which belongs to Phylum Zygomycota. These responses show that students lacked clear understanding of the functions of the parts of the mammalian respiratory system.

Item (ii) required the students to complete the statement: *The muscles that are found between the ribs are called* _____. The correct answer was *intercostal muscles,* but most of the students wrote *diaphragm*. They failed to understand that diaphragm is a sheet of muscular tissue separating the thorax and abdomen while intercostal muscles are found between the ribs. Other students wrote types of muscles such as *ciliary muscles*, *skeletal muscles* and *smooth muscles.* Moreover, other students wrote *sphincter*

muscle which is found in the human urinary system instead of *intercostal muscles.* All these responses show that the students lacked clear understanding of the parts and functions of the mammalian respiratory system.

Item (iii) required the students to complete the statement: *The process of taking in air into the lungs is called* _____. The correct answer was *inhalation/breathing in/inspiration.* Most of the students failed to distinguish inhalation and exhalation. Therefore, they wrote *exhalation* which is an incorrect response. Furthermore, the analysis reveals that incorrect responses such as *gaseous exchange* and *breathing* were observed in students' scripts. These responses show that the students lacked clear understanding of the mechanism of gaseous exchange in mammals.

Item (iv) required the students to complete the statement: *The breakdown of food in the absence of oxygen to release energy is known as* _____. The correct answer was *anaerobic respiration,* but most of the students failed to distinguish anaerobic from aerobic. Therefore, they wrote aerobic which is an incorrect response since aerobic respiration occurs in the presence of oxygen. Other incorrect responses found in students' scripts were *breathing, gaseous exchange* and *photosynthesis*. This indicates that the students lacked clear understanding of the types of respiration.

Item (v) required the students to complete the statement: *The structure that closes the opening of the trachea to prevent food from entering it during swallowing is known as* _____ The correct answer was *epiglottis,* but most students wrote *pharynx.* They failed to realize that pharynx is a cavity found at the back of the mouth and nose which allows the openings into both the oesophagus and the trachea. Further analysis reveals that incorrect responses such as, *larynx, tongue, bronchus, thorax* and *oesophagus* were observed in students' scripts. Incorrect responses indicate that students had inadequate knowledge of parts and functions of the mammalian respiratory system. Extract 3.1 is a sample of a student's poor response.

4. Complete each of the following statements by writing the correct answer in the spaces provided.

(i) The sticky fluid in the nose that helps to trap dust is known as....nostril.....

(ii) The muscles that are found between the ribs are called....cardiac muscles.....

(iii) The process of taking in air into the lungs is called....exhalation.....

(iv) The breakdown of food in the absence of oxygen to release energy is known as...respiration

(v) A structure that closes the opening of the trachea to prevent food from entering it during swallowing is known as...diaphragm.....

Extract 3.1: An example of student's poor response in question 4.

In Extract 3.1, the student wrote *nostril* instead of *mucus* in (i) and *respiration* instead of *anaerobic respiration* in (iv). Also the responses given in (ii), (iii) and (v) were incorrect.

Despite the poor performance in this question, 20,703 (3.5%) students had sufficient knowledge of the tested concepts and performed well. Extract 3.2 is a sample of a student's good response.

4. Complete each of the following statements by writing the correct answer in the spaces provided.

(i) The sticky fluid in the nose that helps to trap dust is known as.....mucus.....

(ii) The muscles that are found between the ribs are called.....intercostal muscles

(iii) The process of taking in air into the lungs is called.....inhalation.....

(iv) The breakdown of food in the absence of oxygen to release energy is known as.....anaerobic respiration

(v) A structure that closes the opening of the trachea to prevent food from entering it during swallowing is known as.....epiglottis.....

Extract 3.2: An example of student's good response in question 4.

Extract 3.2 shows correct responses from a student who had sufficient knowledge of the tested concepts and scored all the five marks.

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 Organisation

The question had three parts: (a), (b) and (c). In part (a), students were required to differentiate eukaryotic from prokaryotic cells. In part (b), students were required to choose any two parts found in an animal cell and briefly explain one function. In part (c), students were required to briefly explain why most of the plant cells have cellulose cell wall.

Data analysis shows that out of 581,326 students who attempted this question, 459,248 (79.0%) scored from 0 to 2.5 marks out of 10 marks allocated to this question. The students who scored from 3 to 6 marks were 81,967 (14.1%) whereas, 40,111 (6.9%) scored from 6.5 to 10 marks. Figure 5 summarizes the students' performance in question 5.

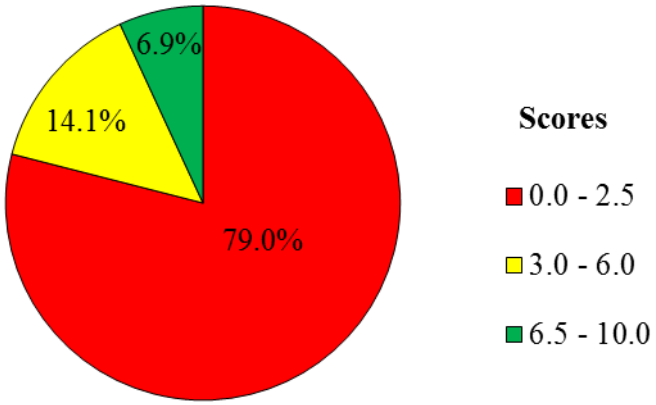


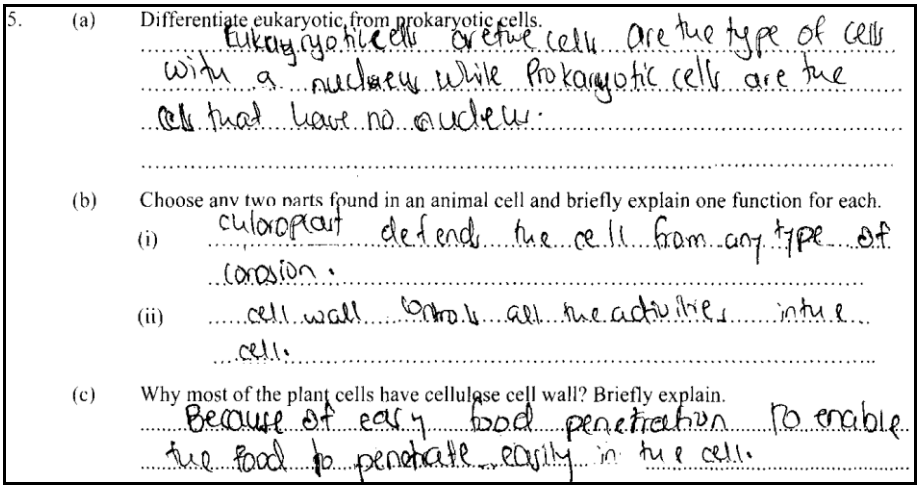
Figure 5: *Summary of the students' performance in question 5.*

The trend of performance indicated in Figure 5 shows that 79.0 percent of the students obtained low marks. Most of them wrote incorrect responses in all parts of the question. For example, in part (a), most of the students wrote eukaryotic cell *is a cell which have true membrane while* prokaryotic cell *is a cell which do not have true membrane.* Another student wrote eukaryotic cell *is a cell which is found in multicellular organism* while prokaryotic cell *is a cell which is found in unicellular organism.* Some of the students regarded eukaryotic cell as animal cell and prokaryotic cells as plant cell. Their reponses were: *eukaryotic cell has temporary vacuole while prokaryotic cell has permanent vacuole*; *prokaryotic cells has no*

chloroplast while eukaryotic cell has chloroplast. Other students regarded eukaryotic cell as unicellular and prokaryotic cell as multicellular. Their responses were *eukaryotic cell is a cell which is made up of one cell while prokaryotic cells is made up of many cells.* Incorrect responses show that the students lacked clear understanding of the types of cell. These students failed to understand that eukaryotic cell has membrane bound nucleus while prokaryotic cells have no membrane bound nucleus.

Likewise in part (b), most of the students who performed poorly did not understand the demand of the question as they provided the answer about organisation of the cell such as *cell, tissue, organ* and *system* instead of the parts found in the animal cell. Another student wrote *cellulose* and *vacuole*. Others mentioned the correct parts but either failed to explain the functions of the two parts or explained one function and hence poor performance. All these poor responses were the results of students' inadequate knowledge of the structure and function of plant and animal cells.

Moreover, in part (c), most of the students gave incorrect reasons as to why most of the plant cells have cellulose cell wall. For example, some of them wrote; *plant cells have cellulose cell wall for controlling all the activities of the cell.* Others wrote *because it helps in photosynthesis.* Another student wrote *because it protects the cell membrane.* These responses indicate that students had inadequate knowledge on the structure and function of the parts of plants and animal cells. Extract 4.1 is a sample of a student's poor response.


5. (a) Differentiate eukaryotic from prokaryotic cells.
Eukaryotic cells are the cells are the type of cells with a nucleus while Prokaryotic cells are the cells that have no nucleus.

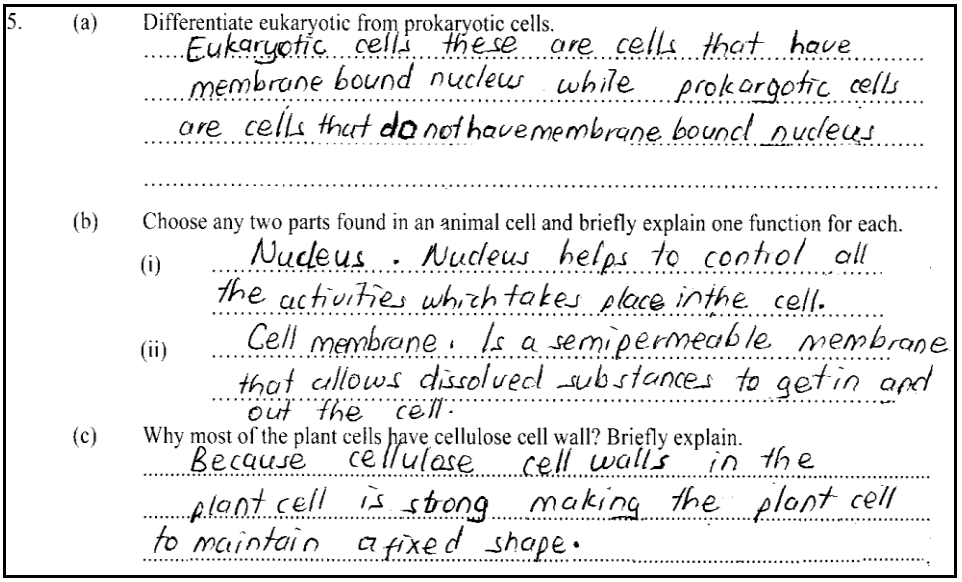
(b) Choose any two parts found in an animal cell and briefly explain one function for each.
(i) chloroplast defends the cell from any type of corosion.
(ii) cell wall controls all the activities in the cell.

(c) Why most of the plant cells have cellulose cell wall? Briefly explain.
Because of easy food penetration to enable the food to penetrate easily in the cell.

Extract 4.1: An example of student's poor response in question 5.

In Extract 4.1, the student incorrectly differentiated eukaryotic from prokaryotic cells in part (a). The student wrote the parts found in plant cell instead of the parts found in animal cell in part (b). Also, the response given in part (c) was incorrect.

On the other hand, 6.9 percent of the students scored from 6.5 to 10 marks in this question. This suggests that these students had sufficient knowledge of the tested concepts thus, they were able to correctly differentiate eukaryotic from prokaryotic cell in part (a). The students also correctly gave parts found in an animal cell and explained the function of each in part (b). Also, they gave a reason as to why most of the plant cells have cellulose cell wall in part (c). Extract 4.2 is a sample of a student's good response.


5. (a) Differentiate eukaryotic from prokaryotic cells.
Eukaryotic cells these are cells that have membrane bound nucleus while prokargotic cells are cells that do not have membrane bound nucleus

(b) Choose any two parts found in an animal cell and briefly explain one function for each.
(i) Nucleus . Nucleus helps to control all the activities which takes place in the cell.
(ii) Cell membrane : Is a semipermeable membrane that allows dissolved substances to get in and out the cell.

(c) Why most of the plant cells have cellulose cell wall? Briefly explain.
Because cellulose cell walls in the plant cell is strong making the plant cell to maintain a fixed shape.

Extract 4.2: An example of student's good response in question 5.

Extract 4.2 shows that the student had good understanding of the topic of Cell Structure and Organisation thus, provided correct responses in parts (a), (b) and (c).

2.2.2 Question 6: Introduction to Biology

The question had two parts: (a) and (b). In part (a), students were required to state three laboratory rules. In part (b), students were provided with Figure 1 which represents an instrument used to magnify too small objects

or organisms in a Biology laboratory and were required to (i) name the parts labelled **A** - **F** and (ii) state the function of the part labelled **E**.

A total of 599,417 students attempted this question. The analysis of students' performance shows that, 162,442 (27.1%) students scored from 0 to 2 marks out of the 10 marks allocated to this question. Students who scored from 3 to 6 marks were 310,498 (51.8%) and those who scored from 7 to 10 marks were 126,477 (21.1%). Figure 6 summarizes the students' performance in question 6.

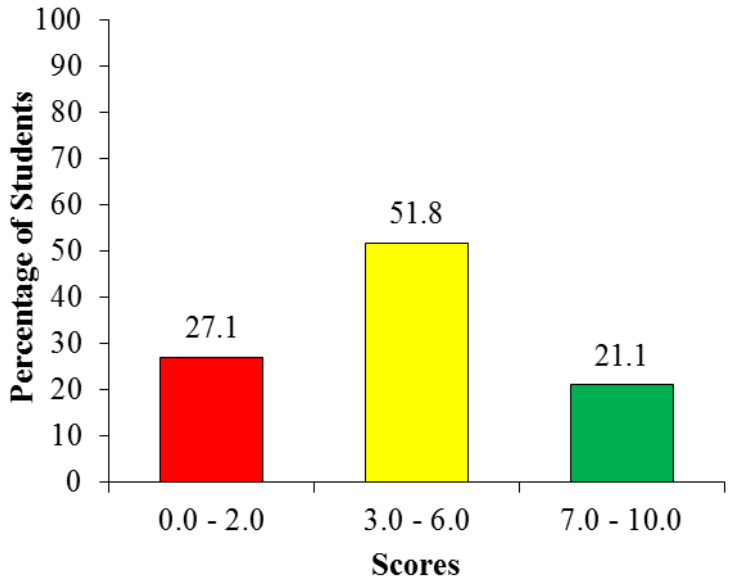


Figure 6: *Summary of the students' performance in question 6.*

Based on the analysis in Figure 6, the general performance in this question was good because 72.9 percent of the students scored 30 percent and above of the 10 marks allotted to this question. The students who performed well (21.1%) gave correct responses in almost all parts of the question. These students correctly stated three laboratory rules in part (a). Also, they correctly named the parts labelled **A** - **F** in (b) (i) and stated the function of the part labelled **E** in (b) (ii). Extract 5.1 illustrates a sample of a response from the student who answered the question correctly.

6. (a) State three laboratory rules.

(i) You should not enter the laboratory without permission.

(ii) You should not start any experiment without any instruction.

(iii) You should not eat, drink or swallow anything in the Laboratory.

(b) **Figure 1** represents an instrument used to magnify too small objects or organisms in a Biology laboratory. Study it carefully and then answer the questions that follow:

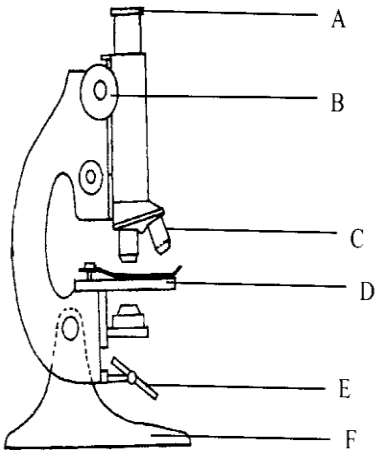


Figure 1

(i) Name the parts labeled **A - F**

A Eye piece lense

B Coarse adjustment knob.

C Objective lense

D Stage.

E Mirror.

F Base.

(ii) State the function of the part labeled **E**.

It reflects light so it can be used to illuminate the specimen under observation.

Extract 5.1: An example of student's good response in question 6.

Extract 5.1 illustrates a sample of a response from the student who correctly stated three laboratory rules in part (a). Also, the student correctly named

the parts labelled **A - F** in (b) (i) and stated the function of the part labelled **E** in (b) (ii).

However, 162,442 (27.1%) students obtained 0 - 2 marks. These students incorrectly stated the laboratory rules in part (a). For instance, one of them wrote: *do not touch any apparatus*, *do not enter into the laboratory* and *do not share apparatuses in the laboratory.* Another student wrote; *use broken apparatuses, do not study in the laboratory* and *do not sing in the laboratory.* Another student wrote; *do not touch any equipment in the laboratory.* Incorrect responses signify that the students had inadequate knowledge of the Biology laboratory.

In part (b) (i), some students failed to name the parts labelled **A - F**. For example, some students wrote the names of some apparatuses as parts of the microscopes for example, one student wrote *A – dropper, C- beaker, D – test tube, E – spatula, F – petri dish.* All these poor responses were the results of students' inadequate knowledge of the apparatuses found in the Biology laboratory.

Similarly, in part (b) (ii), some students failed to state the function of the part labelled E. They regarded part labelled E as diaphragm instead of mirror and wrote the function *as to regulate the amount of light passing from the mirror to the condenser*. Others regarded it as condenser instead of mirror and wrote the function as; *to concentrate light onto the specimen*. These responses indicate that the students lacked clear understanding of the laboratory apparatus and their uses specifically the microscope. Extract 5.2 illustrates a students' poor response.

6. (a) State three laboratory rules.

(i) Do not walk in the laboratory.

(ii) Do not wash apparatus.

(iii) Do not use or do anything in the laboratory.

(b) **Figure 1** represents an instrument used to magnify too small objects or organisms in a Biology laboratory. Study it carefully and then answer the questions that follow:

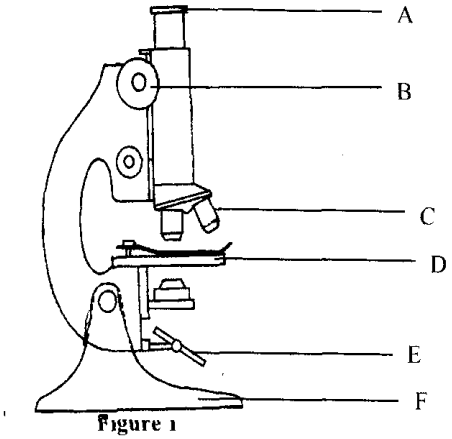


Figure 1

(i) Name the parts labeled **A - F**

A objective lens

B Eye pice

C stage

D Diaphragram

E Base

F Mirror

(ii) State the function of the part labeled **E**.

To magnify the light

Extract 5.2: An example of student's poor response in question 6.

In Extract 5.2, the student incorrectly stated the laboratory rules in part (a). The student wrote the parts of the microscope but mixed them for example, he/she wrote *A, objective lens* instead of *eye piece lens* in part (b). Also, the response given in part (b) (ii) was incorrect.

2.2.3 Question 7: Balance of Nature

The question had three parts: (a), (b) and (c). In part (a), students were required to explain briefly why food chain is considered to be a simple transfer of energy. In part (b), students were required to construct four possible food chains using the following organisms: Grasses, Lion, Bacteria, Zebra, Hyena and Giraffe. In part (c), students were required to explain the role played by (i) Bacteria and (ii) Grasses in the food chains constructed in 7(b).

Data show that out of 570,606 students who attempted this question, 382,877 (67.1%) scored from 0 to 2 marks. The students who scored from 3 to 6 marks were 113,550 (19.9%) whereas, 74,179 (13.0%) scored from 7 to 10 marks. Figure 7 summarizes the students' performance in question 7.

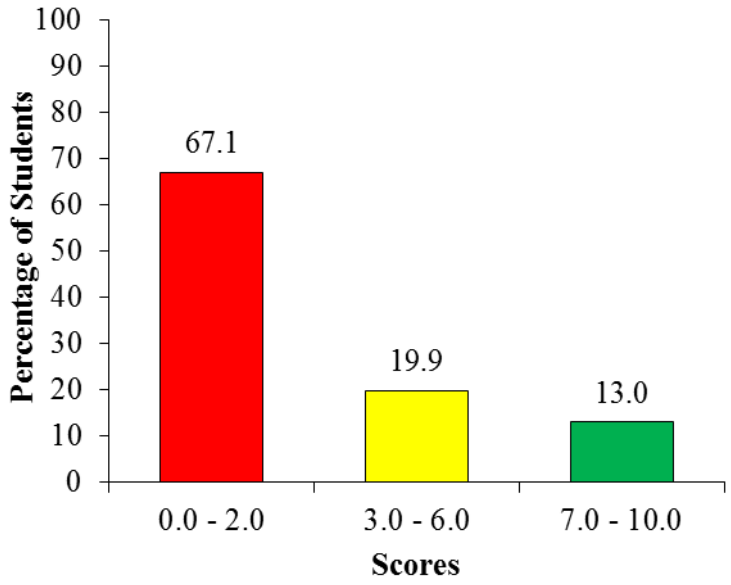
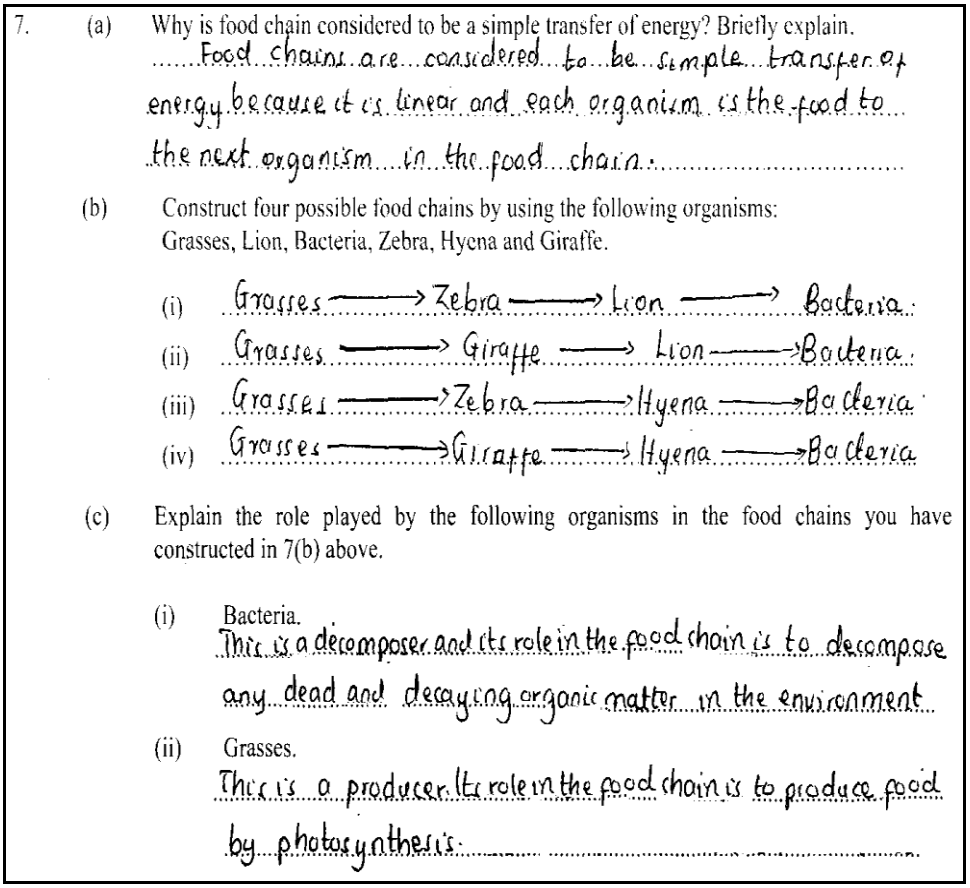


Figure 7: *Summary of the students' performance in question 7.*

The analysis shows that the students' performance in this question was average since 187,729 (32.9%) scored from 3 to 10 marks. The students who scored 3 to 6 marks were 113,550 (19.9%). Most of them correctly did part (a) and (c) but wrote incorrect responses in part (b). Some of them managed to construct 1 or 2 correct food chains hence obtained an average score. The students who performed well (13.0%) in part (a) correctly explained why food chain is considered to be a simple transfer of energy. In

part (b), the students correctly constructed four possible food chains. In part (c), they correctly explained the role played by (i) Bacteria and (ii) Grasses in the food chains constructed in 7(b). This indicates that the students had adequate knowledge of food chain and food web. Extract 6.1 illustrates a sample of students' good response.


7. (a) Why is food chain considered to be a simple transfer of energy? Briefly explain.

Food chains are considered to be simple transfer of energy because it is linear and each organism is the food to the next organism in the food chain.

(b) Construct four possible food chains by using the following organisms: Grasses, Lion, Bacteria, Zebra, Hyena and Giraffe.

(i) Grasses → Zebra → Lion → Bacteria.

(ii) Grasses → Giraffe → Lion → Bacteria.

(iii) Grasses → Zebra → Hyena → Bacteria

(iv) Grasses → Giraffe → Hyena → Bacteria

(c) Explain the role played by the following organisms in the food chains you have constructed in 7(b) above.

(i) Bacteria.
This is a decomposer and its role in the food chain is to decompose any dead and decaying organic matter in the environment

(ii) Grasses.
This is a producer. Its role in the food chain is to produce food by photosynthesis.

Extract 6.1: An example of student's good response in question 7.

In Extract 6.1, the student correctly explained why food chain is considered to be a simple transfer of energy in part (a). The student correctly constructed four possible food chains in part (b). Also, in part (c), the student correctly explained the role played by (i) Bacteria and (ii) Grasses.

Conversely, 382,877 (67.1%) students in this question scored 0 - 2 marks. Some of the students were not able to correctly explain why food chain is considered to be a simple transfer of energy. For example, in part (a), some students explained the significance of food chain and food web as *it*

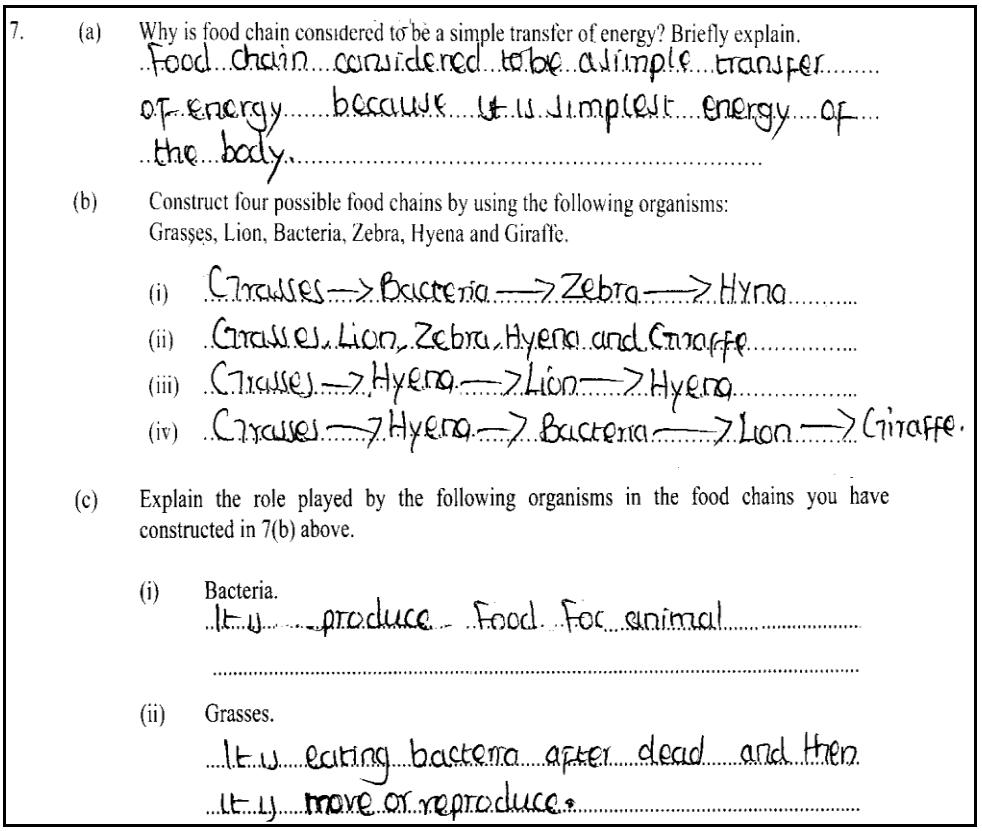
facilitate mineral circulation in the ecosystem, It enable energy from the sun to be processed and used by organisms. Others regarded it as food web and they wrote; *it is a net work of food chains.* Other incorrect responses given by the students were; *it shows consumers and producers, it is decomposer, it simplifies transfer of energy in organisms.* These responses show that the students lacked clear understanding of food chain and food web.

Likewise in part (b), some students failed to construct four possible food chains. Most of them failed to locate the organisms into correct trophic levels and therefore ended to incorrect food chain. They did not understand that a food chain starts with a producer followed by primary consumer then secondary consumer and finally decomposers. Others placed the organisms in their correct trophic levels but used lines ——— to show flow of energy instead of the arrow ⟶ . These students failed to understand that the arrow ⟶ means eaten by as shown in the following food chain.

Grasses ⟶ zebra ⟶ lion ⟶ bacteria

Others did not understand the demand of the question as they constructed food webs instead of food chains. These responses indicate that the students lacked clear understanding of the food chain and food web.

Furthermore, in part (c), some students gave incorrect responses. For example, one student wrote the role of bacteria as a pathogen as *a disease-causing agents* and grasses as *plants living on the soil top.* Another student stated that; *grasses are organisms found in land* and bacteria; as *the producer of food chain*. Other students stated that; *grasses are organisms belonging to Kingdom Plantae* and bacteria; *as organisms of Kingdom Monera*. This shows that, they had insufficient knowledge about the subtopic of food chain and food web which is taught under the topic of Balance of Nature. Extract 6.2 is a sample of a student's poor responses.


7. (a) Why is food chain considered to be a simple transfer of energy? Briefly explain.

Food chain considered to be a simple transfer of energy because it is simplest energy of the body.

(b) Construct four possible food chains by using the following organisms: Grasses, Lion, Bacteria, Zebra, Hyena and Giraffe.

(i) Grasses → Bacteria → Zebra → Hyna

(ii) Grasses, Lion, Zebra, Hyena and Giraffe

(iii) Grasses → Hyena → Lion → Hyena

(iv) Grasses → Hyena → Bacteria → Lion → Giraffe.

(c) Explain the role played by the following organisms in the food chains you have constructed in 7(b) above.

(i) Bacteria.

It is produce Food for animal

(ii) Grasses.

It is eating bacteria after dead and then it is move or reproduce.

Extract 6.2: An example of student's poor response in question 7.

In Extract 6.2, the student incorrectly explained why food chain is considered to be a simple transfer of energy in part (a). The student did not use arrow in part (b) (ii) but even for the parts ((i), (iii) and (iv)) where the arrow is used, the organisms are not correctly placed in their trophic levels hence incorrect food chains. Also in part (c), the student wrote incorrect responses.

2.2.4 Question 8: Nutrition

The question had three parts: (a), (b) and (c). The question asked: *2 cm^3 of a food sample solution Q changed to purple colouration when 1 cm^3 of sodium hydroxide followed by 2 - 3 drops of copper II sulphate solution were added to it. (a) Identify a food substance present in the solution Q, (b) State two functions of the food substance present in the solution* Q, (c) *Give five natural sources of food substance contained in the solution Q.*

A total of 570,606 students attempted this question. The analysis of students' performance shows that 493,004 (86.4%) students scored from 0 to 2 marks out of the 10 marks allocated to this question. Students who scored from 3 to 6 marks were 30,812 (5.4%) and those who scored from 7 to 10 marks were 46,790 (8.2%). Figure 8 summarizes the students' performance in question 8.

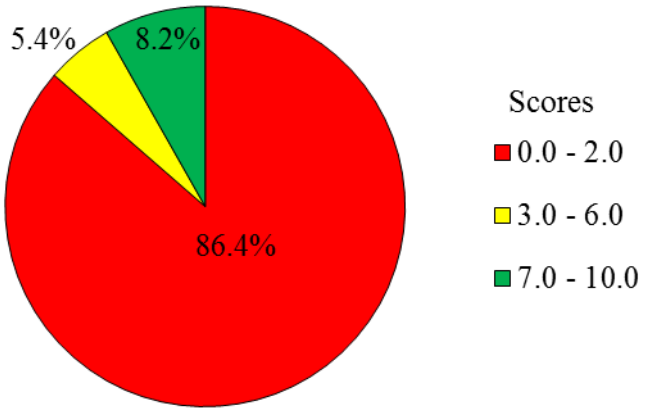


Figure 8: *Summary of the students' performance in question 8.*

The trend of performance indicated in Figure 8 shows that 86.4 percent of the students obtained low (0 - 2) marks. These students wrote incorrect responses in all parts of the question. Most of the responses given by these students were contrary to the demands of the question. For instance, in part (a), most of the students wrote incorrect foods such as, *starch*, *reducing sugar* and others wrote *lipids, non reducing sugar, mineral salts,* and *vitamins.* These students failed to understand that the procedure given for testing the food present in solution Q was for protein therefore, food present was protein.

Likewise, in part (b), some students failed to state two functions of the food substance present in the solution Q. For example, some students wrote the functions of vitamins as *it protects the body against diseases.* Others wrote the functions of roughage as *it prevent constipation* and *it aids peristalsis.* Others wrote the functions of lipids and minerals salts instead of the

functions of protein. Others skipped this part indicating that they had inadequate knowledge of the food tests.

Furthermore, in part (c), some students wrote incorrect natural sources of food substance contained in the solution Q. The students wrote incorrect responses such as, *maize, sweet potatoes, irish potatoes* and *cocoyams*. Others wrote sources of vitamins as, *pineapples, cucumber, oranges* and *jackfruit*. Others wrote the types of food substance as *carbohydrate, lipids, protein, vitamins* and *mineral salts* instead of sources of protein such as milk, eggs, fish, beans, peas, meat, groundnuts etc. These responses show that the students had inadequate knowledge of properties of food substances specifically food tests. Extract 7.1 is a sample of a student's poor response.

8. 2 cm^3 of a food sample solution **Q** changed to purple colouration when 1 cm^3 of sodium hydroxide followed by 2-3 drops of copper II sulphate solution were added to it.

(a) Identify a food substance present in the solution **Q**.

Carbohydrate

(b) State two functions of the food substance present in the solution **Q**.

(i) Makes our body strong.

(ii) Provide energy to our body.

(c) Give five natural sources of food substance contained in the solution **Q**.

(i) Cassava

(ii) Yams

(iii) Wheat flour

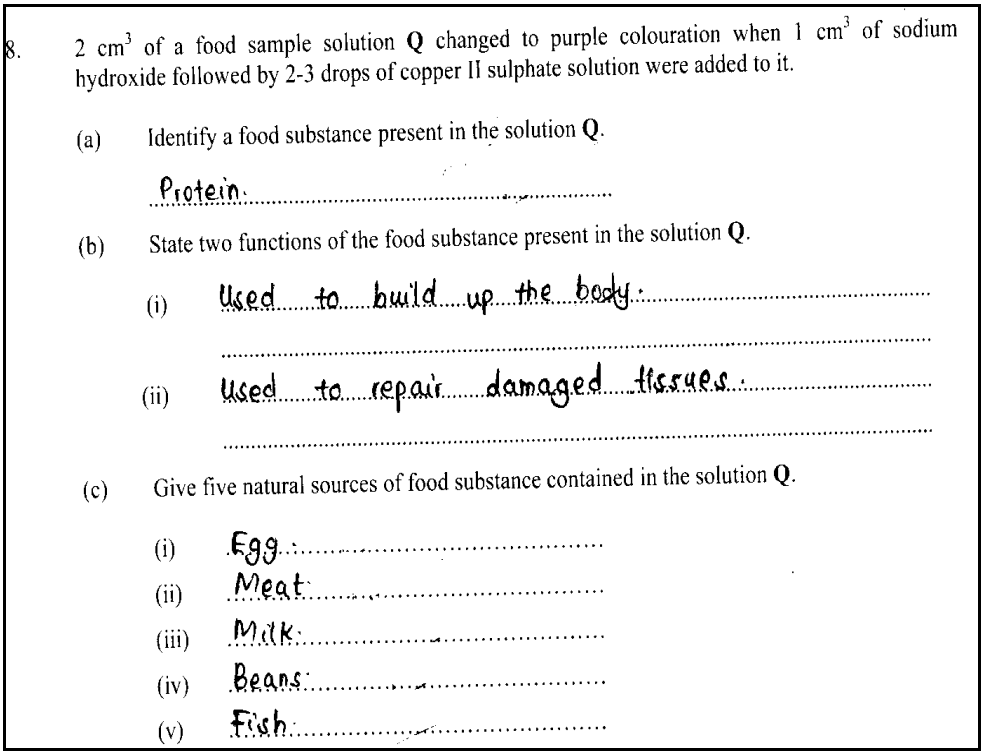
(iv) Rice

(v) Bananas

Extract 7.1: An example of student's poor response in question 8.

In Extract 7.1, the student wrote *carbohydrate* instead of *proten* in part (a). The student wrote the *functions of carbohydrate* instead of *proteins* in part (b). Also, he/she gave sources of carbohydrate instead of protein in part (c).

Conversely, 46,790 (8.2%) students performed well in this question. They wrote correct responses in all the parts. This indicates that the students had adequate knowledge of food tests. Extract 7.2 is a sample of a student's good response.


8. 2 cm^3 of a food sample solution **Q** changed to purple colouration when 1 cm^3 of sodium hydroxide followed by 2-3 drops of copper II sulphate solution were added to it.

(a) Identify a food substance present in the solution **Q**.

Protein.

(b) State two functions of the food substance present in the solution **Q**.

(i) Used to build up the body.

(ii) Used to repair damaged tissues.

(c) Give five natural sources of food substance contained in the solution **Q**.

(i) Egg.
(ii) Meat.
(iii) Milk.
(iv) Beans.
(v) Fish.

Extract 7.2: An example of student's good response in question 8.

In Extract 7.2, the student correctly identified the food present in solution Q in part (a). The student correctly stated the functions of the food identified and gave natural sources of the food in parts (b) and (c), respectively.

2.2.5 Question 9: Safety in Our Environment

The question had two parts: (a) and (b). In part (a), students were required to state the use of the following components of the First Aid Kit: (i) Cotton wool (ii) New razor blade (iii) Soap (iv) Iodine tincture. In part (b), the

students were required to give four importance of providing First Aid to a person who has been bitten by a snake.

Data analysis shows that out of 591,685 students who attempted this question, 256,791 (43.4%) scored from 0 to 2.5 marks out of 10 marks allocated to this question. The students who scored from 3 to 6 marks were 173,364 (29.3%) whereas 161,530 (27.3%) scored from 6.5 to 10 marks. Figure 9 summarizes the students' performance in question 9.

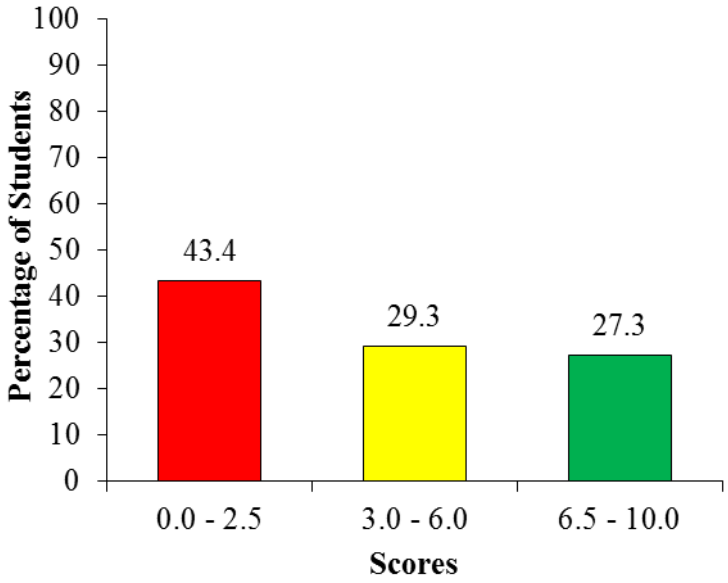


Figure 9: *Summary of the students' performance in question 9.*

Based on the data in Figure 9, the general performance in this question was average because 56.6 percent of the students scored 30 percent and above of the 10 marks allocated to this question. Despite the average performance, 27.3 percent of the students performed well in this question as they scored higher marks. These students correctly stated the use of the components of First Aid Kit: (i) Cotton wool (ii) New razor blade (iii) Soap and (iv) Iodine tincture in part (a). Also, they correctly gave the importance of providing First Aid to a person who has been bitten by a snake in part (b). These responses show that the students had adequate knowledge about First Aid. Extract 8.1 is a sample of a student's good response.

9. (a) State the use of the following components of First Aid kit.

(i) Cotton wool

used for cleaning and drying wounds.

(ii) New razor blade

used for cutting dressing materials.

(iii) Soap

washing hands and other equipments after first aid.

(iv) Iodine tincture

used to clean fresh cuts and wounds to kill germs.

(b) Give four importance of providing First Aid to a person who has been bitten by a snake.

(i) It saves life.

(ii) It gives hope to the victim.

(iii) It removes fear of death.

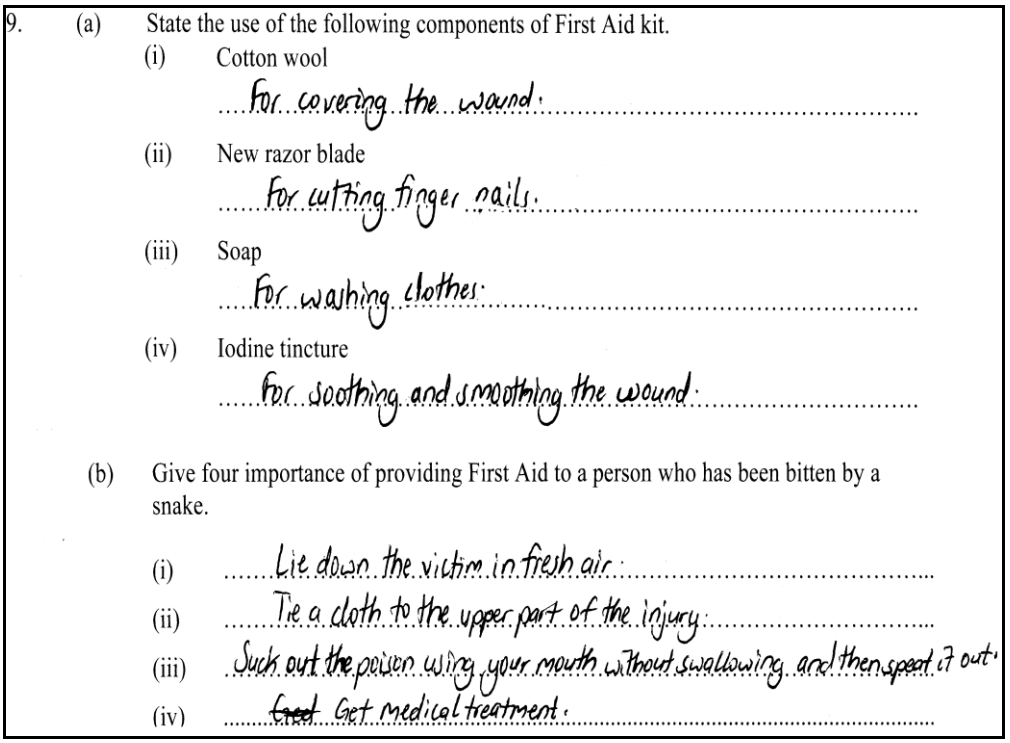
(iv) It prevents spread of venom in the body of the victim.

Extract 8.1: An example of student's good response in question 9.

In Extract 8.1, the student correctly stated the use of the components of First Aid Kit given in part (a). Also, the student correctly gave the importance of providing First Aid to a person who has been bitten by a snake in part (b).

However, 43.4 percent of the students scored low marks. These students wrote incorrect responses almost in all parts of the question. For example in part (a) (i), some students wrote the use of *cotton wool* as the use of a spatula; *cotton wool is used to measure powder or crystalline substances.* In (ii) and (iii), they wrote the general uses of the components as *New razor blade is used for shaving, soap is used for washing utensils* instead of their use in providing First Aid. In (iv) some of the students wrote the use of iodine tincture as a food test reagent as they wrote *iodine tincture* is *used to test for starch in a food test*. All these responses show that students had inadequate knowledge on First Aid specifically components used during First Aid process.

Similarly, in part (b), some students wrote the importance of providing First Aid as *it reduce boundary of a victim, it gives fresh air, to wake up the victim, to close up the injury, to check security of victim.* This is an indicator that students lacked clear understanding of First Aid. Extract 8.2 is a sample of a student's poor response.


9. (a) State the use of the following components of First Aid kit.

(i) Cotton wool

For covering the wound.

(ii) New razor blade

For cutting finger nails.

(iii) Soap

For washing clothes.

(iv) Iodine tincture

For soothing and smoothing the wound.

(b) Give four importance of providing First Aid to a person who has been bitten by a snake.

(i) Lie down the victim in fresh air.

(ii) Tie a cloth to the upper part of the injury.

(iii) Suck out the poison using your mouth without swallowing and then spead it out.

(iv) ~~Feed~~ Get medical treatment.

Extract 8.2: An example of student's poor response in question 9.

In Extract 8.2 the student wrote the use of plaster/bandage instead of cotton wool in (i). He/she wrote the daily uses of razor blade and soap instead of their use as First Aid components in (ii) and (iii). Also, he/she wrote the use of petrolleum jelly instead of iodine tincture in (iv). In part (b), the student did not understand the demand of the question and therefore wrote the procedures instead of the importance of providing First Aid to a person who has been bitten by a snake. Moreover, the procedures given were incorrect.

2.3 Section C: Essay Questions

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

2.3.1 Question 10: Classification of Living Things

This question required the students to describe two merits and two demerits of each of the artificial and natural systems of classification.

Data show that out of 242,009 (44.4%) students who attempted this question, 213,210 (80.8%) scored from 0 to 5.5 marks out of which 66.0 percent scored 0 mark. The students who scored from 6 to 12.5 marks were 20,329 (10.5%) whereas 8,470 (8.7%) scored from 13 to 20 marks. Figure 10 summarizes the performance of the students in this question.

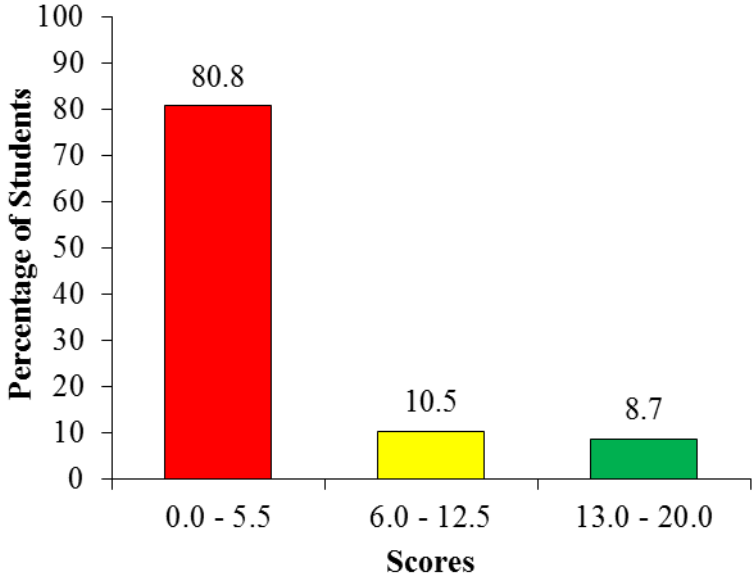


Figure 10: *Summary of the students' performance in question 10.*

Figure 10 shows that students' performance in this question was weak since 80.8 percent scored 0 – 5.5 marks out of the 20 marks allocated to this question. The students who scored low marks gave an incorrect introductory part and outlined incorrect points which led to loss of marks. In addition to that, some students failed to write the conclusion. In the introduction, they were required to define the terms artificial and natural systems of classification but most students did not define them and even those who managed to define gave incorrect definitions. Others had correct responses but interchanged them. Some of the incorrect responses observed in the students' scripts in the introduction include; *natural classification is the system of grouping organisms according to observable features, artificial classification is the system of grouping organisms that use*

internal features. Likewise, another student gave the following definition; *natural classification is the system of grouping organisms to observable features, artificial classification is the system of grouping people to observable features*. Another student defined natural classification as classification and artificial as nomenclature as *natural classification is the process of grouping organisms according to their similarities and difference and artificial classification is the system of assigning scientific names to organisms.* Other incorrect responses given by the students were; *artificial classification is a type of classification which based to internal individual skill, natural classification is the type classification which based on external advanced skills of classification*.

In the main body, the students were required to write the points and give explanation for it. The analysis shows that some wrote incorrect points while others wrote correct points but failed to give explanation which led them to score low marks. Examples of incorrect responses observed in students' scripts were, *artificial classification is expensive, it consumes time and need high skill*. *Natural classification*; *it has less cost, it does not consume time and it does not use more skills*. Another student wrote the importance of classification as the merits of natural classification as *it makes the study of living things easy, it enables scientist to make predictions.* All these responses imply that the students had inadequate knowledge on the concept of classification systems. The students also wrote incorrect conclusion for instance, *In general all in all is all about merits and demerits of using natural and artificial classification*. Another student wrote, *as I have written above those are the merits and demerits of natural and artificial classification.* Extract 9.1 is a sample of a student's poor response.

10. Describe two merits and two demerits of each of the artificial and the natural systems of classification.

11. Explain the importance of transport of materials in animals. Give six points.

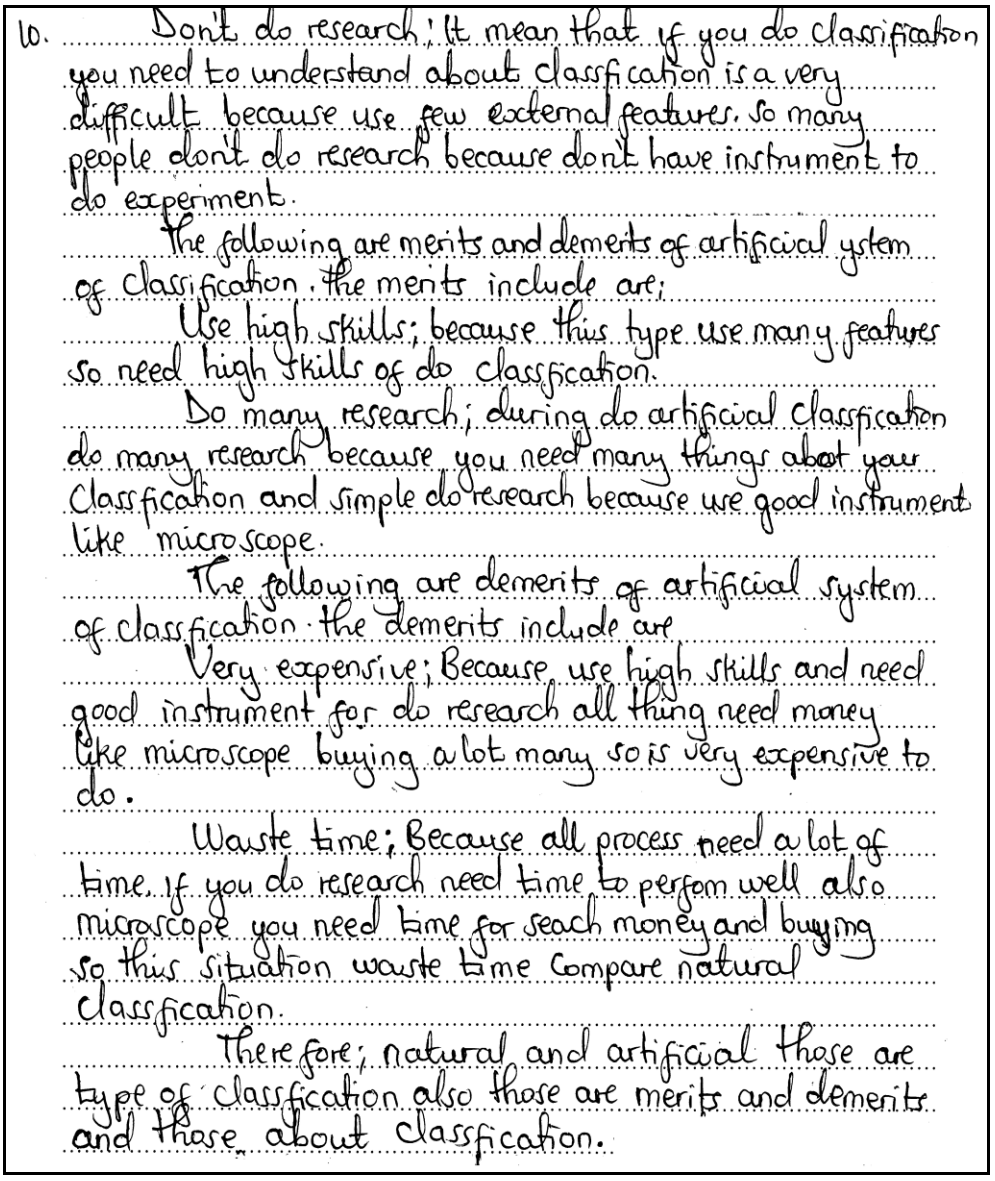
10. Classfication is the process of grouping organism based their similarities and different. Classfication is important because help to know group of bird and other group; also there are type of classfication which are; artificial classfication and natural classfication. Those type of classfication there are imerits and demerits. The following are merits and demerits of the natural classfication.

Don't waste time; natural don't waste time because use few external features so this is merits because use simple way.

Not expensive; Because use simpe part eg: wings So this is cheap because you seen organism like have legs eyes etc so you see what you need during classfication.

The following are demerits of natural system of classfication include are;

Don't use high skills; this is because do classfication for looking so this problem, sometimes bird have characterized like animals so don't know if a birds a have group of animals or birds. So this situation need high skills for get answers of this ~~on~~ question and need good instrument


10. Don't do research ; It mean that if you do classification you need to understand about classfication is a very difficult because use few external features. so many people don't do research because don't have instrument to do experiment.

The following are merits and demerits of artificial ystem of classification . the merits include are;

Use high skills; because this type use many features so need high skills of do classfication.

Do many research; during do artificial classfication do many research because you need many things abat your Classfication and simple do research because use good instrument like microscope.

The following are demerits of artificial system of classfication . the demerits include are

Very expensive; Because use high skills and need good instrument for do research all thing need money like microscope buying a lot many so is very expensive to do.

Wauste time; Because all process need a lot of time. if you do research need time to perfom well also microscope you need time for seach money and buying so this situation wauste time Compare natural classfication.

Therefore; natural and artificial those are type of classfication also those are merits and demerits and those about classfication.

Extract 9.1: An example of student's poor response in question 10.

In Extract 9.1, the student defined classification instead of artificial and natural systems in the introduction. Also, in the main body he/she interchanged the merits and demerits of the artificial and natural systems and wrote incorrect conclusion.

Despite the weak performance in this question, 8.7 percent of the students had good performance. These students correctly described the merits and demerits of each of the artificial and natural systems of classification. They organized their responses in essays having introduction, main body and the conclusion. This indicates that the students had adequate knowledge of the topic of Classification of Living Things specifically Classification systems. Extract 9.2 illustrates a response from the student who correctly answered the question.

10. Describe two merits and two demerits of each of the artificial and the natural systems of classification.

10) Classification systems are divided into two types which are Natural system and artificial system.

Natural system of classification is a system of classification that classify organisms by using both internal and external features.

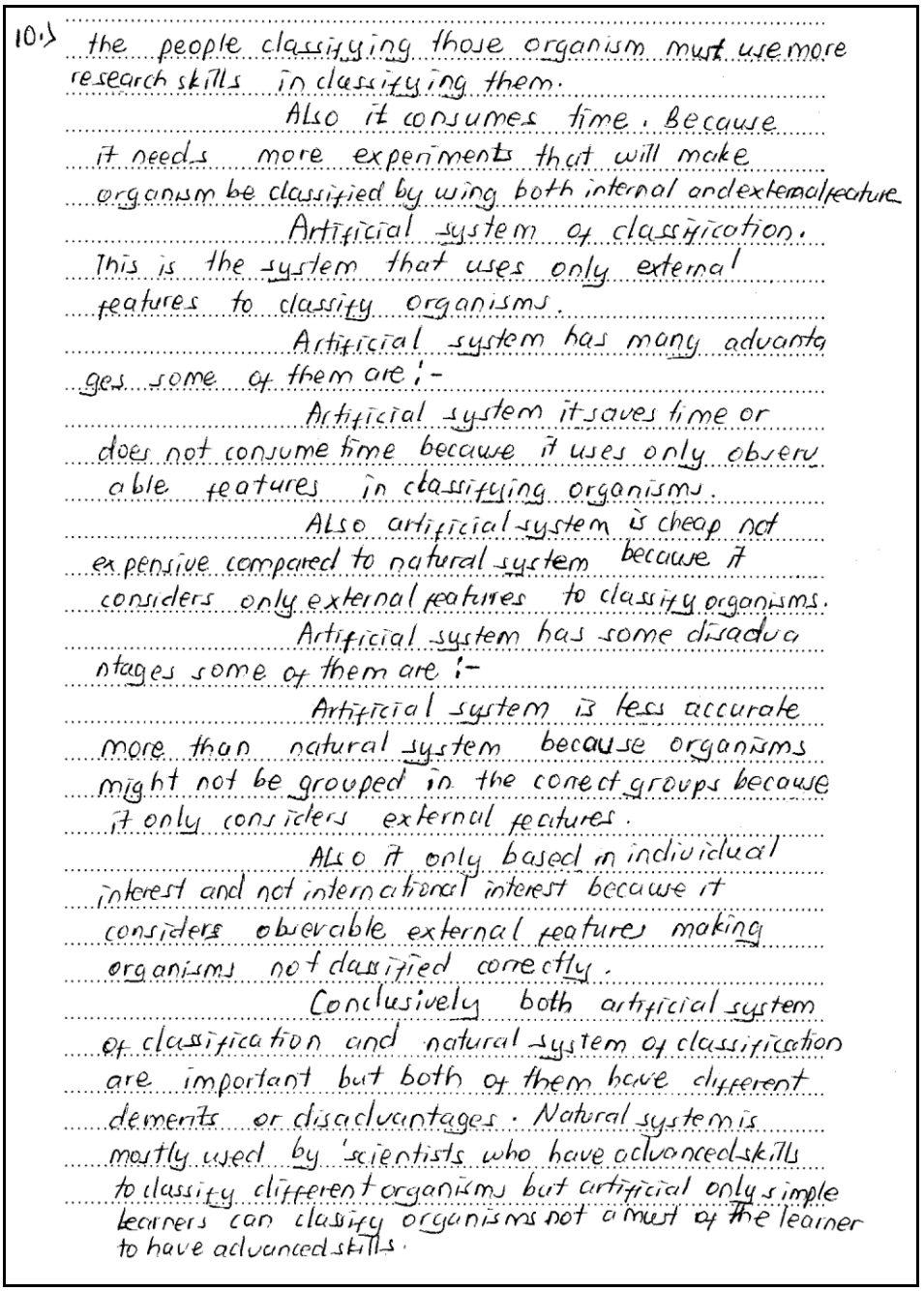
Natural system have many advantages some of them are:-

Natural system of classification is more accurate because it considers both internal and external features.

Natural system of classification is international interest because it uses more advanced skills making organisms classified correctly.

Also natural system have disadvantages some of them are:-

It is so expensive. This is because it requires more advanced research skills and it uses more time in classifing organisms correctly.


10.) the people classifying those organism must use more research skills in classifying them.
Also it consumes time. Because it needs more experiments that will make organism be classified by wing both internal and external feature.
Artificial system of classification.
This is the system that uses only external features to classify organisms.
Artificial system has many advantages some of them are;-
Artificial system it saves time or does not consume time because it uses only observable features in classifying organisms.
Also artificial system is cheap not expensive compared to natural system because it considers only external features to classify organisms.
Artificial system has some disadvantages some of them are;-
Artificial system is less accurate more than natural system because organisms might not be grouped in the corect groups because it only considers external features.
Also it only based in individual interest and not international interest because it considers observable external features making organisms not classified correctly.
Conclusively both artificial system of classification and natural system of classification are important but both of them have different demerits or disadvantages. Natural system is mostly used by 'scientists who have advanced skills to classify different organisms but artificial only simple learners can classify organisms not a must of the learner to have advanced skills.

Extract 9.2: An example of student's good response in question 10.

Extract 9.2 shows a response of a student who was knowledgeable enough to describe two merits and two demerits of each of the artificial and natural systems of classification. The student also had a good command of the English Language and good essay writing skills.

2.3.2 Question 11: Transport of Material in Living Things

The question asked: *Explain the importance of transport of materials in animals. Give six points.*

The question was attempted by 303,014 (55.6%) students. Data show that 266,955 (88.1%) students scored from 0 to 5 marks out of which 63.0 percent scored 0 mark, 25,453 (8.4%) scored from 6 to 12 marks whereas, 10,606 (3.5%) scored from 13 to 20 marks out of 20 marks allocated to this question. Figure 11 summarizes the performance of students' in this question.

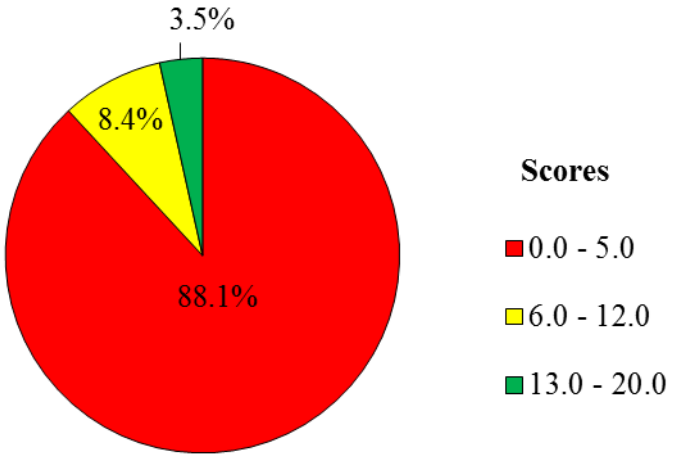


Figure 11: *Summary of the students' performance in question 11.*

The trend of performance indicated in Figure 11 shows that 88.1 percent of the students obtained 0 - 5 marks out of 20 marks allocated to this question. These students had either little or no knowledge of the tested concept which led them to write incorrect responses. In the introduction, students were required to define Transport of materials in animals. Most of the students gave a general definition of transportation of people or goods such as; *Transport is the movement of organism from one place to another, Transport is the ability to travel from one place or another using cows, cars and railway, Transport is the movement of animals from one place to another place, Transport is the process whereby people or animal move from one place to another.*

In the main body, students were required to mention a point and give explanation for it. The analysis shows that some of the students wrote incorrect points while others outlined 1 to 3 correct points without explanations. Some of the students gave explanations which lacked clarity while others gave incorrect explanation and hence obtained low marks. Further analysis shows that there were students who failed to understand the demand of the question. They explained the importance of various food substances in the human body such as *carbohydrate is a source of energy in the body* and *protein-build and repair the body*. Others explained the importance of studying Biology such as, *It helps man to understand himself better* and *It help us to understand the characteristics of living things*. Others explained the importance of blood transfusion such as, *it is used to treat diseases such as sickle cell anaemia, It ensures replacement of blood due to accidents* instead of the importance of transport of materials in animals.

In addition, they also wrote incorrect conclusion such as; *Generally, those were the importance of transport of materials in animals but there were limitation like causing disease, cause death because many materials that have been taken*. Another student incorrectly concluded that; *Therefore transport is very important in our lives such that they provide food*. All these responses imply that the students had inadequate knowledge on the concept of Transport of Materials inL Things. Extract 10.1 is a sample of a student's poor response.

11. Explain the importance of transport of materials in animals. Give six points.

Question 11.

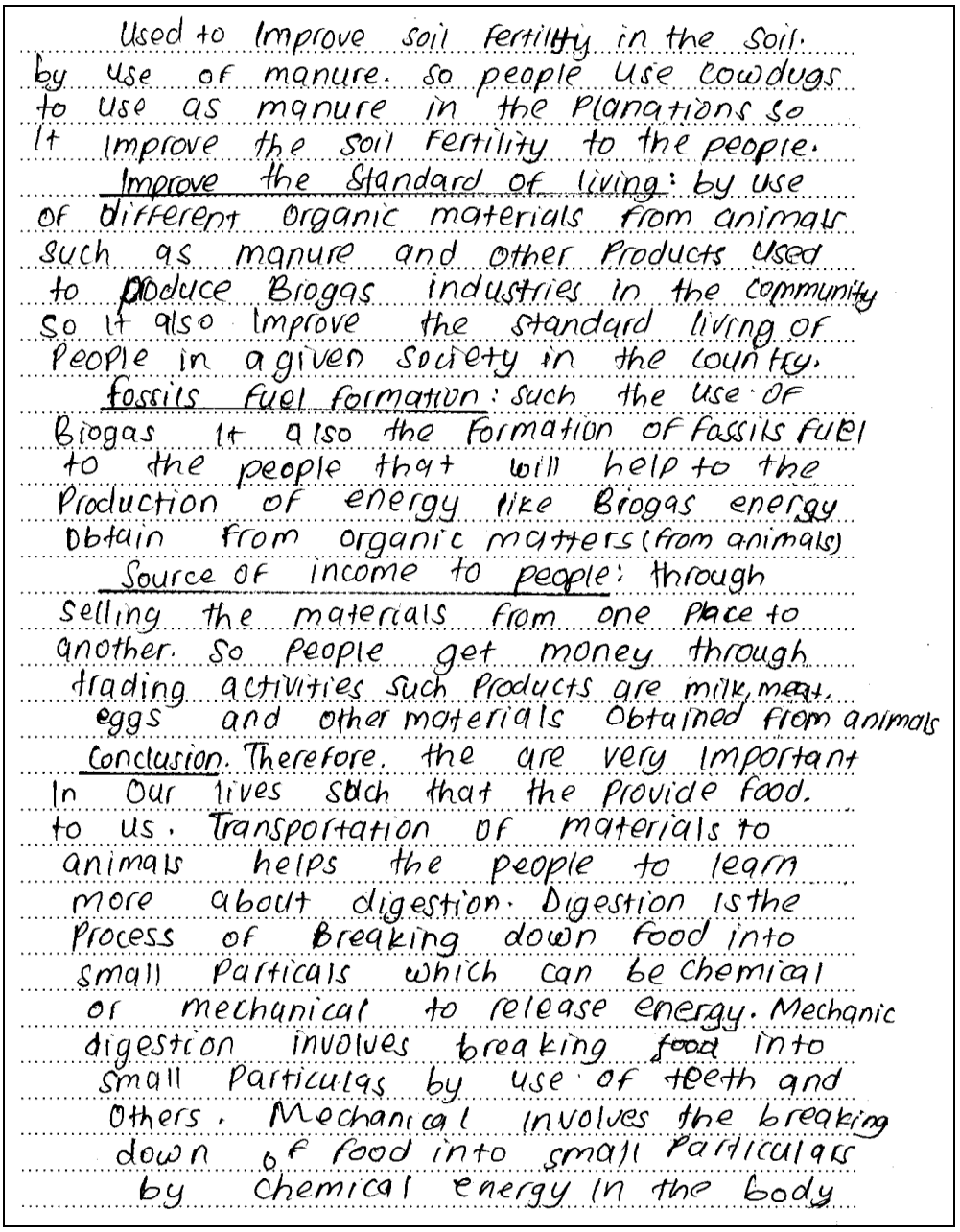
IMPORTANCE OF MATERIAL IN ANIMALS.

In transportation of materials in animals- means that transportation of food to animals such as Cows. They chew food (grass) by some time the grass is not chewed well so the th- food is Chyme so it has to be chewed again in the mouth. The following are Importan of transportation of materials in animals.

Source of food. The materials we get from animals are used as foods such grass to cows, milk, meat to People and others. So some materials are used as source of food.

Biogas Production: After the food being digested. The people take the wastes in orde to obtain Biogas. so People get the material to make biogas industries.

Manufacturing dairy products such as milk, and othe products like meat. eggs which we get from animals. the product are Obtained as Raw materials.


Used to Improve soil fertility in the soil. by use of manure. so people use cowdugs to use as manure in the planations so it improve the soil fertility to the people.
Improve the Standard of living: by use of different organic materials from animals such as manure and other Products used to produce Biogas industries in the community so it also improve the standard living of People in a given society in the country.
fossils fuel formation: such the use of Biogas it also the formation of fossils fuel to the people that will help to the Production of energy like Biogas energy obtain from organic matters (from animals)
Source of income to people: through selling the materials from one place to another. So people get money through trading activities such Products are milk, meat, eggs and other materials obtained from animals
Conclusion. Therefore. the are very important In Our lives such that the provide food. to us. Transportation of materials to animals helps the people to learn more about digestion. Digestion is the Process of Breaking down food into small particals which can be chemical or mechanical to release energy. Mechanic digestion involves breaking food into small Particulas by use of teeth and Others. Mechanical involves the breaking down of food into small Particulars by chemical energy in the body

Extract 10.1: An example of student's poor response in question 11.

In Extract 10.1, the student explained the importance of animals such as *source of food* and *biogas production* instead of importance of transport of materials in animals.

Conversely, 10,606 (3.5%) students scored from 13 to 20 marks. This shows that these students had adequate knowledge of the tested concepts

which enabled them to score from 13 to 20 marks. Extract 10.2 illustrates a sample of a response from the student who correctly answered the question.

11. Explain the importance of transport of materials in animals. Give six points.

11. Transport of materials in animals is the movement of materials such as food substances and water from one part of the body to another and back. Examples of materials transported are hormones, white blood cells and end products of digestion. They are transported through the blood vessels to the heart which distributes materials to other parts of the body. Transport of materials is done by the circulatory and lymphatic systems. The following are importance of transport of materials in animals :-

Helps in movement of respiratory gases such as oxygen and Carbondioxide. The respiratory gases are made to be available to body cells through transport from the lungs to the heart through the blood vessels. The heart then distributes oxygen to body cells and carbondioxide is expelled through transporting it to the lungs and finally out of the body. Oxygen is used by body cells for respiration and other metabolic processes.

Facilitates the movement of end products of digestion to other body parts. End products of digestion for example amino acids, fatty acids and glycerol and

glucose are transported to the heart through blood vessels. They are then distributed to other body parts for assimilation. For example glucose is used by body cells and provides energy to body cells.

Facilitates movement of white blood cells to the site of infection. White blood cells are produced by the lymph nodes. They are transported through lymph vessels which join at the vena cava to the heart. They are distributed by the heart to the site of infection. White blood cells at the site of infection produce antibodies which kill pathogens.

Helps in excretion of nitrogenous wastes such as urea and excess water. Excess or undigested food nutrients are transported from the digestive system to the excretory system where they are removed from the body. This helps to remove dangerous waste products and reduce health problems such as constipation and bowel cancer.

Facilitates movement of hormones to the site they are needed by the body. Hormones control body activities. They are therefore transported by the circulatory system through blood vessels and distributed to body parts through the heart. For example vasopressin which controls sugar levels. They are therefore made available made available to the sites they are needed through transport.

Distribution of heat. The blood circulatory system helps in the transport of blood throughout the body. Body heat is transported by blood as the blood moves through blood vessels to the heart and back to the body parts. The continous circulation provides the body with heat

In conclusion, transportation in animals is necessary for survival also for body activities such as respiration to take place. However, transportation is affected factors such as sickle-cell anaemia which reduces efficiency of transport of materials in animals.

Extract 10.2 An example of student's good response in question 11.

In Extract 10.2, the student correctly explained the importance of transport of materials in animals. The student had good English Language proficiency and good presentation skills.

3.0 ANALYSIS OF THE STUDENTS' PERFORMANCE PER TOPIC

A total of nine (9) topics were assessed in FTNA 2020 Biology subject. The analysis shows that question 2 which consisted of True and False items derived from the topics of *Cell Structure and Organisation, Health and Immunity, Gaseous Exchange and Respiration, Transport of Material in Living Things, Introduction to Biology, Nutrition, Balance of Nature, Classification of Living Things* and *Safety in Our Environment* had the highest performance of 97.1 percent. Another good performance of 90.6 percent was observed in question 1 which consisted of Multiple Choice Items derived from the topics of *Transport of Materials in Living Things, Nutrition, Gaseous Exchange and Respiration, Classification of Living Things, Balance of Nature, Safety in Our Environment* and *Health and Immunity.* This was followed by question 6 and 3 from the topics of *Health and Immunity* and *Introduction to Biology* with the performance of 72.9 and 65.9, respectively.

The topics with average performance were: *Safety in Our Environment* (56.6%) and *Balance of Nature* (32.9%) which were assessed in question 9 and 7, respectively.

The topics with weak performance were: *Cell Structure and Organisation (21.0%), Classification of Living Things (19.2%), Gaseous Exchange and Respiration (15.2%),* Nutrition *(13.6%)* and *Transport of Materials in Living Things (11.9%)* which were assessed in questions 5, 10, 4, 8 and 11 respectively. Appendix I summarizes the students' performance in FTNA 2020 topic-wise.

In comparing the performance of the students in the years 2019 and 2020 topic wise, the analysis shows that in the FTNA 2020, the performance has improved from weak (15.2%) to good (65.9%) in the topic of *Health and Immunity*. Likewise, the performance has improved from weak (21%) to average (32.9%) in the topic of *Balance of Nature*. This implies that there were some efforts directed toward improving teaching and learning in Biology subject. Moreover, the topic of *Introduction to Biology* maintained

its good performance while *Safety in Our Environment* maintained its average performance. On the other hand, the performance of the topics of *Gaseous Exchange and Respiration* and *Cell Structure and Organisation* has decreased from average in 2019 to weak in 2020 by 15.2 and 21.0 percent, respectively. Conversely, the topics of *Classification of Living Things*, *Transport of Materials in Living Things* and *Nutrition* have maintained the weak performance. The comparison is summarized in Appendix II.

4.0 CONCLUSION

The analysis which was done on the Biology FTNA assessment 2020 shows that, questions which had good performance were 2 (97.1%), 1 (90.6%), 6 (72.9%) and 3 (65.9%). Questions which had average performance were 9 (56.6%) and 7 (32.9%). On the other hand, the questions with poor performance were 5 (21.0%), 10 (19.2%), 4 (15.2%), 8 (13.6%) and 11 (11.9%), respectively. Generally, the performance of the students in Biology assessment for the FTNA 2020 was average since 369,612 (61.52%) students passed. Summary of the performance of students in each topic is shown in appendix I.

The factors which made some of the students fail to score high marks include: failure to understand the demands of the questions and lack of adequate knowledge in the respective topics. On the other hand, the ability to understand the demands of the questions and adequate knowledge about the assessed topics led to good performance.

5.0 RECOMMENDATIONS

With regard to the findings made in Students' Item Response Analysis (SIRA); the following suggestions are put forward to improve the performance in Biology subject in future assessment:

(a) Teachers and students are advised to read the Students' Item Response Analysis report (SIRA). This will enable them to find the factors which affect students' responses and take appropriate measures in the classroom teaching - learning process so as to improve the students' performance.

(b) From time to time, teachers should emphasize students to read questions carefully before answering them in order to understand the demand of the questions and answer them correctly.

(c) For the students to acquire enough competencies of the topics with weak performance the following are recommended:

(i) For the topic of *Transport of Materials in Living Things*, teachers should use charts/photographs/models which show transport of materials in living things. They should guide the students in groups to discuss the concept of transport of materials in living things. Students should present their work and the teacher to guide them to construct the meaning of the concept of transport of materials in living things and brainstorm on the importance of transport of materials in living things.

(ii) For the topic of *Nutrition,* teachers should demonstrate to students how to carry out food test experiments using apparatuses and food test reagents such as Sudan III, Sodium hydroxide, copper II sulphate solution, dilute HCL, iodine solution and Benedict's solution. Then students in groups should carry out food test experiments on the food samples for starch, reducing sugar, non reducing sugar, lipids and proteins. This will enable the students to remember the proper food test for each food type.

(iii) For the topic of *Gaseous Exchange and Respiration*, teachers should provide the students with charts/models of the human respiratory system and guide them through discussion to identify the parts of the human respiratory system and their functions. Also teachers should lead discussion on types of respiration in groups and make clarifications and conclusions.

(iv) For the topic of *Classification of Living Things*, teachers should provide students with charts/pictures of various living things and lead them to brainstorm on classification systems, their merits and demerits. Also, the students should discuss classification systems and their differences then the

teacher should summarize students' responses and give conclusion.

(v) For the topic of *Cell Structure and Organisation,* teachers should design practical work for the students to observe different types of cells. Students in groups should observe charts/models/slides of plants and animal cells. The teacher should lead the discussion on the functions of different parts of a plant and animal cell.

Appendix I

Students' Performance Topic - wise in FTNA – 2020

S/N	Topic	FTNA 2020		
		Question Number	**Percentage of Students who Scored from 30% or above**	**Remarks**
1.	Transport of Materials in Living Things, Nutrition, Gaseous Exchange and Respiration, Classification of Living Things, Balance of Nature, Safety in Our Environment; and Health and Immunity.	2	97.1	Good
2.	Cell Structure and Organisation, Health and Immunity, Gaseous Exchange and Respiration, Transport of Material in Living Things, Introduction to Biology, Nutrition, Balance of Nature, Classification of Living Things and Safety in Our Environment.	1	90.6	Good
3.	Introduction to Biology	6	72.9	Good
4.	Health and Immunity	3	65.9	Good
5.	Safety in Our Environment	9	56.6	Average
6.	Balance of Nature	7	32.9	Average
7.	Cell Structure and Organisation	5	21.0	Weak
8.	Classification of Living Things	10	19.2	Weak
9.	Gaseous Exchange and Respiration	4	15.2	Weak
10	Nutrition	8	13.6	Weak
11	Transport of Material in Living Things	11	11.9	Weak

Appendix II

Comparison of the Students' Performance topic-wise in FTNA 2019 and 2020

SN	Topic	FTNA 2019			FTNA 2020		
		Question number	Percentage of Students With a Score of 30% or Above	Remarks	Question number	Percentage of Students With a Score of 30% or 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	97.1	Good
2	Introduction to Biology, Cell Structure and Organisation, Safety in Our Environment, Health and Immunity, Nutrition, Transport of Material in Living Things and Classification of Living Things	1	93.6	Good	1	90.6	Good
3	Introduction to Biology	6	67.4	Good	6	72.9	Good
4	Safety in Our Environment	9	44.2	Average	9	56.6	Average
5	Gaseous Exchange and Respiration	3	44.0	Average	4	15.2	Weak
6	Cell structure and Organisation	5	34.6	Average	5	21.0	Weak
7	Classification of Living Things	8	26.2	Weak	10	19.2	Weak
8	Transport of Materials in Living Things	11	21.4	Weak	11	11.9	Weak
9	Balance of Nature	4	21	Weak	7	32.9	Average
10	Health and Immunity	7	15.2	Weak	3	65.9	Good
11	Nutrition	10	8	Weak	8	13.6	Weak