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

CANDIDATES' ITEM RESPONSE ANALYSIS REPORT ON THE CERTIFICATE OF SECONDARY EDUCATION EXAMINATION (CSEE) 2020

BIOLOGY

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033 BIOLOGY

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FOREWORD

The National Examinations Council of Tanzania (NECTA) is pleased to issue the Candidates' Item Response Analysis report (CIRA) for Certificate of Secondary Education Examination (CSEE) 2020 in Biology subject. The examination was conducted in November 2020. The CSEE is a summative evaluation which marks the end of the four years of secondary education. This evaluation among other things, evaluates the knowledge and skills acquired by the candidates in their ordinary secondary education.

The report highlights factors which contributed to the achievements of the candidates as well as the challenges which the candidates faced in attempting the examination questions. The analysis showed that the candidates who performed well were able to identify the demands of the questions, had adequate knowledge, and had good command of the English language. However, the candidates with weak performance failed to understand the demand of the question, had insufficient content knowledge, and poor command of the English language. It is expected that, this report will enable education administrators, school managers, teachers, students, other stakeholders in education and the members of the public in general to identify areas where the candidates had learning difficulties and make improvement.

Moreover, the feedback will help in making decision on how to improve secondary education for good performance in future Biology examinations administered by the Council.

Finally, the Council would like to express its gratitude to the Examination Officers, Examiners and all who participated in the preparation of this report.

Dr. Charles E. Msonde
EXCECUTIVE SECRETARY

1.0   INTRODUCTION

This report focuses on the performance of the candidates who sat for the Certificate of Secondary Education Examination (CSEE) in Biology subject which was held in November 2020. The examination paper comprised questions which were intended to measure candidates' competencies on the content stipulated in the 2010 Biology syllabus. The CSEE Biology paper was set in accordance with the NECTA format issued in 2019.

Data show that, a total of 448,212 candidates were registered of which 435,420 sat for the examination and 240,285 (55.18%) passed. This implies that, the general performance in this subject was average. This performance is lower by 0.8 per cent when compared to the 2019 Biology examination where 232,960 (55.26%) passed.

This report analyses the candidates' responses in 033/1 Biology 1 (Theory Paper) and 033/2 Biology 2 (Actual Practical Paper). The theory paper consisted of fifteen questions divided into sections A, B and C making a total of 100 marks. The practical paper had three (3) alternative papers; 033/2A Biology 2A, 033/2B Biology 2B and 033/2C Biology 2C. Each alternative paper consisted of two short answer questions each weighing 25, marks making a total of 50 marks.

The national examination results were 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, performance in a question was considered to be good, average or weak if the percentage of the candidates who scored 30 percent or more of the marks allocated in a question fell within the range of 65 to 100, 30 to 64, and 0 to 29, respectively. In addition, green, yellow and red colours have been used in charts and appendices to indicate good, average and poor performance, respectively.

The subsequent section of the report analyses the performance of the candidates in each question by describing the demand of the question and candidates' responses. It also highlights misconceptions observed on candidates' responses and spots some possible reasons for the observed misconceptions. The samples of the candidates' responses were inserted as

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extracts to illustrate good and poor responses. In addition, some charts and graphs were used to illustrate candidates' performance in each question.

Generally, the report consists of five main sections which are: introduction, analysis of the candidates' performance per question in 033/1 Biology 1, analysis of the candidates' performance per question in 033/2 Biology 2, analysis of candidate performance in each topic, conclusion and recommendations.

2.0 ANALYSIS OF THE CANDIDATES' PERFORMANCE IN EACH QUESTION IN 033/1 - BIOLOGY 1

This section presents the analysis of the performance of the candidates in each question and item in sections A, B, and C of Biology paper 1. The analysis is as follows:

2.1 SECTION A: Objective Questions

The section consisted of question 1 and 2 which were Multiple Choice and Matching Items, respectively. The candidates were instructed to answer all the questions.

2.1.1 Question 1: Multiple Choice Items

The question consisted of 10 multiple choice items. In these items, the candidates were instructed to choose the correct answer from among the given five alternatives and write its letter besides the item number in the answer booklet provided. The items were constructed from 10 topics, namely; Gaseous Exchange and Respiration, Introduction to Biology, Classification of Living Things, Nutrition, Coordination, Reproduction, Safety in Our Environment, Evolution, Transport of Materials in Living Things and Cell Structure and Organisation.

The analysis of candidates' performance indicates that, out of 436,963 (99.9%) candidates who attempted this question, 155,122 (35.5%) scored from 0 to 2 out of 10 marks allocated to this question. The candidates who scored from 3 to 6 marks were 247,758 (56.7%) and 34,083 (7.8%) scored from 7 to 10 marks. Figure 1 summarizes the candidates' performance in this question.
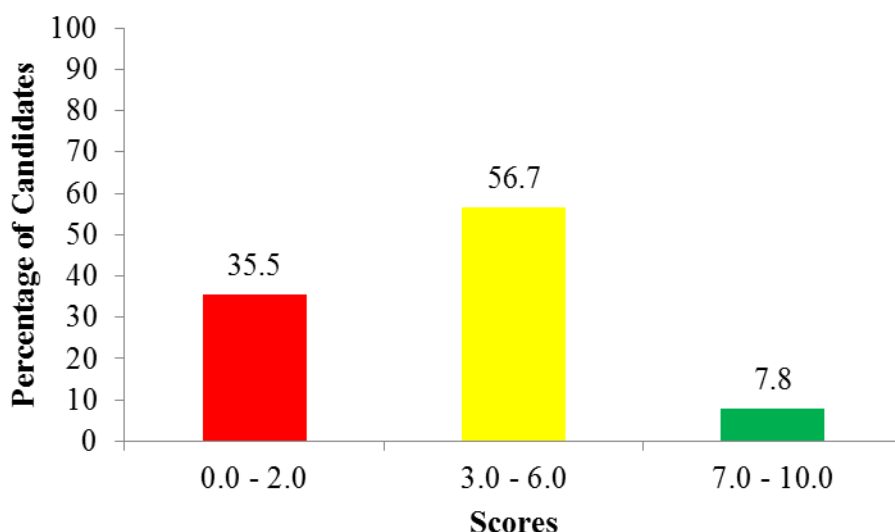
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Figure 1: *Candidates' performance in question 1.*

Based on Figure 1, the general performance on this question was average because 64.5 percent of the candidates scored from 3 to 10 marks. However, among them only 7.8 percent scored from 7 to 10 marks. These candidates had adequate knowledge of the tested topics as the following analysis of the items indicates.

Item (i) *What is the main product of anaerobic respiration in plants?*

    A   Uric acid   B   Lactic acid   C   Water

    D   Alcohol   E   Pyruvic acid

The correct response for this item was alternative *D, Alcohol*. The candidates who chose the correct response *D, Alcohol,* were familiar with the types of respiration. They understood that, in absence of oxygen, plants break down glucose into ethanol (alcohol) and carbondioxide. The candidates who chose *A, Uric acid* were not aware that uric acid is the metabolic waste product of birds, insects and reptiles. Those who chose *B, Lactic acid* did not understand that lactic acid is a main product of anaerobic respiration in animals. Those who selected *C, Water* failed to realize that water is a product of aerobic respiration. Likewise, those who chose *E, Pyruvic acid* failed to understand that pyruvic acid is an end product of the glycolysis process which enters the Krebs cycle if oxygen is present.

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Item (ii) *Suppose you are provided with a small sections of cells from different organisms, which equipment will you use to identify them?*
A Test tube   B Watch glass   C Microscope
D Petri dish   E Beaker

The correct response for this item was alternative *C, Microscope*. The candidates who chose this alternative were familiar with the concept of laboratory apparatuses and their uses. They understood, that a microscope is a laboratory instrument used to examine objects that are too small to be seen by naked eyes. However, those who chose *A, Test tube* failed to understand that a test tube is used for carrying substances for testing, heating or boiling. The candidates who chose incorrect answer *B, Watch glass* failed to understand that it is used as an evaporating surface or cover for beakers. Moreover, those who chose *D, Petri dish* failed to understand that, a petri dish is used to put specimens for close observation also it can be used for growing microorganisms. Likewise, those who selected incorrect response *E, Beaker* did not understand that it is used for mixing substances or measuring liquids.

Item (iii) *In which Phylum do filarial worms belong?*
A Annelida   B Nematoda   C Arthropoda
D Platyhelminthes   E Chordata

The correct response for this item was alternative *B, Nematoda.* The candidates who responded correctly had sufficient knowledge about different phyla found in the Kingdom Animalia and therefore it was easy for them to identify the correct response. Those who chose *A, Annelida* and *C, Arthropoda,* failed to understand that Phylum Annelida consists of organisms such as earthworms and leech while Phylum Arthropoda includes bees, spider, crabs, millipede and centipede. Also, Phylum Platyhelminthes are the flat worms such as tapeworm planaria and liverfluke while Phylum Chordata include the animals with backbone like human beings.

Item (iv) *Which nutritional disorder may result when a person takes larger quantities of carbohydrate than body's requirements?*
A Rickets   B Marasmus   C Beriberi
D Kwashiorkor   E Obesity

The correct response for this item was *E, Obesity*. The candidates who responded correctly to this item had adequate knowledge about nutritional deficiencies and disorders in human beings. They understood that excess carbohydrates in the body is stored as fat thus, leads to obesity. Those who chose *A, Rickets* and *C, beriberi* did not understand that rickets and beriberi are vitamin deficiency diseases caused by lack or insufficiency of vitamins D and B$_1$, respectively. On the other hand, those who chose *B, Marasmus* and *D, Kwashiorkor* did not understand that marasmus is caused by a general lack of adequate amounts of food while kwashiorkor is a protein deficiency disease.

Item (v) *What is the role of a cerebrum in human being?*
>   A   Breathing   B   Sneezing   C   Yawning
>   D   Learning   E   Walking

The correct response for this item was *D, Learning*. The candidates who responded correctly had adequate knowledge about the roles of parts of the human brain. Therefore, they could identify learning as one of the conscious activities controlled by cerebrum. On the other hand, those who chose *A, Breathing, B, Sneezing,* and *C, Yawning*, failed to realize that these are unconscious activities which are controlled by medulla obllongata. Likewise, those who chose *E, Walking* failed to recognize that this is an activity which is controlled by cerebellum.

Item (vi) *In which specific part of female reproductive system is tubal ligation applied as a method of birth control?*
>   A   Oviduct   B   Uterus   C   Cervix
>   D   Ovary   E   Vagina

The correct response for this item was *A, Oviduct*. Candidates who responded correctly to this item indicated possession of adequate knowledge on family planning and contraception methods. They understood that, tubal ligation is a surgical procedure in which the oviducts are permanently blocked by being cut and sealed. Contrary to this, the candidates who selected *B, Uterus* failed to understand that uterus is a muscular sac where implantation of the zygote takes place. Those who selected *C, Cervix* failed to understand that *Cervix* is an opening to the uterus found between vagina and lower part of the uterus. Similarly, those who selected *D, Ovary* failed to recognize that ovary is an organ that produces female gametes and female sex hormones. Furthermore, those who selected *E, Vagina* failed to realize that the vagina is a birth canal. It

is the part at which sperms are deposited during copulation. Also it provides a passageway for blood and mucosal tissue from the uterus during a woman's monthly period.

Item (vii) *Why a faint victim should be laid down with the head lower than the feet when rendering First Aid?*
  A *The body needs minerals*
  B *The brain needs oxygenated blood*
  C *The body needs nutrients*
  D *The lung needs deoxygenated blood*
  E *The victim needs carbon dioxide*

The correct response for this item was *B, The brain needs oxygenated blood.* The candidates who selected the correct response were familiar with the proper procedures of providing First Aid to various victims. They understood that, fainting is caused by lack of oxygen supply to the brain thus, it is important to lift the legs higher than the head to allow constant supply of the oxygenated blood to the brain. Those who selected *A, The body needs minerals* and *C, The body needs nutrients* were not aware that minerals are one of the nutrients required for proper functioning of the body and that their presence or absence in the body does not lead to fainting. Likewise, those who selected *E, The victim needs carbon dioxide* failed to recognize that fainting is caused by inadequate amounts of oxygen in the brain and therefore increased amount of carbon dioxide leads to fainting. On the other hand, those who chose *D, The lung needs deoxygenated blood* failed to realize that deoxygenated blood is blood which contains carbon dioxide.

Item (viii) *Which of the following structures of organisms are homologous?*
  A *Wings of birds and wings of grasshopper*
  B *Forelimbs of man and wings of butterfly*
  C *Wings of houseflies and wings of bat*
  D *Wings of bees and forelimbs of man*
  E *Forelimbs of man and wings of bat*

The correct response for this item was *E, Forelimbs of man and wings of bat.* The candidates who selected the correct response had clear understanding on the concept of homologous structures. Those who chose the responses *A, Wings of birds and wings of grasshopper, B, Forelimbs of man and wings of butterfly, C, Wings of houseflies and wings of bat* and *D, Wings of bees and forelimbs of*

man did not realize that homologous structures are the structures which have the same origin but perform different functions. For that reason, the given structures in options A, B, C and D have different origins but perform the same function thus termed as analogous and not homologous.

Item (ix) *Why is transfusion of blood from a donor with group O to a recipient with blood group AB successful?*
  A   *The recipient's blood has no antibodies*
  B   *The recipient's blood has no antigens*
  C   *The donor's blood has many antigens*
  D   *The donor's blood has many antibodies*
  E   *The recipient's blood has antigen O*

The correct response for this item was *A, The recipient's blood has no antibodies.* The candidates who selected the correct response were familiar with the concept of blood groups and blood transfusion. Those who chose *B, The recipient's blood has no antigens* were not aware that the basis of blood group of different people is the antigens present on their red blood cells and therefore people with blood group AB have antigens A and B. Those who chose *C, The donor's blood has many antigens* and *D, The donor's blood has many antibodies* failed to recognize that the donor's blood (blood group O) has no antigen but has antibody A and B.

Item (x) *Study the following groups of organs and answer the question that follows:*
  (i) Tongue, stomach, liver and the intestine
  (ii) Stomach, tongue, heart and liver
  (iii) Urethra, urinary bladder, ureter and kidney
  (iv) Urinary bladder, kidney, tongue and heart

  Which combination form a system?
   A   *(i) and (ii)*   B   *(i) and (iv)*   C   *(i) and (iii)*
   D   *(ii) and (iv)*   E   *(ii) and (iii)*

The correct response for this item was *C, (i) and (iii).* The candidates who correctly responded to this item had adequate knowledge on the concept of cell differentiation. They understood that tongue, stomach, liver and the intestine make the digestive system while urethra, urinary bladder, ureter and kidney make the urinary system. On the other hand, those who chose *A, (i) and (ii),* did not understand that the heart in (ii), is not part of the

digestive system. Those who chose *B, (i) and (iv),* did not understand that, the tongue in (iv) is part of the digestive as well as nervous system while the heart forms the circulatory system. Those who chose *D, (ii) and (iv),* did not understand that the heart in (ii) forms the circulatory system while tongue and heart in (iv) are not part of the urinary system. Likewise, those who chose *E, (ii) and (iii)* failed to understand that heart in (ii) is not part of the digestive system.

2.1.2 Question 2: Introduction to Biology

The question comprised five matching items which required the candidates to match the functions of the parts of microscope in **List A** with their corresponding parts of microscope in **List B** by writing the letter of the correct response besides the item number in the answer booklet provided.

List A		*List B*	
(i)	*Allows light to pass from the objective lens to the eye piece lens.*	*A*	*Body tube*
		B	*Coarse adjustment knob*
(ii)	*Supports eye piece and revolving nose piece.*	*C*	*Diaphragm*
		D	*Fine adjustment knob*
(iii)	*Raises or lowers the body tube in order to bring the image into a sharp focus.*	*E*	*Hinge screw*
		F	*Mirror*
		G	*Ocular tube*
(iv)	*Raises or lowers the body tube in order to bring image into focus.*	*H*	*Stage clip*
(v)	*Raises and lowers the stage to keep the specimen in right position for observation.*		

Data show that, out of 436,086 (99.7%) candidates who attempted this question, 301,336 (69.1%) scored from 0 to 1 marks out of 5 marks allocated to this question. The candidates who scored from 2 to 3 marks were 102,480 (23.5%) whereas, 32,270 (7.4%) scored from 4 to 5 marks. Figure 2 summarizes the candidates' performance in this question.
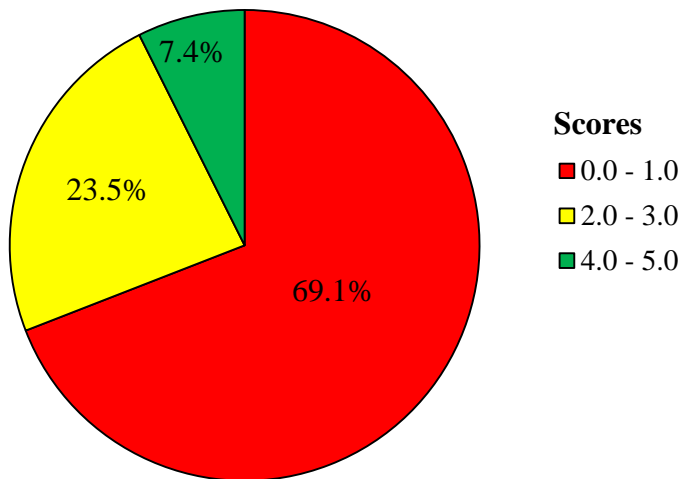
Figure 2: *Candidates' performance in question 2.*

Considering Figure 2, the general performance of candidates' on this question was average as 30.9 per cent scored from 2 to 5 marks. Candidates' average performance on this question was attributed to their moderate knowledge of the concepts tested such that they managed to correctly match some of the items given. Despite the average performance, 7.4 percent of the candidates scored from 4 to 5 marks which is a good performance. This shows that they had sufficient knowledge of the tested concepts. Extract 1.1 illustrates a response from one of the candidates who matched all the phrases correctly.

2.	LIST A	i	ii	iii	iv	v	
	LIST B	G	A	D	B	E	

Extract 1.1: Candidate's good response in question 2.

Extract 1.1 is a response of a candidate who matched all the items correctly.

Further analysis shows that 301,336 (69.1%) candidates who scored lower marks $(0 - 1)$ gave incorrect responses contrary to the requirements of the question. This indicates lack or insufficient knowledge on the tested concepts as the following analysis shows:

Item (i) required the candidates to select a response which correctly matches the description of the part of the microscope which allows light to pass from the objective lens to the eye piece lens. The correct answer was

G, Ocular tube. Most of the candidates wrote alternative *F, Mirror.* These candidates failed to understand that a mirror reflects and directs light to the specimen under observation.

Item (ii) required the candidates to select a response which correctly matches the description of the part of the microscope that supports the eyepiece and revolving nose piece. The correct answer was *A, Body tube.* The candidates who matched it correctly had adequate knowledge of the laboratory apparatuses and their uses.

In item (iii) candidates were required to select a response which correctly matches the description of the part of the microscope that raises or lowers the body tube in order to bring the image into sharp focus. Most of the candidates confused coarse and fine adjustment knobs and therefore they wrote alternative *B, Coarse adjustment knob* instead of *D Fine adjustment knob,* which was the correct answer. These candidates failed to understand that the coarse adjustment knob raises or lowers the body tube in order to bring image into focus and not sharp focus.

Item (iv) required the candidates to select a response which correctly matches the description of the part of the microscope that raises or lowers the body tube in order to bring image into focus. The correct answer was *B, Coarse adjustment knob.* Some of the candidates wrote alternative *D, Fine adjustment knob* while others wrote *H, Stage clip.* The incorrect match indicates lack of clear understanding of the parts of the microscope and their uses.

Item (v) required the candidates to select a response which correctly matches the description of the part of the microscope that raises or lowers the stage to keep the specimen in right position for observation. The correct response was *E, Hinge screw.* Most of the candidates matched it correctly indicating a clear understanding on the parts of the microscope. Those who wrote *C, Diaphragm* failed to understand that the diaphragm regulates the amount of light passing from the mirror to the condenser. Extract 1.2 is a sample of the candidate's poor response.

2.	LIST A	i	ii	iii	iv	v
	LIST B	A	E	F	C	H

Extract 1.2: Candidate's poor response in question 2.

In extract 1.2, the candidate responded incorrectly to all the items of the question.

2.2 SECTION B: Short Answer Questions

This section consisted of 10 short answer questions. The candidates were instructed to answer all questions in this section. The analysis of each question is as follows:

2.2.1 Question 3: Safety in Our Environment

The question had two parts. In part (a) the candidates were required to give three points on how fire accidents can be avoided in the school laboratory. In part (b) the candidates were required to suggest three causes of cut accidents at home.

A total of 420,957 (96.2%) candidates attempted this question. The analysis of candidates' performance shows 320,769 (76.2%) candidates scored from 0 to 1 marks out of which 236,845 (56.3%) scored 0 mark. The candidates who scored from 2 to 3 were 64,407 (15.3%) whereas 35,781 (8.5%) scored from 4 to 6 marks. Figure 3 summarizes the candidates' performance in this question.
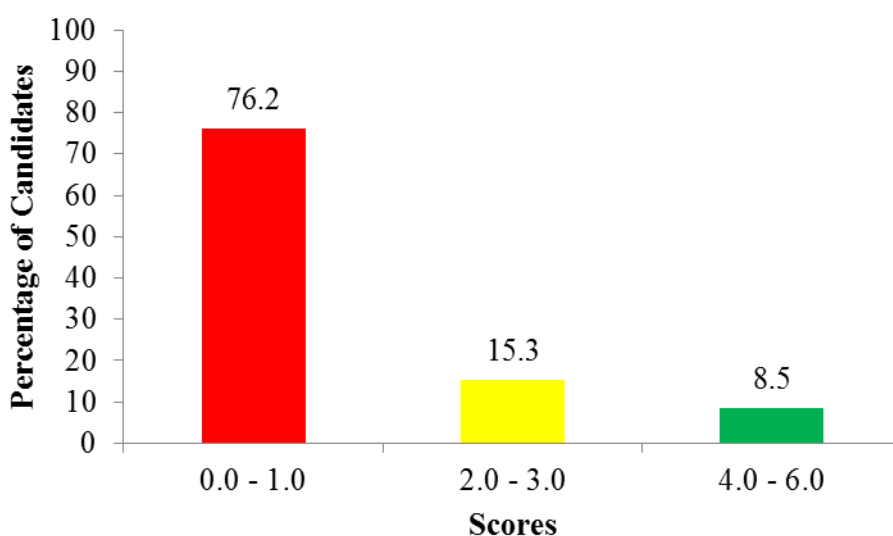

Figure 3: *Candidates' performance in question 3.*

In view of Figure 3, the general performance on this question was weak since 76.2 percent of the candidates scored low (0 - 1) marks. In part (a), it was observed that most of the candidates in this category either failed to give three points on how fire accidents can be avoided in the school laboratory or gave one out of three ways. Most of the candidates gave responses which are contrary to the demand of the question. For example, one candidate wrote laboratory rules such as *Do not use broken apparatus*, *Do not eat, drink or smoke in the laboratory* and *Turn off water taps when not in use.* Another candidate wrote the ways in which fire accident can be caused such as *burning of wastes close to houses at home, smoking cigarrettes in a petrol station* and *leaving the bunsen burners on after use.* Another candidate wrote the qualities of a biology laboratory as ways of avoiding fire accidents such as *a source of water, adequate storage room and proper lighting.* Another candidate wrote ways to extinguish fire such as *By carbon dioxide*, *using sand and water*. However, the candidates were required to give responses such as *Putting fire extinguisher around the school buildings and learning how to use them if fire occurs, Installing fire alarms in the school laboratory, To adhere to the precautions of using flammable substances, Regular checking of electrical installation and switching off all sources of fire (Bunsen burner and cookers) when not in use* as the ways to avoid fire accident in the laboratory.

Similarly, in part (b) of this question, the candidates were required to suggest three causes of cut accidents at home. Most of the candidates who scored less than 2 marks gave 2 to 3 incorect responses. For example, one candidate wrote the ways of preventing fire accident such as *Avoid smoking close to flammable substances, avoid touch electrical tool with wet hand, keep kerosine away from sources of fire.* Another candidate wrote the ways of preventing drowning accident such as *Avoid visit to water body at night, fencing swimming pools and use bridge when crossing rivers.* Another candidate wrote different activities which involve use of sharp objects such as *carpentry work, tailoring work and cooking activities.* Some of the candidates wrote different sharp objects which can cause cut accident such as *knives, slashers*, *razor blades, nail cutter and hand hoe* instead of suggesting three causes of cut accidents at home. These responses show that the candidates had inadequate knowledge about the tested concepts. Extract 2.1 is an example of the candidate's poor responses.

3	(a) Fire accidents be avoided in the school laboratory are i) Openning their windows and door's ii) Take their chemical laboratory and apparatus to their special room . iii) To take their fire-extinqusher to close the fire and are go to take their information institution of their fire.	
	(b) Three causes of cut accidents at home i) Bleeding the are nose ii) Electricity shock iii) Snake bitting the body of human body.	

Extract 2.1: Candidate's poor response in question 3.

In Extract 2.1, the candidate wrote incorrect ways of preventing fire accidents in school laboratory in part (a). Also, he/she outlined the general examples of accidents instead of suggesting causes of cut accidents at home in part (b).

Despite the poor performance, 8.5 percent of the candidates performed well. These candidates managed to give three points on how fire accidents can be avoided in the school laboratory in part (a). Also, they correctly suggested three causes of cut accidents at home. This indicates that these candidates had adequate knowledge about the topic of Safety in Our Environment particularly safety at home and school. Extract 2.2 shows the correct response from one of the candidates.

3.	a) i- Flammable substances should be kept away from source of ignition example bunsen burner.
	ii- Gas tap should be closed after use to avoid fire accidents.
	iii- Oxidant materials also should be properly handled when using source of heat in conducting experiments.
	b) i- The use of broken glass or bottles will cause cuts at home.
	- Walking with barefoot may also cause cut when one steps on broken glasses.
	- The use of sharp object such as knives, razorblades carelessly may also cause cuts at home.

Extract 2.2: Candidate's good response in question 3.

In Extract 2.2, the candidate correctly gave three ways used to avoid fire accidents in the school laboratory in part (a). Also he/she correctly suggested three causes of cut accidents at home.

2.2.2   Question 4: Classification of Living Things

The question required the candidates to explain the structure of tilapia fish by considering the following features; (a) Nature of skeleton (b) Types of scales (c) Position of mouth (d) Tail fin.

A total of 375,199 (85.8%) candidates attempted this question. The analysis indicates that 370, 321 (98.7%) candidates scored from 0 to 1.5 marks out of 6 marks allocated to this question. The candidates who scored from 2 to 3 marks were 3,377 (0.9%) whereas those who scored from 4 to 6 marks were 1,501 (0.4%). Figure 4 summarizes the candidates' performance in this question.
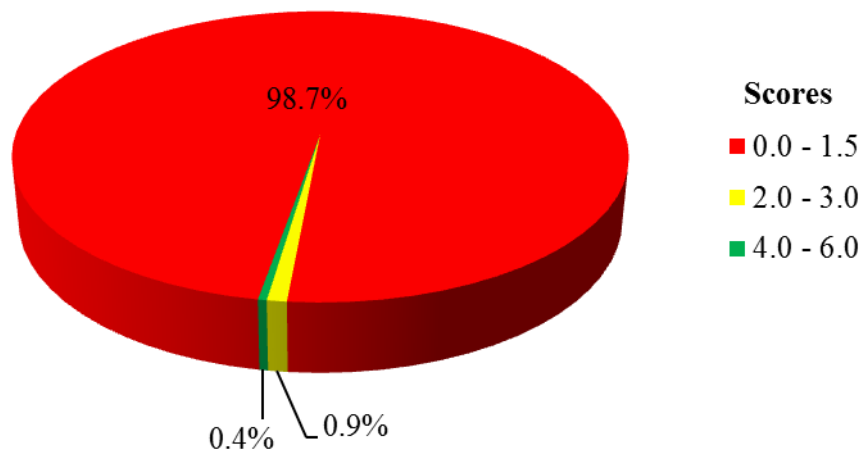
Figure 4: *Candidates' performance in question 4.*

Figure 4 indicates that, the candidates' performance on question 4 was weak since 98.7 percent of the candidates scored low (0-1.5) marks. These candidates wrote incorrect responses in almost all parts of the question. For example, in responding to part (a) some of the candidates wrote types of skeleton such as *endoskeleton, Hydrostatic skeleton* and *exoskeleton.* These candidates failed to recognize that tilapia fish which is found in Class Osteichthyes has *bony skeleton.* Others wrote *cartilaginous skeleton* which is the type of skeleton found in fish in the Class Chondrichthyes such as; sharks. Also, in part (b*),* they wrote the types of fish such as *Tilapia fish has silvered scales(silver fish) , Tilapia fish has lung scales(lung fish), Tilapia fish has ray scales(ray fish) and Tilapia fish has cat scales(cat fish)* instead of the type of scale found in tilapia fish which is cycloid scales. Moreover, one candidate wrote *placoid scales* which are found in shark indicating lack of knowledge on the structure of tilapia fish.

Likewise, in part (c), they incorrectly located the position of the mouth as they wrote different parts of the body. Some of the incorrect responses provided in this part were: *The mouth of tilapia fish is under the head*, *tilapia fish has mouth below nostril, Mouth of tilapia fish is located at the lower part of the eye, tilapia fish has mouth on the head* instead of Tilapia has mouth which is terminally placed which is the correct answer. Similarly, in part (d), some of the candidates wrote types of fins which are found in tilapia such as *caudal fins, ventral fins, dorsal fins* and *pectoral fins* instead of explaining the shape of tail fin. Another candidate wrote the

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feature of the fins found in shark as *Tail fin has lobes of different size.* There was also a candidate who drew the diagram of tilapia and labelled the features given in (a) – (d) instead of explaining the structure for each part. Incorrect responses provided by candidates indicate that they had inadequate knowledge about Phylum Chordata. Extract 3.1 shows the poor response from one of the candidates.

Extract 3.1:Candidate's poor response in question 4.

In Extract 3.1, the candidate explained the uses of each of the parts (a) to (d) instead of explaining the structure of tilapia basing on the features given.

Despite the weak performance on this question, 0.4 percent of the candidates obtained high marks (4 to 6). These candidates correctly explained the structure of tilapia fish by considering the given features. This indicates that the candidates had adequate knowledge about the Phylum Chordata. Extract 3.2 shows a sample of one of the candidates' good responses.

4.	(a) Nature of skeleton -The tilapia fish is made up of bony skeleton. This is to say that its body have skeleton made up of bones.	
	(b) Types of scale -Tilapia have cycloid scales which are made to lie backward ie overlapping cycloid scales.	
	(c) Position of the mouth - Tilapia fish have terminal mouth; meaning that its mouth is located terminally.	
	(d) Tail fin - Tilapia fish have tail fins which have lobes of the same size.	

Extract 3.2: Candidate's good response in question 4.

In Extract 3.2, the candidate correctly explained the structure of the tilapia fish by considering nature of skeleton, types of scales, position of the mouth and tail fin.

2.2.3 Question 5: Balance of Nature

The candidates were given the following organisms: lions, buffalo, wildebeest, hyena, shrubs, grasses and bacteria. They were required to (a) construct a food web that accommodates all the organisms and (b) explain what will happen into the ecosystem if bacteria are eliminated.

Data indicate that 406,700 (93.7%) candidates attempted this question, where 302,178 (74.3%) candidates scored from 0 to 1 mark out of 6 marks allocated to this question, The candidates who scored from 2 to 3 marks were 42,297 (10.4%) whereas 62,225 (15.3%) scored from 4 to 6 marks. Figure 5 summarizes the candidates' performance on this question.
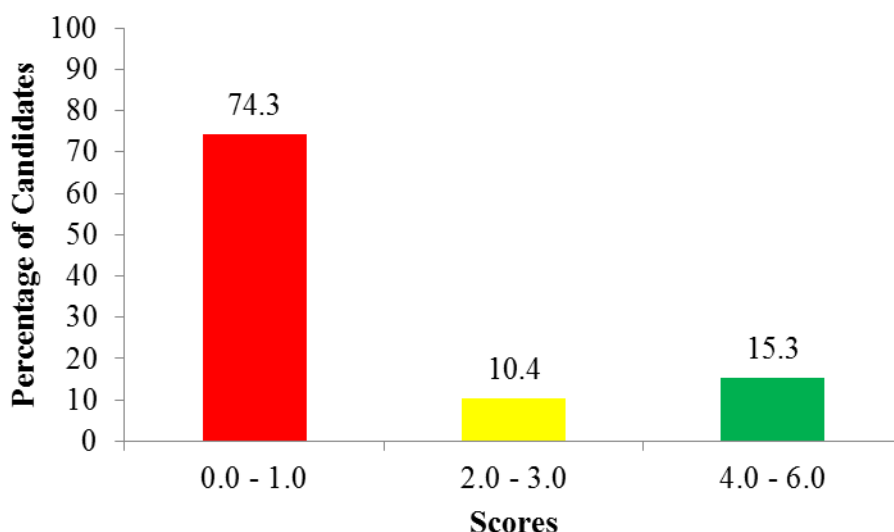
Figure 5: *Candidates' performance in question 5.*

The trend of performance indicated in Figure 5 shows that 74.3 percent of the candidates obtained low marks (0 - 1) making the general performance of the question to be weak. In part (a), most of them failed to construct food web. They failed to locate the organisms into their respective trophic levels and therefore ended with an incorrect food web. They did not understand that organisms that produce food for other organisms which are the green plants (producers) occupy the first trophic level followed by organisms which feed on plants (primary consumer) then organisms which feed on primary consumer (secondary consumers) and finally decomposers which are bacteria and fungi. Others drew the food web but did not manage to show all the food chains in it thus lost most marks. Others did not understand the demand of the question as they constructed food chains instead of food webs as one candidate wrote

Grasses ⟶ *wildebeest* ⟶ *hyena* ⟶ *bacteria*

Shrubs ⟶ *buffalo* ⟶ *hyena* ⟶ *bacteria*

Grasses ⟶ *buffalo* ⟶ *lion* ⟶ *bacteria*

The other candidates neither drew food chain nor food webs but categorized the organisms into their trophic levels as one candidate wrote *Producers- shrubs and grasses, primary consumer - buffalo and wildebeest, secondary consumers- lion and hyena, and finally decomposers - bacteria.*

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These responses indicate that the candidates lacked clear understanding of the food chain and food web.

Likewise, in part (b), these candidates gave incorrect responses. For example one candidate wrote *if bacteria are eliminated there will be no food for the primary consumers*. Another candidate wrote; *If bacteria are eliminated from ecosystem hyena can be in greater number*. Furthermore another candidate wrote when *bacteria are eliminated in ecosystem there will be increase in number of lions, hyena, buffalo and wildebeest* and *if bacteria are eliminated the food web will not exists*. These candidates failed to understand that bacteria are decomposers therefore if are eliminated from the ecosystem there will be no decomposition of organic matter. Also, the nutrients/minerals locked in the bodies of organisms in such ecosystem will not be available to benefit them in the nutrient pool. Provision of incorrect responses is an indication that the candidates had inadequate knowledge of food chain and food web which is taught under the topic of Balance of Nature. Extract 4.1 is an example of the candidates' poor responses in question 5.
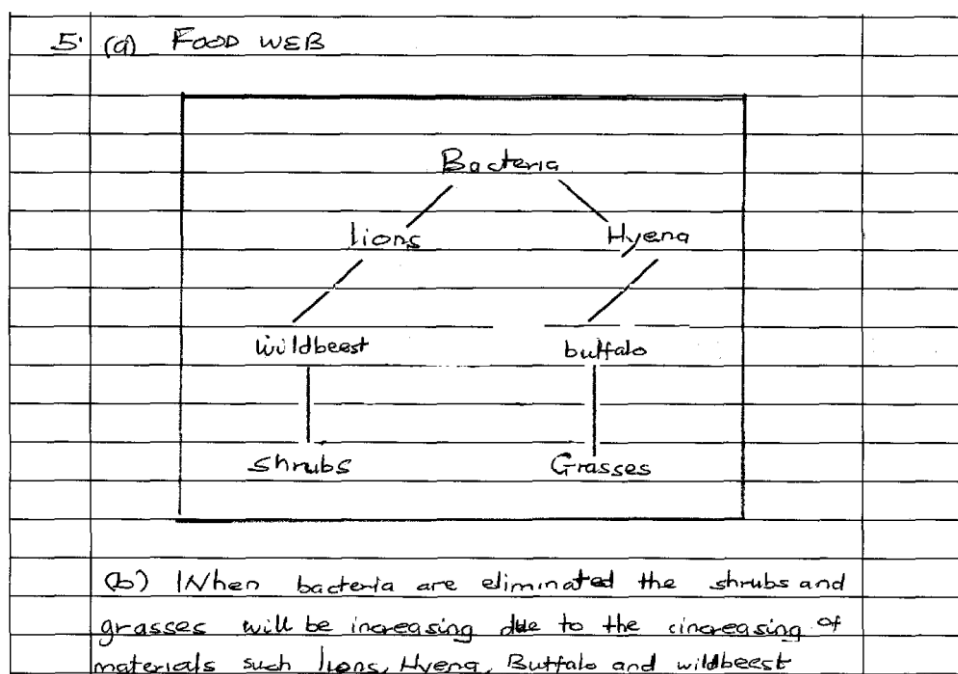
Extract 4.1: Candidate's poor response in question 5.

In Extract 4.1, the candidate correctly placed organisms into their trophic levels using lines ———— instead of linear arrow ———▶ therefore ended

up constructing incorrect food web. Also the response given in part (b) was incorrect.

On the other hand, further analysis shows that most of the candidates who scored 2 to 3 marks (10.4%) managed to draw food web but gave incorrect response in part (b) and hence scored less than 4 marks. Despite the poor performance of the candidates in this question, 15.3 percent of the candidates scored from 4 to 6 marks. Out of them 4.5 percent correctly constructed food web in part (a) and also gave a correct reason on what will happen if bacteria are eliminated from the ecosystem and therefore scored high marks. This reveals that these candidates had sufficient knowledge about food web and food chain. Extract 4.2 shows a sample of the candidate's good response in question 5.
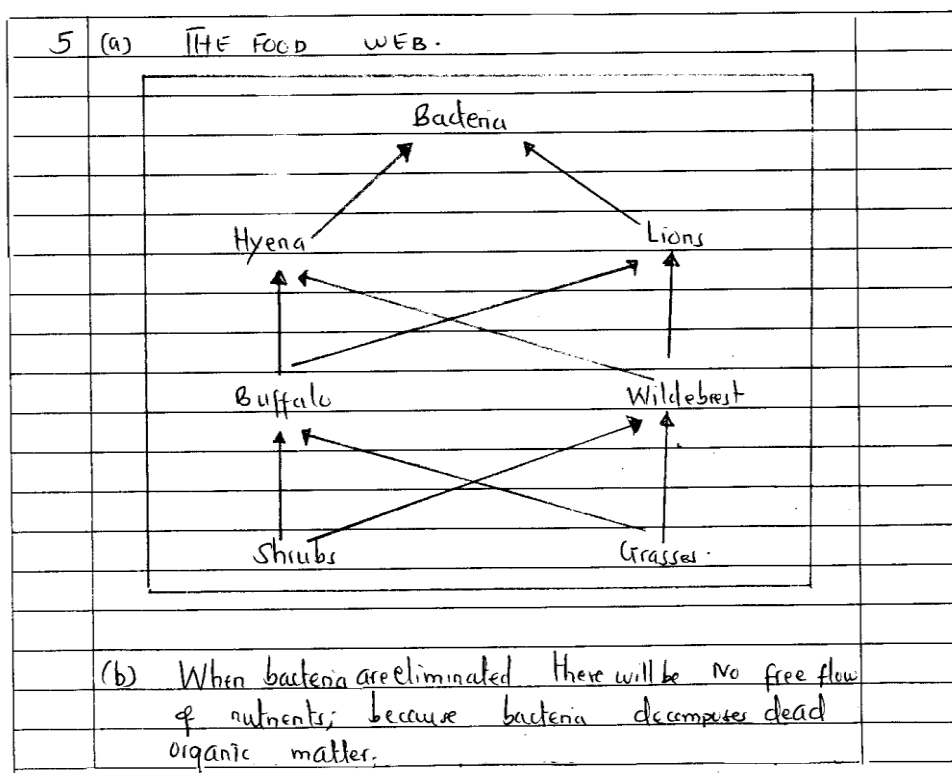
Extract 4.2: Candidate's good response in question 5.

In Extract 4.2, the candidate correctly constructed food web in part (a) showing all the necessary food chains for the given organisms. Also he/she gave a correct answer in part (b).

2.2.4 Question 6: Transport of Materials in Living Things

In this question, the candidates were given a statement; While performing surgery on a mammal, two blood vessels were cut by mistake. In one of the vessels blood flowed out with high pressure while in the other vessel blood flowed out with low pressure. The candidates were required to give the names of the two blood vessels in part (a). In part (b) they were required to briefly explain why one blood vessel had high blood pressure and the other low pressure.

Data analysis shows that out of 378,731 (86.6%) candidates who attempted this question, 292,759 (77.3%) scored from 0 to 1 mark out of 6 marks allocated to this question. The candidates who scored from 2 to 3 marks were 67,035 (17.7%) whereas, 18,937 (5.0%) scored from 4 to 6 marks. Figure 6 summarizes the candidates' performance in question 6.
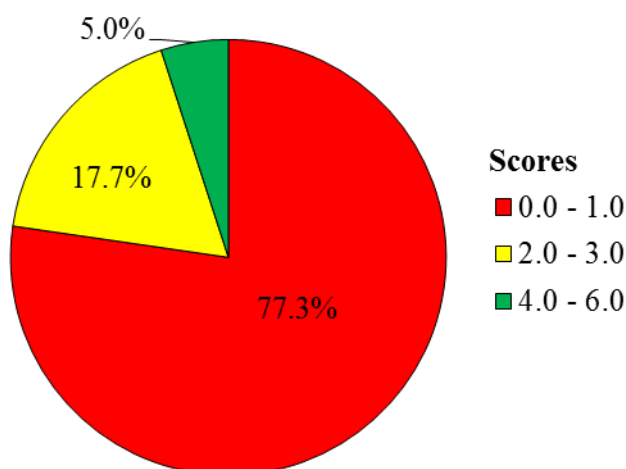
Figure 6: *Candidates' performance in question 6.*

Figure 6 reveals that the candidates' performance on this question was weak since the majority (77.3%) scored 0 to 1 mark. This signifies that they had either little or no knowledge of the blood vessels. For example, in part (a) one candidate wrote the chambers of the heart as blood vessels with high and low pressure as *In auricle blood flow with high pressure, In ventricle blood flow with low pressure*. Another candidate wrote the names of the blood vessels which enter and leave blood into the glomerulus as *afferent arteriole and efferent arteriole*. Another candidate wrote blood vessels with high pressure as; *White blood cell* and the one with low

pressure as *Red blood cell*. Also, some of the candidates wrote blood group O as the one with high pressure and *blood group AB* as the one with low pressure. Incorrect responses signify inadequate knowledge about the structure of blood vessels.

Similarly, in part (b), candidates failed to give reason as to why one has high pressure and the other low pressure. They wrote incorrect responses such as, *The one with high blood pressure pumps blood into the heart while the one with low blood pressure transport blood to other parts of the body*. Another candidate wrote *the one with high pressure has valves while the one with low pressure has no valves*. These candidates did not understand that an artery has high pressure because of narrow lumen and in veins blood flows at low pressure because of wide lumen. Also the artery takes blood from the main artery (aorta) where blood is already under high pressure due to the pumping action of the left ventricle of the heart. Pressure is low near the venous end of a capillary where blood is being collected to be transported towards the heart. Extract 5.1 is a sample of a candidate's poor response in question 6.

Extract 5.1: Candidate's poor response in question 6.

In Extract 5.1, the candidate wrote the blood vessel with high pressure as *vein* instead of *artery* and the one with low preesure as *artery* instead of *vein* in part (a). The candidate also interchanged the answers in part (b).

On the other hand, 5.0 percent of the candidates scored from 4 to 6 marks in this question. These candidates had sufficient knowledge of the tested concepts thus, they correctly wrote the names of the two blood vessels in part (a). The candidates also correctly gave reasons as to why one bloood

vesel has high pressure and the other with low pressure in part (b). Extract 5.2 is a sample of a candidate's good response in this question.

6	ⓐ The one with high pressure → ARTERIES (AORTA)	
	The one with low pressure → VEINS (VENA CAVA)	
	ⓑ → ARTERIES are narrow in the lumen hence blood	
	flow in high pressure due to small area and heart pump	
	blood in Aorta in high power to supply blood to all	
	the body.	
	→ VEINS have wide lumen hence pressure	
	of blood becomes low. Also due to the	
	Right Ventricles to have less muscles than left ventrical	
	Causing vein (vena cava) to have low pressure	

Extract 5.2: Candidate's good response in question 6.

In Extract 5.2, the candidate correctly named the blood vessels in part (a). Also he/she correctly explained why one blood vessel has high pressure and the other low pressure in part (b).

2.2.5   Question 7: Growth

In this question, the candidates were required to briefly explain three significances of mitosis in living organisms.

A total of 376,098 (86.0%) candidates attempted this question. The data analysis shows that 241,455 (64.2%) candidates scored from 0 to 1 marks, out of 6 marks allocated to this question. The candidates who scored from 2 to 3 were 68,826 (18.3%) whereas 65,817 (17.5%) scored from 4 to 6 marks as presented in Figure 7.

23
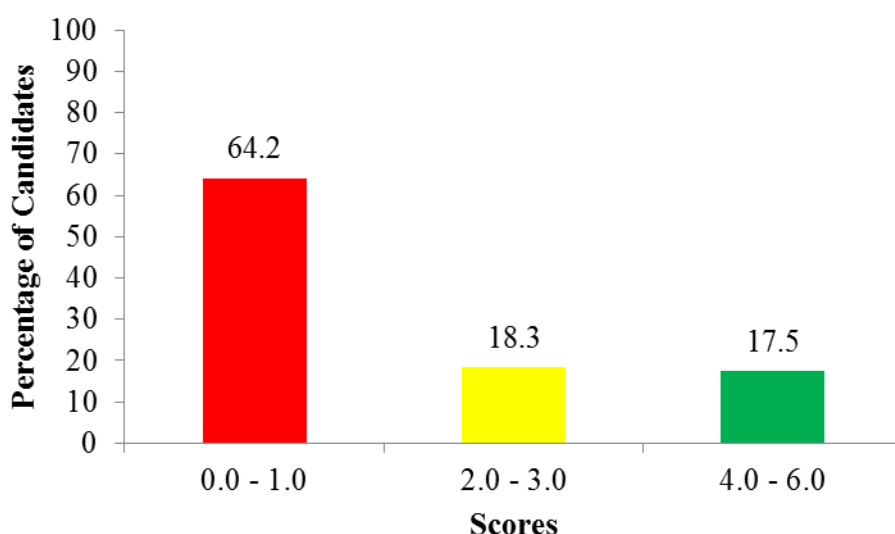
Figure 7: *The candidates' performance in question 7.*

Figure 7 shows that, the general performance on this question was average because 35.8 percent of the candidates scored 30 percent and above of the 6 marks allotted to this question. Despite the average performance, 17.5 percent of the candidates performed well in this question. These candidates correctly explained three significance of mitosis in living organisms. This indicates that, the candidates had adequate knowledge of the concept of mitosis and growth. Extract 6.1 displays a sample of the candidates' good response in this question.

07 (i)	Mitosis helps in regeneration of worn out body cells.	
	→ Mitosis helps to recover the body cells which have been worn out, for example the tail of the lizard is replaced by mitosis, Also the cells on the damaged skin are also replaced by mitosis.	
(ii)	Mitosis helps to bring about genetic stability	
	→ This is because mitosis produces diploid number (2n) of cells as the original parent cell this ensures genetic stability.	
(iii)	Mitosis helps in growth of a living organism	
	→ Mitosis leads into increase in the number of body cells since when cell division occurs it causes the number to increase twice the number of the parent cells hence growth of an organism due to cell division and elongation.	

Extract 6.1: Candidate's good response in question 7.

In Extract 6.1 the candidate correctly explained the significance of mitosis in living organisms.

Conversely, 64.2 percent of the candidates obtained low marks (0 - 1). These candidates either failed to explain the significance of mitosis in living organisms or gave responses which deserved low marks. For example, one candidate wrote the advantages of asexual reproduction such as *desirable characteristics are passed on to the offsprings, offsprings mature faster than those produced by sexual reproduction.* Another candidate wrote the importance of reproduction as *mitosis ensures continuity of species and mitosis maintains good and desirable traits in organisms.* In addition, some of the candidates' incorrect responses were *Mitosis help to bring offspring with good feature, Mitosis increase probability of fusion of gametes, Mitosis bring out offspring which can survive as gametes are from different parents. Mitosis aid in reproduction, Mitosis is important in cell functioning, Mitosis is important in haploid formation.* These responses indicate that the candidates had inadequate knowledge of the concept of mitosis and growth. Extract 6.2 is a sample of one of the candidate's poor response.

7	a, It helps in reproduction.	
	-Mitosis help during reproduction as the	
	new formed daughter cells are in haploid	
	State.	
	b, It helps in Variation.	
	-Due to the mitosis the characteristics from	
	parent pass to the daughter and hence	
	Cause Variation.	
	C, It helps to get four daughter cells from	
	each reproductive cell.	

Extract 6.2: Candidate's poor response in question 7.

In Extract 6.2, the candidate explained the significance of meiosis instead of mitosis in living organisms.

2.2.6 Question 8: Coordination

The candidates were required to give four adaptations of the mammalian eye to its function.

A total of 363,748 (83.2%) candidates attempted this question. The analysis shows that 308,458 (84.8%) candidates scored from 0 to 1.5 marks, 20,734 (5.7%) scored from 2 to 3.5 marks whereas 34,556 (9.5%) scored from 4 to 6 marks as illustrated in Figure 8.
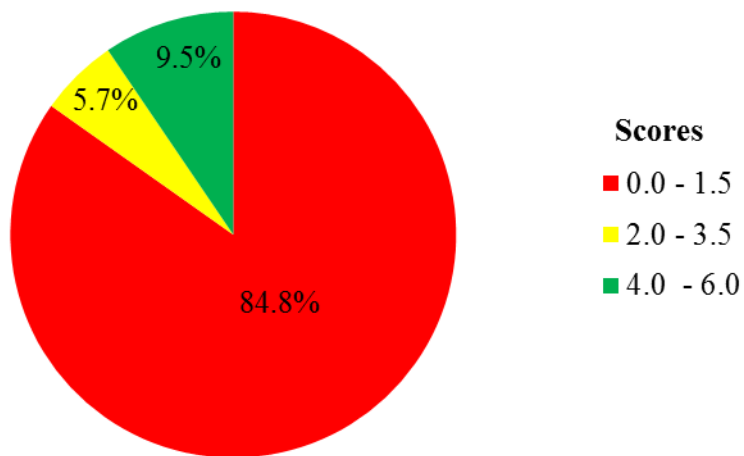
Figure 8: *Candidates' performance in question 8.*

Considering Figure 8, the candidates' performance on this question was weak because 84.8 percent of the candidates scored from 0 to 1.5 mark. Most of the candidates listed the parts of the eye such as *eye lid, eye lashes, sclera, lens, iris, optic nerve, cornea aqueous humour and vitreous humour* instead of explaining how the eye is adapted to its function. Others wrote the structure and function but the functions given were interchanged. For example one candidate wrote; *Eyelids covers cornea and protect it from damage* which is the function of conjunctiva, *Suspensory ligaments contract to alter the shape of lens* which is the function of ciliary muscles *Pupil refracts the light* which is the function of the lens *and blind spot control the amount of light entering the eye* which is the function of the iris. Other candidates did not understand the demand of the question as they drew the labelled diagrams of the external and internal structures of the human eye. These candidates failed to understand that the term adaptation means the structural development which enables the structure to perform its function. These responses imply that the candidates had inadequate knowledge about the sense organs, specifically the eye. Extract 7.1 shows a sample of a candidate's poor response.

8.	Function of Mammalian eye.
	– It help to see.
	– It help to regulate amount of light,
	– It help to allow the light to enter to the eye,
	– It help to detect the colour.

Extract 7.1: Candidate's poor response in question 8.

In Extract 7.1, the candidate wrote the function of the eye instead of explaining structure and function (adaptation) of the mammalian eye.

Despite the weak performance on this question, 9.5 percent of the candidates gave correct responses. In their responses, they included answers such as *The eye has conjunctiva which covers cornea and protect it from damage; it has sclerotic layer which protect and maintains the shape of the eye. It has eyebrows which prevents the entry of dust particles and sweat from entering the eye.* This indicates that the candidates had adequate knowledge of the structure of the eye in relation to its function. Extract 7.2 shows a sample of a correct response by one of the candidates.

8.	i) It has a tear gland which secretes tears. Tear help to lubricate the eyeball and cleans the eye to remove dust.
	ii) It has eyelashes which help to trap dust particles and hence preventing them from reaching the eye.
	iii) The eye has got vitreous humour which refract light as light enters the eye for image formation.
	iv) The eye has got the choroid layer for sufficient supply of oxygen and nutrient to the eye.

Extract 7.2: Candidate's good response in question 8.

In Extract 7.2, the candidate correctly explained the adaptations of human eye to its functions.

2.2.7 Question 9: Excretion

The candidates were required to briefly explain three ways through which plants get rid of excretory products.

A total of 348,115 (79.6%) candidates attempted this question. The data analysis shows that, 322,703 (92.7%) candidates scored from 1 to 1.5 marks out of which 285,042 (81.9%) scored 0 mark. The candidates who scored from 2 to 3.5 were 18,102 (5.2%) whereas 7,310 (2.1%) scored from 4 to 6 marks. Figure 9 summarizes the candidates' performance in this question.
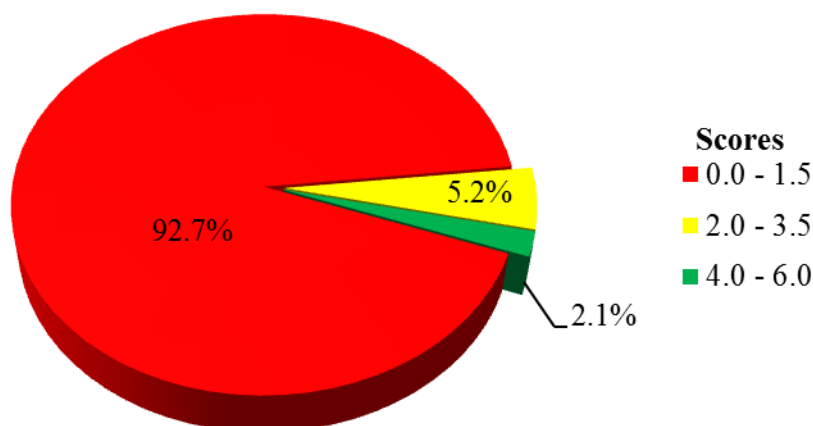
Figure 9: *Candidates' performance in question 9.*

The trend of performance indicated in Figure 9 shows that 92.7 percent of the candidates obtained low (0 – 1.5) marks. Most of these candidates did not understand the demand of the question and therefore wrote incorrect responses. For example, one of the candidates wrote the stages of urine formation in human beings such as *filtration and reabsorption*. Others wrote excretory *organs* in human beings such as *liver, skin, lungs and kidney*. Others wrote the mechanisms of transport of materials in living things such as *mass flow and osmosis* instead of the ways through which

plants get rid of their excretory products. There were other candidates who mentioned one or two correct ways but failed to give explanations hence scored low marks. These responses show that the candidates had inadequate knowledge of excretion in plants. Extract 8.1 is a sample of a candidate's poor response.

09:	i. Rubber, this is one among the plant excretory waste that is used to manufacture rubber materials such as rubber tyre and other.
	ii. Tanin, this is the plant excretory waste product that is used to tendernse meat before cooking tanin is responsible for making the meat tender, it is also suitable since it has no effect to the meat.
	iii. Alkaloids, these include cocaine, quinine and others which can be used to manufacture medicines, drugs and many things example quinine manufactures anti-malaria drugs.

Extract 8.1: Candidate's poor response in question 9.

In Extract 8.1, the candidate wrote some of the excretory products in plants and their uses instead of the ways through which plants get rid of their wastes.

Further analysis shows that the candidates who scored from 2 to 3.5 marks managed to mention all the three ways correctly but gave incorrect explanation or correctly explained only two ways hence loss of marks. On the other hand, 2.1 percent of the candidates performed well in this question. These candidates correctly explained the ways through which plants get rid of their excretory products. This indicates that the candidates had adequate knowledge of excretion in plants. Extract 8.2 is a sample of a candidate's good response.

9. Ways through which plants get rid of excretory products :	
i. Diffusion:	
Plants can get rid of their excretory products through diffusion for the gaseous products that are products of metabolic reactions such as photosynthesis that produce oxygen which diffuses from the plant using the stomata of the leaf.	
ii. Abcission	
Plants can get rid of their excretory products by directing their excretory products in organs that can fall of or be removed by the plant for instance at the Leaves where, leaves can be full of wastes and left to fall. which help the plant to remove wastes.	
iii. Degradation	
Plants can get rid of harmful wastes such as gases to useful substances or the excretory wastes such as oxygen can be reused by the plant cells during respiration to release energy or any other metabolic process during the night.	
Also the plants may convert their wastes into compounds and secrete them inform of fluids	

Extract 8.2: Candidate's good response in question 9.

In Extract 8.2, the candidate correctly explained three points on how plants get rid of the excretory products.

2.2.8 Question 10: Regulation

In this question, candidates were required to explain briefly three factors which affect the content of salts and water in human body.

The data analysis indicates that, out of 356,270 (81.5%) candidates who attempted this question, 292,498 (82.1%) candidates scored from 0 to 1.5 out of 6 marks allocated to this question. The candidates who scored from 2

to 3.5 marks were 31,708 (8.9%) and 32,064 (9.0%) scored from 4 to 6 marks. Figure 10 summarizes the candidates' performance in this question.
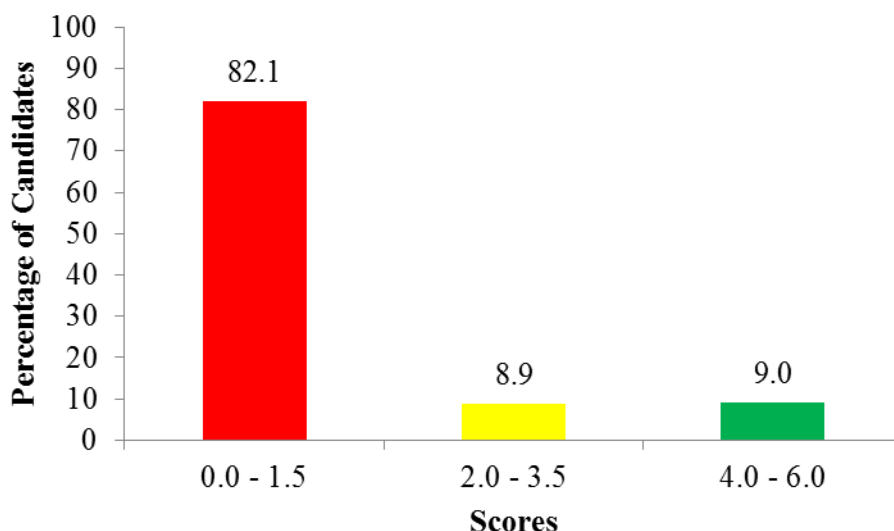
Figure 10: *Candidates' performance in question 10.*

Considering Figure 10, the candidates' performance on this question was weak because 82.1 percent of the candidates scored from 0 to 1.5 mark. Most of these candidates wrote incorrect responses signifying lack of knowledge of osmoregulation. For example, some of the candidates wrote the effects of excessive intake of salts in the body as one candidate wrote *it leads to disease like high blood pressure* and *it make someone feel thirst*. Others wrote the factors which affect body immunity such as *poor nutrition, extreme stress,* and *genetic disorders*. Others explained the factors which affect content of sugar in the body such as *too much intake of starch, lack of physical exercises* and *failure of pancreas to produce insulin hormone* instead of the factors which affect salt and water in the body. Others mentioned one or two correct factors but failed to give explanation which led to poor performance. These responses indicate that these candidates had inadequate knowledge about osmoregulation. Extract 9.1 is a sample of a candidate's poor response.

10. Water and Salts are important things to ~~body~~ the body of human and in order to control different functions and to produce of mineral in the human bodies. The following are the factors which affect the Content of salts and water in human body. Availability of oxygen and Carbondioxide, the one of the factor that Can affect the Content of Salts and water in human body is the availability of oxygen and Carbondioxide. Availability of haemoglobin in the lungs is one of the factor that Can affect the Content of Salts and water in human body is the availability of haemoglobin Altitude, one of the factor which can lead to Cause the Content of water and mineral Salts is altitude which involve the environment which was Sarrounding us.	

Extract 9.1: Candidate's poor response in question 10.

In Extract 9.1 the candidate wrote factors affecting the rate of gaseous exchange in mammals instead of the factors which affect the content of salt and water in human body.

Moreover, the analysis shows that the candidates who scored from 2 to 3.5 marks correctly mentioned three factors but managed to give correct explanation to only one factor. Also, 9.0 percent of the candidates who scored 4 to 6 marks correctly explained two to three factors which affect the content of salts and water in human body and a few scored all the 6 marks. This shows that the candidates had enough knowledge about the concept of Osmoregulation in Mammals. Extract 9.2 is a sample of candidates' good response.

10	(i) Amount of salt and water taken from the diet.	
	-The amount taken in food, affect the content of salt and water in the body so if an organism takes too much salt with little water consumption, there will be high salt concentration in the body.	
	(ii) Amount of Anti-diuretic hormone produced.	
	-Anti-diuretic hormone is responsible for the reabsorption of water in the nephron of the kidney in order to prevent loss of water in the body, so if ADH is produced at high content, then there will be low salt concentration since water is in high amounts.	
	(iii) Environmental weather condition	
	Weather condition also has its effects since in hot weather a lot of water is lost in form of sweats this reduces the amount of water which result into low water content, hence high salt concentration	

Extract 9.2: Candidate's good response in question 10.

Extract 9.2 illustrates a response of a candidate who correctly explained three factors which affect the content of salts and water in human body.

2.2.9 Question 11: Reproduction

The candidates were required to give four differences between insect pollinated flowers and wind pollinated flowers.

Data analysis indicates that, out of 347,165 (79.4%) candidates who responded to this question, 303,422 (87.4%) scored from 0 to 1.5 out of 6 marks allocated to this question. The candidates who scored from 2 to 3.5 marks were 20,830 (6.0%) whereas 22,913 (6.6%) scored from 4 to 6 marks as shown in Figure 11.

34
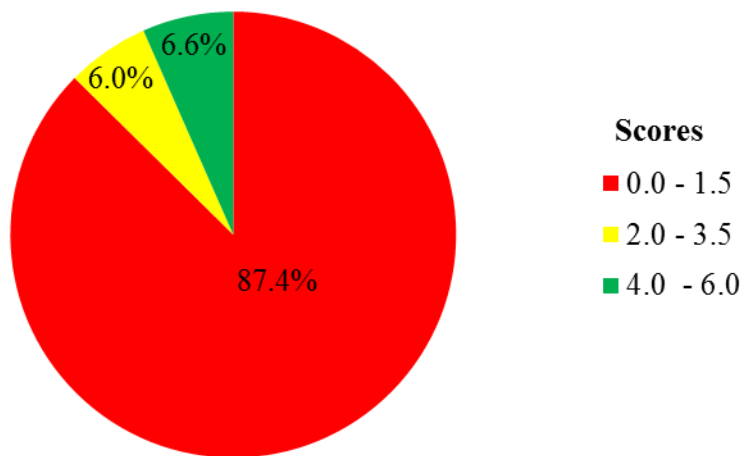
Figure 11: *Candidates' performance in question 11.*

The analysis indicates that the candidates' performance on this question was weak since 87.4 percent scored from 0 to 1.5 out of 6 marks. Most of the candidates wrote responses which were contrary to the correct answer. For example, some candidates wrote the parts of a flower and their function as one wrote *petals attract insect for pollination, anther produces pollen grains and filament holds the anther*. Others drew well labelled diagrams of hibiscus flower instead of giving four differences that exist between insect pollinated flowers and wind pollinated flowers. There were other candidates who wrote differences between cross pollination and self-pollination. Responses like this imply that these candidates lacked clear understanding on the differences between insect pollinated flowers and wind pollinated flowers. Extract 10.1 shows a sample of a candidate's poor response.

11.	Insect pollinated flowers	Wind pollinated flowers	
	(i) Flowers have very dull coloured petals	(i) Flowers have bright coloured petals	
	(ii) Have long filaments that carries large anthers.	(ii) Have short filament that carries small anthers.	
	(iii) They have no nectaries	(iv) They have nectaries	
	(iv) The pollen grains are very light hence they are easily blown	(iv) The pollen grains are large.	

Extract 10.1: Candidate's poor response in question 11.

In Extract 10.1, the candidate interchanged the answers where he/she wrote the answers of insect pollinated flowers in place of wind pollinated flowers.

Despite the weak performance on this question, 6.6 percent of the candidates obtained high marks of which 2.4 percent obtained all the 6 marks allocated to this question. These candidates managed to give four differences between insect pollinated flowers and wind pollinated flowers. This shows that the candidates had adequate knowledge of the insect and wind pollinated flowers. Extract 10.2 shows the sample of the candidate's good response.

11	Insect pollinated flower	Wind pollinated flower	
	i/ They have brightly coloured petals to attract insects	i// They have dull coloured petals or they do not have attractive petals to attract insect	
	ii/ They are Their pollens are sticky and heavy so as the can stick on the body of insect and be transfered to the stigma.	ii/ Their pollen grains are light since their carried on transpered by wind to the stigma	
	iii/ They have small anther since its pollen grains are carried by insect	iv/ They have long filla ment so as to expose the big anther outside the petals so that the pollen can be carried by wind	
	iv/ They have nectaries which produce nectar which insect like.	iv/ They are scentless and also not have nectaries	

Extract 10.2: Candidate's good response in question 11.

In Extract 10.2, the candidate correctly gave four differences between insect pollinated flowers and wind pollinated flowers.

2.2.10 Question 12: Genetics

In this question, the candidates were given a description; *In an experiment, bean seeds having smooth seed coat were crossed with beans having wrinkled seed coat. All the seeds obtained in the first filial generation (F_1) had a smooth seed coat. The candidates were required to use genetic cross to find out the formation of (F_1) individuals.*

Data reveals that out of 365,454 (83.6%) candidates who attempted this question, 222,196 (60.8%) scored from 0 to 1.5 marks and 16,080 (4.4%) scored from 2 to 3.5 marks. The candidates who scored from 4 to 6 marks

were 127,178 (34.8%). Figure 12 summarizes the candidates' performance in this question.
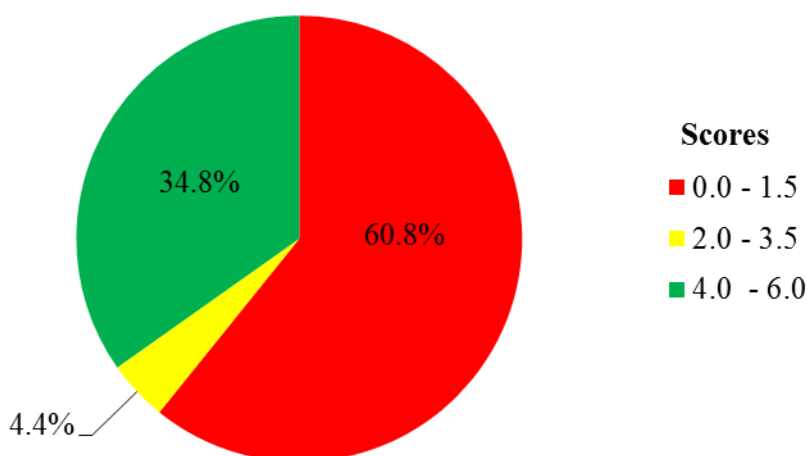
Figure 12: *Candidates' performance in question 12.*

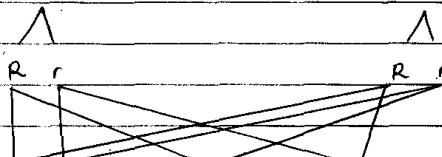The analysis indicates that the candidates' performance on this question was average since 39.2 percent scored from 2 to 6 marks of which, 34.8 percent performed well by scoring 4 to 6 marks. These candidates had adequate knowledge about Mendelian inheritance theory thus; they correctly worked out the genetic crosses for F_1 generation. Extract 11.1 shows sample of a candidate's good responses.

12	· All (F₁) are smooth hence smooth is dominant.	
	Let : A represent dominant gene for smooth seed coat. and	
	a represent recessive gene for wrinkled seed coat .	
	parental phenotypes: Smooth seed coat X Wrinkled seed Coat.	
	parental genotypes: A A × a a	
	meiosis :	
	gametes : A A a a	
	fertilization:	
	F₁ generation genotypes: Aa Aa. Aa . Aa,	
	F₁ generation phenotypes: All are bean seeds with smooth seed coat.	

Extract 11.1: Candidate's good response in question 12.

In Extract 11.1, the candidate correctly identified the parental genotypes and used the genetic cross to find out the formation of (F₁) individuals. He/she clearly illustrated all the steps.

However, 60.8 percent of the candidates scored low marks. These candidates failed to identify correct parental genotypes and some did not illustrate proper crosses. A group of candidates showed genetic crosses for F_2 generation instead of F_1 generation. Also, there were candidates who used incorrect labels on diagrammatic crosses. For example, they wrote *gametes* instead of *parents, phenotypes* in place of *genotypes, mitosis* instead of *meiosis.* Furthermore, some candidates used different letters to represent monohybrid crosses contrary to the genetic principles which require a character to be presented by the same letter. A capital letter represents a dominant character while the lower case represents a recessive character. For example, one candidate wrote *BB for smooth seed coat,* and *tt for wrinkled seed coat.* Moreover, some of the candidates used sex chromosomes to represent allele of the character. For example, they wrote *XY* for smooth seed coat and *xx* for wrinkled seed coat. This implies that the candidates lacked clear understanding of Mendelian law of inheritance. Extract 11.2 shows the sample of candidate's poor responses.

12.	Solution		
	let the seeds with smooth coat be Rr		
	let the seeds with wrinkled coat be Rr		
	The (F1) generation — 4RR (smooth seed coat)		
	Inorder to get (F1) individuals, one has to perform a test cross		
	Smooth seed coat wrinkled seed coat		
	Rr R r		
	R r R r		
	F2 generation RR Rr Rr RR		
	phenotype ratio; All the seeds have smooth seed coat.		

Extract 11.2: Candidate's poor response in question 12.

In Extract 11.2, the candidate crossed heterozygous smooth seed coats (Rr, Rr) instead of crossing homozygous dominant (RR) and homozygous recessive (rr) to show the genetic crosses of F_1.

2.3   SECTION C: Essay Questions

This section had three essay type questions. One question (Question 13) carried 15 marks while each of the other two questions (14 and 15) carried 10 marks. The candidates were required to answer two questions of which question 13 was compulsory.

2.3.1   Question 13: Health and Immunity

In this question, the candidates were required to give four points on how they will educate the people on the symptoms and five preventive measures to be taken in order to minimize the spread of Tuberculosis in the country.

A total of 375,864 (85.9%) candidates attempted this question. The analysis shows that, 222,887 (59.3%) candidates scored from 0 to 4 marks out of the 15 marks allocated to this question. The candidates who scored from 4.5 to 9.5 were 114,639 (30.5%) whereas 38,338 (10.2%) scored from 10 to 15

marks. Figure 13 presents the summary of the candidates' performance in this question.
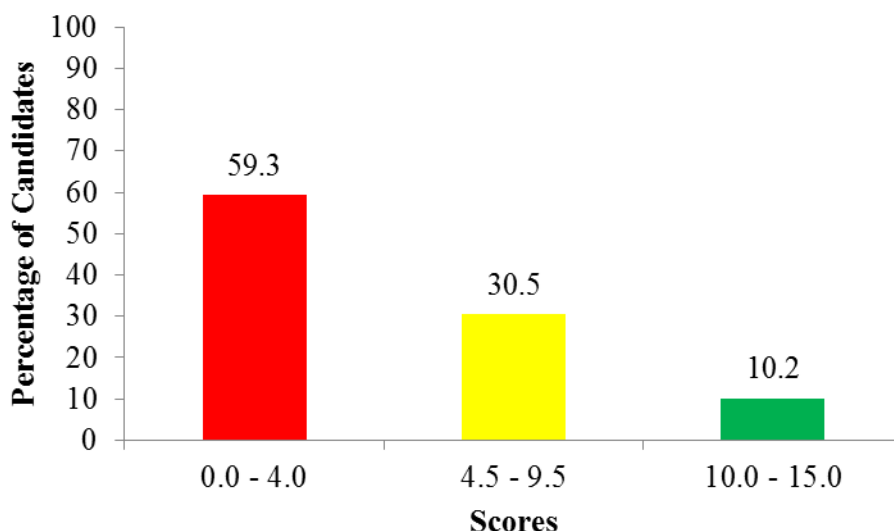
Figure 13: *Candidates' performance in question 13.*

Figure 13 shows that the performance on this question was average since 40.7 percent of the candidates scored from 4.5 to 15 of which, 10.2 percent performed well by scoring 10 to 15 marks. The candidates who scored 4.5 - 9.5 marks (30.5%) gave partial responses in some parts of the question. Some gave a correct introductory part, explained three symptoms and two preventive measures, instead of giving four symptoms and five preventive measures. Also, some gave the points with neither introduction nor conclusion contrary to the demand of essay type questions which led to loss of some marks.

Despite the average performance, 10.2 percent of the candidates performed well on this question. They correctly gave four symptoms and five preventive measures of tuberculosis. They also followed the regulations of essay writing by organizing their essays in introduction, main body and conclusion. This indicates that the candidates had adequate knowledge of infections and diseases. Extract 12.1 is a sample of candidates' good response in this question.

13. Tuberculosis is an airborne bacterial respiratory disease. It is abbreviated as TB. This disease is caused by a bacteria called mycobacterium tuberculosis which is transmitted from a victim to a healthy person through airways coughing sneezing or inhaling infected air. These bacteria invade and destroy lung cells an incidence which can lead into death. A patient of TB show some or all of the following symptoms.

Night fever with excessive sweating. A patient of tuberculosis experience long periods of fever and excessive sweating especially during the night.

Discharge of blood-stained sputum. Since the tissues of the respiratory tract are damaged the sputum sput by the coughing patient always have stains of blood.

Prolonged cough. As the tuberculosis pathogens attack the respiratory tract. The infected person coughs frequently in a long period of time.

General body weakness and weight loss. As the respiratory system is destructed the infected person experiences severe fatigue. Moreover, the patient suffers from loss of weight body unusually.

Since this disease is dangerous at is causes lung damage which can lead into death the following can be done as preventive measures

Vaccination. All people especially children under the age of 5 years should be immunized with BCG (Bacilli Calmette Guerin) vaccine to protect them from the infection of mycobacterium tuberculosis. This is offered in hospitals and health centres.

13.	Avoiding overcrowded and poorly ventilated areas This reduces the chance of inhaling air infected with tuberculosis pathogens.	
	Medical treatment to patients. Patients of tuberculosis should be taken to the hospital to get medical cure from qualified doctors. This as well prevents the spread to others and saves patient's life.	
	Covering mouth and nose when sneezing or coughing. This reduces the release of tuberculosis bacteria into the air hence minimizing the chance of infecting others.	
	Isolating the victim and covering sputum with soil. The victim of tuberculosis should be kept away from frequent contacts with non-patients such as placing him/her in own room. Moreover the sputum to be covered with soil to prevent spread of pathogens.	
	To sum up, everyone in the Tanzanian community should take an active part in fighting against tuberculosis to save people's lives from death caused by this diseases.	

Extract 12.1: Candidate's good response in question 13.

In Extract 12.1 the candidate correctly explained the four symptoms and five preventive measures to be taken against Tuberculosis. Also, he/she had good command of English language and essay writing skills.

Despite the average (40.7%) performance on this question, further analysis shows that 59.3 percent of the candidates scored low (0 - 4) marks. Most of them either gave one to two correct symptoms or none. For the candidates who scored zero mark (25.0%), most of them did not understand the demand of the question. For example, in the introduction some candidates wrote the agents of other diseases such as *Tuberculosis is caused by female anopheles mosquito*, *Tuberculosis is caused by water snails.* Others wrote the causative organisms of other diseases such as, *Tuberculosis is a disease caused by virus*, *Tuberculosis is a disease caused by protozoa called schistosomes.*

Similarly, in the main body, these candidates gave incorrect responses. Some gave the symptoms of other diseases like those of cholera as they wrote *diarrhoea, wrinkled skin and muscle cramps*. Another candidate wrote symptoms of gonorrhea such as *pain when urinating, menstrual irregularities and itching in private parts*. Likewise, on the preventive measures to be taken so as to minimize the disease, some candidates wrote the preventive measures of other diseases. For example, one candidate wrote the preventive measures of AIDS as *Avoid sharing of sharp objects such as tooth brushes*, *use condoms during sexual intercourse*, *abstain from sex*, *and use only screened blood.* Another candidate wrote the preventive measures of cholera as *Drinking water should be boiled, Food should be protected well, Washing hands after visiting toilet, Avoid eating cold food.* Additionally, these candidates wrote incorrect conclusions and others did not give any conclusion. Incorrect responses imply that the candidates had inadequate knowledge of the topic of Health and Immunity specifically infections and diseases. Extract 12.2 shows sample of a candidate's poor response.

13. Tuberculosis (TB) Is the disease that caused by plasmodium and transmission through mosquito the Tuberculosis has more symptoms among it is ±

Fever and nausea the tuberculosis let the human being to be have nausea and fever that led for the person to don't an ability to do the development things.

Abdominal pain the Tuberculosis bacteria their go directly to harm the stomach and get pain.

Head ache the fail of taking in and out Air it led the brain and blood to loose the oxygen and brain to detect has problem that led for the head ache.

High pain in the joints. Tuberculosis is the painful disease in the other you can say be cause it cause the seriously pain act for in long time. Some times led disease with high blood pressure that led for human being to get more painful.

This is the among of the symptoms of that disease but that disease have a preventive measure that when you do you should not get the Tuberculosis or to reduce the amount of the disease in the country.

Cutting long grasses the you should to cutting the long grass to remove all the mosquito birth and other insect.

Remove stagnant water the Insect mosquito should be birth at high amount in the stagnant water that near in the home or in the street.

To use the mosquito net the when you want to sleep you should be use the mosquito net in order to reduce the ability for infect you.

To use the insect spray that help for the insect inter in the room for guarding you with the infection.

The tuberculosis is the disease that led the economic to fall down by the killing more many people who just used as the labour.

Extract 12.2: Candidate's poor response in question 13.

In Extract 12.2, the candidate wrote the symptoms and preventive measures for malaria instead of symptoms and preventive measures for Tuberculosis. He/she had good essay writing skills as the work was organized into introduction, main body and conclusion but the content given was wrong.

2.3.2 Question 14: Nutrition

In this question, the candidates were given a statement; Members of Matatu village are hunters, farmers and fishermen. They obtain a variety of foods from their activities but do not have food processing industries. The candidates were required to explain four methods which will help villagers to preserve their food giving one example in each case.

A total of 142,986 (32.7%) candidates attempted this question. The analysis shows that 72,494 (50.7%) candidates scored from 0 to 2.5 marks, 38,463 (26.9%) scored from 3 to 6 marks whereas 32,029 (22.4%) scored from 6.5 to 10 marks as illustrated in Figure 14.
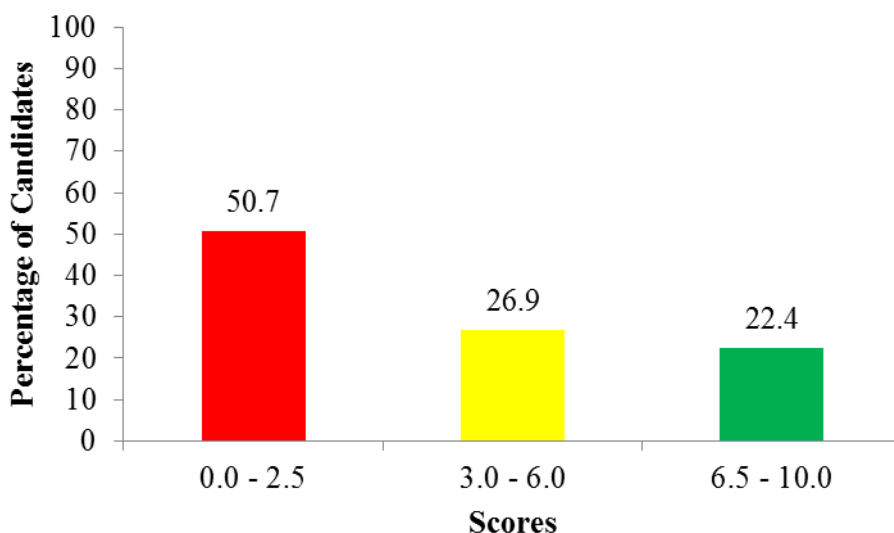
Figure 14: *Candidates' performance in question 14.*

Considering Figure 14, the candidates' performance on this question was average because almost half (49.3%) of the candidates scored from 3 to 10 marks. Some of these candidates (26.9%) managed to explain two to three methods of food preservation with or without examples and hence obtained low marks. On the other hand, 22.4 percent of the candidates had an adequate knowledge of food preservation. Therefore, they managed to correctly explain four methods of food preservation and they gave correct

examples in each case. Extract 13.1 illustrates a candidate's good response in this question.

14.	food preservation is the process of enabling food to stay for along time' safe and without rotting. Food preservation can be done though both tradition ways and modern ways. At villages, usually traditional methods are required and used. The following are the methods that can be used to preserve food at village by villagers (traditional methods):
	Smoking. This method involves putting the food in a smoke. Smoke removes water from food hence destructing habitats of microorganisms, hence enabling food to stay for along time safe. Example of foods that can be preserved by this method is meat.
	Drying in the Sun. The food to be preserved is put in sun in a hot day, the heat from sun drier the food as evaporates the water hence making the food not be habit for growth of microorganisms. Example; Cassava can be preserved by this method.
	Salting. This is the adding of salt to a food, Salt causes dehydration of the food by reducing moisture content, thus making the food unsuitable for growth of microorganisms. Example of food that can be preserved by this method is fish.
	Cooking. The food is preserving by cooking it. There are many methods of cooking such as roasting and boiling, So as a food is cooked and become safe to consume for a given time. Example of foods that can be preserved by cooking is meat by roasting.
	Generally food preservation is so important as it helps to keep food safe for long time and also methods like salting adds a distinct flavour to food.

Extract 13.1: Candidate's good response in question 14.

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In Extract 13.1, the candidate correctly explained four methods of food preservation and managed to give a correct example in each case.

Despite the average (49.3%) performance on this question, the other half (50.7%) of the candidates gave responses with either one correct point or all irrelevant points. Some of the candidates did not write introductions and even for those who wrote, they wrote incorrect introductions. For example one candidate wrote *Food preservation is a process of treating food to make it appetising and edible.* Further analysis reveals that most of the candidates who gave incorrect responses explained the modern methods of food preservation. For example, one candidate wrote *freezing, refrigeration, canning and bottling.* Others wrote the advantages of traditional methods of food preservation while others wrote the advantages of modern methods of food preservation instead of giving the traditional methods with one example in each. This indicates that the candidates had inadequate knowledge of food preservation methods. Extract 13.2 shows a candidate's poor response in this question.

| 14 | Hunters: People who do their work in the forest looking for food by killing the animals in the forest. Farmers: They do agricultural activities like planting different kinds of food while. fishermen: They produce fish by fishing in the ocean or rivers. The following are the methods which will help this villagers Hunters, farmers and fishermen, to preserve their food because they were not having food processing industries: Provide education: When this villagers get education about importance of Saving and keeping food they will try their level best to do that and Prepare for the markets. Build Stores: Hunters, farmers and fishermen are supposed to build stores and keep what they get because sometime they might get nothing but when they keep it will help them. Save what they get: When they save what they get it will help them times which they get nothing. Set goals: When hunters, farmers and fishermen set goals it will help them to creat market and learned how to preserve food. Due to those point the methods will help them to create better solution for their society and brings development. | |

Extract 13.2: Candidate's poor response in question 14.

In extract 13.2, the candidate defined hunters, farmers and fishermen in the introduction instead of defining food preservation. Also, he/she explained general techiniques of taking care of excess food such as building stores instead of the traditional methods of food preservation. The conclusion given was also incorrect.

2.3.3 Question 15: Movement

The candidates were required to explain four functions of human skeleton by giving one example in each case.

The question was attempted by 251,186 (67.3%) candidates. Data show that 126,095 (50.2%) candidates scored from 0 to 2.5 marks, 80,380 (32.0%)

scored from 3 to 6 marks whereas 44,711 (17.8%) scored from 6.5 to 10 marks out of 10 marks allocated to this question. Figure 15 summarizes the performance of the candidates in this question.
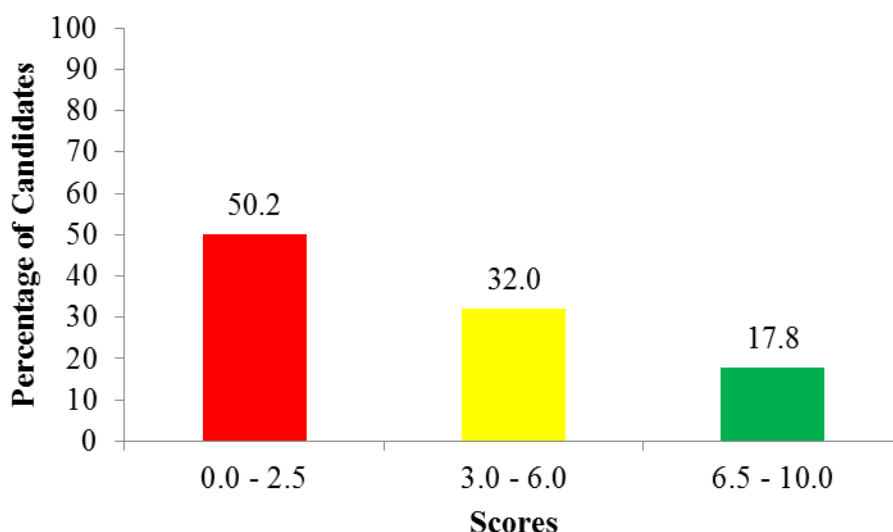
Figure 15: *Candidates' performance in question 15.*

Figure 15 shows that the candidates' performance was average since 49.8 percent scored 30 percent or above of the allocated 10 marks. Despite the average performance, 17.8 percent of the candidates performed well in this question. These candidates correctly explained four functions of human skeleton by giving one example in each case indicating adequate knowledge on the concept of human skeletal system. They organized their responses in essays having introduction, main body and the conclusion. They also showed mastery of English language through good writing skills. Extract 14.1 is one of the candidates' good responses.

15. Human skeleton is the framework which consists of bones, cartilage and joints and cause attachment of muscles on it. Human skeleton is among of endoskeleton type of skeletons. Human skeleton is divided into axial skeleton and appendicular skeleton.

Human skeleton have different functions in the body

The following are the functions of human skeleton :-

Protection, human skeleton offers protection to other parts of human beings which found in the body. They offer protection to many delicate organs such as heart, brain and lungs. For example ribcage which is part of human skeleton protects the lungs against physical damage.

15.	Support, human skeleton provide support to the body because absence of it human being can not be stable. For example presence of pelvic girdle around the hip enable human to sit down well and this shows support of the skeleton without pelvic girdle one can not stay at any style he or she wants.
	Movement, human skeleton provide the aid in movement of human being from one place to another. For example hind limb which is skeleton contains fibula and tibia bones this help human to move from one place to another without any complication as this is the function of skeletons.
	Synthesis of red blood cells human skeleton help in synthesis of red blood cells since red blood cells can be synthesized in the bones. For example synthesis of red blood cells takes place around bone marrow.
	By conclusion human skeleton is very important in human being as without it life process might be difficult to takes place and organism may even die due to destruction of human skeleton

Extract 14.1: Candidate's good response in question 15.

In Extract 14.1, the candidate correctly explained four functions of human skeleton. He/she gave one example in each case.

However, 50.2 percent of the candidates scored low marks (0 – 2.5). Most of these candidates wrote incorrect introduction such as: *Skeleton is a system of muscles.* Others defined it as joint as they wrote; *skeleton is a*

point where two bones meet. Others defined skeleton as tendon as they wrote *skeleton is a tough fibrous tissue which attaches muscle to a bone.*

In the main body, some of the candidates outlined incorrect functions while others outlined one to two correct functions but did not explain them which led to the loss of marks. The other candidates listed different types of bones in the human body as functions of skeleton. For example, one candidate wrote *tibia and fibula, ulna and radius, skull, ribs* and *femur.* Another candidate drew the labelled diagrams of human skeleton while others drew different types of bones such as femur and rib cage. There were other candidates who wrote functions of muscles instead of functions of skeleton in human beings. Moreover, some of the candidates did not conclude their essays while others gave incorrect conclusion. These responses imply that the candidates lacked knowledge about the Human skeletal system and essay writing skills. Extract 14.2 shows a sample of candidate's poor response.

Extract 14.2: Candidate's poor response in question 15.

In Extract 14.2, the candidate wrote an essay about the types of skeleton instead of functions of human skeleton. Also the candidate had poor command of the English language.

3.0 ANALYSIS OF THE CANDIDATES' PERFORMANCE IN EACH QUESTION IN 033/2 - BIOLOGY 2

3.1 Question 1: Coordination

There were three alternative practical papers namely: 033/2A Biology 2A, 033/2B Biology 2B and 033/2C Biology 2C each with two questions. Question 1 from each alternative was set from the topic of Coordination while question 2 was set from the topic of Classification of Living Things. Candidates were required to answer all the questions in each paper. The analysis of candidates' responses in each question in all the three papers is as follows:

A total of 431,620 (99.4%) candidates attempted question 1 in all the three papers. The analysis shows that 287,891 (66.7%) candidates scored from 0 to 7 marks, 132,507 (30.7%) scored from 7.5 to 16 marks whereas 11,222 (2.6%) scored from 16.5 to 25 marks. Figure 16 summarizes the candidates' performance in question 1 for papers A, B and C respectively.
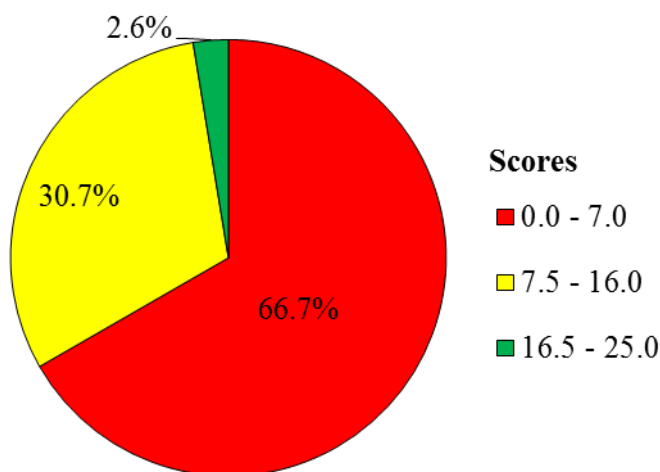
Figure 16: *Candidates' performance in question 1.*

3.1.1 033/2A Biology 2A

The question had six parts (a) - (f) carrying a total of 25 marks. In this question, the candidates were provided with the following: tooth pick, piece of cotton wool, methylated spirit and samples labelled A (sand) and B (wheat flour) which are stimuli of receptors in the body. They were required to carry out experiments in item (i) – (iv) and then answer the questions that follow:

(i)   Look at your body and observe the sense organ that covers the whole hands.

(ii)   Take a tooth pick and prick slightly the upper part of your hand and note the feeling.

(iii)   Touch each of the samples A and B and feel their coarseness.

(iv)   Take cotton wool and soak into methylated spirit. Rub it on your hand and observe what is happening.

The questions asked were:

(a) (i)   *Give the name of the sense organ that covers your hands.*

(ii)   *Explain four functions of the sense organ mentioned in (a)(i).*

(b) (i)   *What did you feel when you pricked the upper part of your hand with tooth pick?*

(ii)   *What type of sensory receptor responsible for the feeling in (b)(i)?*

(c) (i)   *identify the coarseness felt in each of the samples A and B.*

(ii)   *What type of sensory receptor responsible for the feeling in (c)(i)?*

(d) (i)   *What did you feel when you rubbed methylated spirit on your skin?*

(ii)   *Give the two types of sensory receptors responsible for the feeling in (d)(i).*

(e) *What was the aim of the experiment?*

(f) *Explain the role of hairs and sweat pores on the sense organ covering your hands.*

Based on the data in Figure 1, the general performance on question 1 for all alternative papers (A, B and C) was average because 33.3 percent of the candidates scored 30 percent and above of the 25 marks allotted to this

question. The candidates who scored 7.5 to 16 marks gave incorrect responses in some parts of the question hence failed to score all the marks. Despite the average performance, there were candidates (2.6%) who performed well. These candidates wrote correct responses in most part of the question and therefore scored 16.5 to 25 marks. This shows that the candidates had adequate knowledge about sense organs specifically the skin. Extract 15.1 is an example of candidate's good response in question 1 paper 2A.

1a) i)	Skin	
ii)	→ Protection – the skin protects the body against damage like tear.	
	→ Excretion – the skin also helps in the removal of waste products such as sweats from the body of an organism also urea and water.	
	→ Sensing – the skin also helps an organism in sensing of various stimuli from the environment and thus providing response and prevent the body from danger.	
	→ Regulation – the skin also aids in the maintainance of constant body environment of an organism through sweating whereby excess water is lost so as to maintain a constant body environment.	
	b). i). I felt pain and touch ii). Pain and touch receptor.	
	c). i). Sample X. The coarseness of this sample is hard. Sample B The coarseness of this sample is soft. ii). touch receptor.	
	d).i)I felt coldness and touch. ii). – Cold and touch receptor	

e). The aim of the experiment was to determine the response of the skin to various stimuli.	
f) The role of sweat pores is to regulate body temperature during hot the sweat pores opens to allow heat out and during cold the sweat pores closes to prevent heat loss also helps in excretion. The role of hairs is to regulate temperature. when it is hot hair lie to allow water vapour and urea salts through the skin and when it is cold hair stands to prevent heat loss	

Extract 15.1: Candidates' good response in question 1 paper 2A.

In Extract 15.1, the candidate wrote correct answers in all parts of the question.

Despite the average performance on this question, further analysis shows that some of the candidates scored low (0 - 7) marks. These candidates gave incorrect responses in most part of the questions. For example in part (a) (i), some of the candidates wrote other sense organs such as *nose, tongue* and *ears*. Others wrote organs other than sense organs such as *heart, brain, kidney and liver*. These candidates failed to understand that the organ which covers the whole hand is the skin. In part (a) (ii) candidates were required to explain four functions of the skin but most of these wrote incorrect functions. For example, some candidates wrote the general functions of the eye such as *it enables us to detect colour, it helps us to see, it helps us to escape from danger*. Another candidate wrote the function of the ear as *used for hearing, used in balancing the body.* They did not understand that skin is involved in various functions like excretion of sweat which consists of water and small amount of urea; It is a sense organ for pain, heat, cold, touch and pressure; It stores fat in adipose tissue also it is involved in temperature regulation. Likewise, in part (b) (i) they wrote incorrect responses. For example, one candidate wrote I feel *hot* instead of touch and pain. In part (b) (ii) some candidates wrote parts of the brain such as *cerebellum, medulla oblongata and cerebrum*. Others wrote sense organs

such as *skin, nose and ear*. There were other candidates who wrote the components of the central nervous system such as *brain* and *spinal cord* instead of the sensory receptors for the skin which are touch and pain.

In part (c) (i) they were required to identify the coarseness of samples A and B but most of them wrote responses contrary to the correct answer. For example, one candidate wrote the coarseness of sample A is crystalline and B is powder instead of A rough/hard and B smooth/soft. In part (c) (ii) some of the candidates wrote other receptors in the skin such as *pressure*, *pain* and *temperature*. Others wrote *hairs and thigmoreceptors* instead of touch receptors. In part (d) (i) some of the candidates wrote incorrect responses such as *I feel pain, I feel pressure* and *I feel wet.* Another candidate wrote *eye receptors* and *skin receptors* instead of cold/cool and touch. In part (d) (ii) candidates gave incorrect responses such as *pain receptors* and *muscle receptors* instead of touch and cold. In part (e) about the aim of the experiment one candidate wrote incorrect responses such as *the aim of the experiment is coordination*. Another candidate wrote *the aim of the experiment is sense organ.* Another candidate wrote *the aim of the experiment is to demonstrate the concept of coordination in living organisms.* These candidates failed to recognize that, the aim of the experiment was to investigate response of the skin to various stimuli/as sensory organ. In part (f) about the roles of hairs and sweat pores, some candidates wrote *it covers the skin*. These candidates failed to understand that the hairs regulate temperature. When it is hot the hairs lie to the skin surface and facilitate heat loss. When it is cold the hairs stand vertically and trap air to insulate the skin hence preventing heat loss. This indicates that these candidates lacked practical skills in identifying sense organs specifically the skin which is taught under the topic of Coordination. Extract 15.2 is a sample of candidates' poor responses in question 1 paper 2A.

1. a) i/	The name of the sense organ is eye.	
	ii/ To do the human body be stable	
	. Movement	
	. To listening eg, ear	
	. Doing some work eg. writing, eating etc.	
b) i/	We feel coldness	
	ii/ The type of sensory receptor is hairs	
c) i/	Coarseness felt is starch and protein	
	ii/ Sensory receptor is Iodine solution and copper II sulphate	
d) i/	Pain	
	ii/ Hairs and sweat pores	
e)	The aim of thus experiment is to know the work of your sense organ	
f) i/	To cover the human body thus are the main role of hair.	

Extract 15.2: Candidate's poor response in question 1 paper 2A.

In Extract 15.2, the candidate wrote the sense organ is an eye instead of skin in part (a) (i). Also he/she identified the food samples and the chemicals used to test food instead of identifying the coarseness felt in each of the samples A and B and the type of sensory receptors responsible for the feeling in part (c) (i) and (ii). Also, the responses given in other parts were incorrect.

3.1.2 033/2B Biology 2B

The question had seven parts (a) - (g) carrying a total of 25 marks. In this question, the candidates were provided with a piece of mirror and food samples labelled by letter A (sugar), B (lemon fruit), C (table salt) and D (coconut fruit). They were required to carry out experiments under procedures (i) – (v) and then answer the questions that follow:
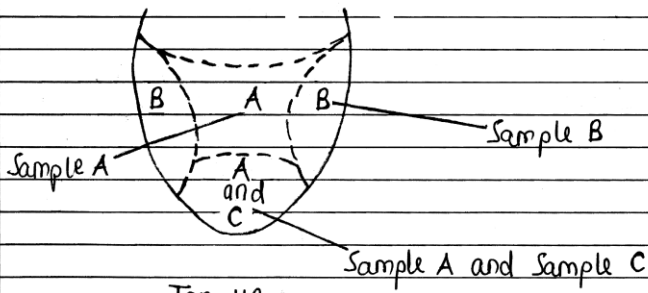
The procedures were:
  (i)   Hold up a mirror in front of your face while opening your mouth widely, and note all sense organs reflected on the mirror.
  (ii)   Carefully look at specimens C and D and note their coarseness.
  (iii) Touch both sample C and D and note their coarseness.
  (iv)   Hold specimen D near the right ear, then shake it vigorously and note the sound that comes from inside.
  (v)   Observe the food samples A, B, and C carefully. Do not taste the food sample in the laboratory.

The question required the candidates to:
  (a) *Identify the function of each sense organ identified in procedure (i).*
  (b) *Name the stimuli perceived by each of the sense organs identified in procedure (i).*
  (c) *What is the shape of the samples C and D?*
  (d) *Identify the coarseness of samples C and D.*
  (e) *Identify the contents producing the sound inside sample D.*
  (f) *Draw a well labeled diagram of sense organ observed in the mouth and locate the regions corresponding to the taste of the following food samples: (i) A (ii)B (iii)C.*
  (g) *Briefly explain how the nervous system recognizes the taste of food samples.*

The candidates who wrote correct responses in most parts of the question had adequate knowledge about sense organs. They were able to identify the sense organs and the function of each. Extract 16.1 is an example of candidate's good response in question 1 paper 2B.

1. a) i) Tongue for tasting
ii) Skin for sensing touch
iii) Nose for smelling
iv) Eye for seeing
v) Ear for hearing

b)

Organ	Stimuli perceived
i/ Tongue	taste
ii/ Ear	Sound
iii/ Skin	Touch
iv/ Eye	light
v/ Nose	Smell

c) Shape of sample C is cubic shape
shape of sample D is spherical shape.

d) The coarseness of sample C is rough and the coarseness of sample D is rough

e) The contents that producing the sound inside sample D is fluid (liquid) contained in the sample

F) The diagram of a tongue

Tongue.

g) Nervous system recognizes the food samples taste as taste buds (regions for taste perception) are stimulated by food substance or chemical dissolved in moist surface, the hair cells (sensory hair cells) which are made up of the sensory fibres connected to the taste buds, sends electrical impulses to the brain for interpretation and taste perception

Extract 16.1: Candidate's good response in question 1 paper 2B.

In Extract 16.1, the candidate managed to give correct responses in all parts of the question and hence scored all the marks.

However, some of the candidates gave incorrect responses in all parts of the question. For example, in part (a) they wrote the functions of other organs such as lungs as one wrote *it is used for gaseous exchange*. In part (b) some of the candidates wrote the functions in place of stimuli as they wrote the *stimulus for eye is seeing, stimulus for ear is hearing*. Another candidate wrote the stimulus for tongue is *food*. In part (c) they wrote incorrect responses such as the shape of specimen D (coconut) is *solid* and shape of sample C is *sandy, small shape* instead of cubic or cube for C and round shape for D. In part (d) in identifying the coarseness of samples C and D, they wrote incorrect responses such as the coarseness of sample C is *wet substance* while the coarseness of sample D is *dry substance*. In part (e) they wrote the contents producing the sound inside sample D as *sound waves* while others wrote the sense organ such as *ear*. In part (f) some drew the diagrams of other sense organs such as the eye, skin and ear. Also, there were other candidates who drew the diagram of a tongue but used words to locate the regions corresponding to the food samples contrary to the demand. For instance, one candidate labelled *sugar, sour* and s*alt* instead of using letters A, B and C respectively. Further analysis shows that most of the candidates failed to explain how the nervous system recognizes food samples in part (g). This shows that these candidates lacked practical skills in identifying the sense organs specifically the tongue. Extract 16.2 exemplifies further. When responding to this part, they were supposed to recognize that food substances dissolve in the saliva/liquid in the mouth and the taste buds in the tongue are stimulated and initiate the impulse. The impulses are carried to the brain by sensory neurone then the brain makes interpretation of the food taste.

F) To draw a well labeled diagram of se
nse organ observed in the mouth and
locate the region corresponding to the
taste of the following food sample,

i) A
ii) B
iii) C

TONGUE

better

sweet

salt

b) Name stimuli perceived by each of
the sense organs identify in procedure.
Tongue

c) Identify the function of each sense
organ identify in procedure
The sensitivity

c) What is the shape of the samples
c and D
The shape of the sample c is lipids
The shape of the sample D is coconut

d) Identify the contents producing the
sound inside sample D?
The sample D are the coconut and
the lipids

Extract 16.2: Candidate's poor response in question 1 paper 2B.

In Extract 16.2, the candidate managed to draw the diagram of the tongue with a caption but he/she incorrectly used letters to label it. Also the candidate wrote incorrect responses in all the other parts. For example, he/she wrote the shape of sample D as coconut instead of round.
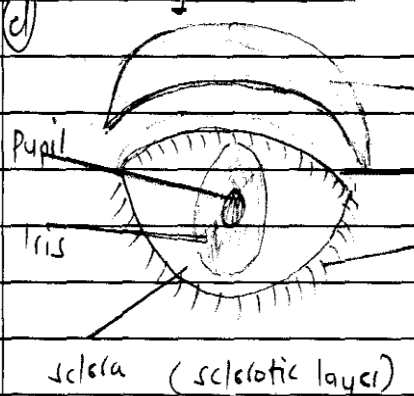
3.1.3   033/2C Biology 2C

The question had five parts (a) - (e) carrying a total of 25 marks. In this question, the candidates were provided with a mirror and were required to hold it up until the image of the face is reflected on the surface of the

mirror. Then, they were required to observe all sense organs on the mirror by touching them and then answer the questions that follow:

(a) *What were the sense organs observed on the surface of the mirror?*
(b) (i) *Identify the sense organ responsible for hearing.*
    (ii) *What nervous mechanism enables your hearing sense organs to recognize the sound?*
(c) (i) *Identify the sense organ responsible for vision.*
    (ii) *What type of stimuli was perceived by the organ mentioned in (c)(i)*
(d) *Draw a well labelled diagram of the sense organ for vision to show the front view as you can see it on the surface of the mirror.*
(e) *Using any three labelled parts in (d) as a reference; explain what will happen in your daily life if the parts are seriously damaged.*

The candidates who performed well wrote correct responses in most parts of the question and therefore scored from 16.5 to 25 marks. This shows that these candidates had adequate knowledge about sense organs specifically the ear and the eye. Extract 17.1 is an example of candidate's good response in question 1 paper 2C.

1 a) (i) Eye

(ii) Ears

(iii) Skin.

(iv) None.

b) (i) Ear.

(ii) The sound waves are trapped by the pinna and directed to the eardrum then to the cochlea the cochlea receives sound waves and convert them into nerve impulses that are then passed into the brain by auditory nerve to be interpreted as sound.

c) (i) Eye.

(ii) Light.

d) diagram of the sense organ for vision (Eye)

Eye brow
Eye lid
Eye lashes
Pupil
Iris
sclera (sclerotic layer)

c) Iris - If the Iris is demaged the eye will Fail to control the amount of light passed in to the eye.	
(ii) Schlerotic layer- If the schlerotic layer is demaged the eye will fail be shapeless and there will not be protection of the eye.	
(iii) Pupil - If the pupil is demaged there is no Vision because the pupil has the function of allowing light to pass through the eye.	

Extract 17.1: Candidate's good response in question 1 paper 2C.

In Extract 17.1, the candidate managed to give correct responses in all parts of the question and hence scored all the marks allocated to this question.

Conversely, there were candidates who scored low marks (0 to 7). Further analysis reveals that some of these candidates wrote correct responses in some parts while others gave incorrect responses in all parts. For example, in part (b) (ii), most of the candidates failed to explain the nervous mechanism which enabled hearing of sound. They wrote incorrect responses such as *hearing mechanism* instead of explaining the mechanism itself. These failed to understand that, the ear recognizes the sound because it has sensory (cochlea/ hair cells) that receive sound waves and convert them to nerve impulses which are transmitted by auditory nerves to the brain for interpretation. In part (c) (i) and (ii) some of the candidates incorrectly identified the sense organ and the stimulus. They wrote *ear* as a sense organ for vision and *sound and object* as stimulus instead of the eye as a sense organ and the stimulus is light. In part (d), some of the candidates could draw the front view of the sense organ for vision but labelled one or two parts while others failed to label completely hence lost the marks. Others drew the internal structure of the eye instead of the front view. Similarly, in part (e), they failed to explain what will happen if the parts labelled were damaged. For example, one candidate wrote *when iris is damaged there will be no light entering the eye*, *when lens is damaged there will be no control of light entering the eye*. These candidates failed to understand that the pupil allows light to enter the eye while iris controls amount of light entering and therefore when damaged, the functions they

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perform will not be executed. Extract 17.2 shows a sample of a candidate's poor response in question 1 paper 2C.

1. You have been provided with a mirror. Hold it up and Face it Until the image OF your Face is reFlected on the SurFace OF the mirror. Observe all tense Organs On the mirror by touching and then answer the questions that Follow

   (a) What were the sense Organs observed on the SurFace OF the mirror ?
   — tongue

   (b) i) IdentiFy the sense Organ Responsible For hearing.
   — Eye.

   ii) What Nervous mechanism enables your hearing Sense Organ to Recorgnize the Sound
   — sense Organ

   (c) i) IdentiFy the sense Organ Responsible For Vision.
   — Ear

   ii) What type OF stimuli was preceived by the Organ mentioned in (c) (i) touch

d) Draw a well labeled diagram of the sense Organ for vision to show the Front View as you can see it On the Surface Of the mirror.

e) Using any three labeled parts in (d) as a reference, Explain What will happen in your daily life it ~~On the Surface of the mirror~~ the part are Seriously damaged.
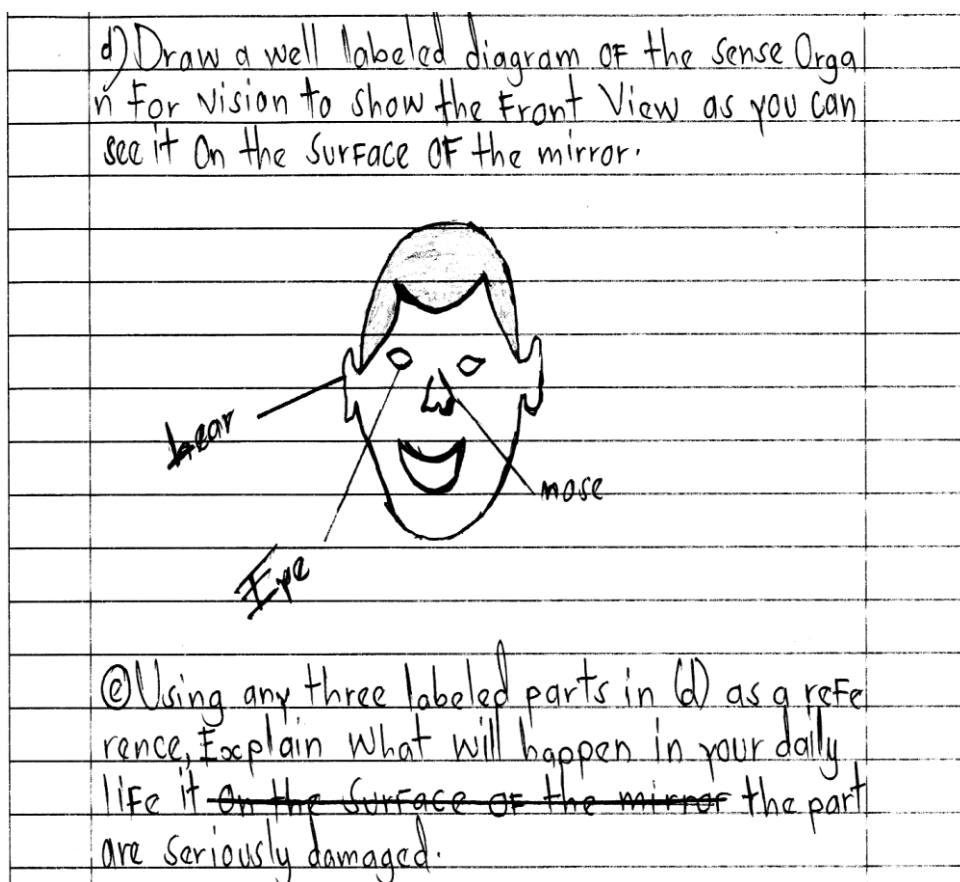
Extract 17.2: Candidate's poor response in question 1 paper 2C.

In Extract 17.2, the candidate wrote incorrect responses in all parts of the question. For example, he/she drew human head and labelled the sense organs instead of drawing the sense organ for vision. Also, the responses given in other parts were incorrect.

3.2   Question 2: Classification of Living Things

A total of 432,274 (99.6%) candidates attempted question 2 in all the three papers A, B and C. The analysis shows that 183,716 (42.5%) candidates scored from 0 to 7 marks, 201,872 (46.7%) scored from 7.5 to 16 marks whereas 46,686 (10.8%) scored from 16.5 to 25 marks. Figure 17 summarizes the candidates' performance in question 2 in papers A, B and C respectively.
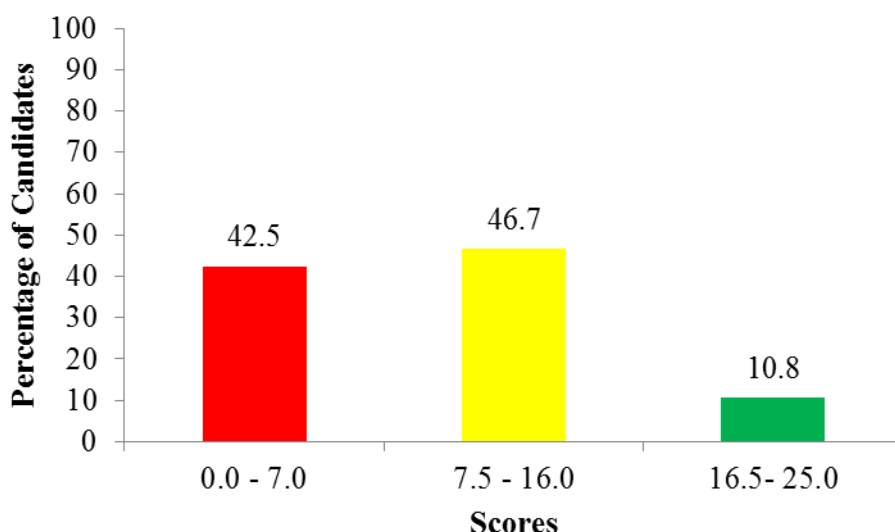
Figure 17: *Candidates' performance in question 2.*

3.2.1 033/2A Biology 2A

The question had four parts (a) - (d) carrying a total of 25 marks. In this question, the candidates were provided with specimens P (mushroom), Q (bean seedling) and R (crab) and were required to examine them carefully and answer the questions that follow:

(a)   (i)   *Classify the specimens P, Q and R to Phylum/Division level.*

      (ii)   *What are the two observable features you used to place specimens P and Q to their respective Kingdoms?*

(b)   *Draw a well labelled diagram of specimen P.*

(c)   (i)   *What is the habitat of specimen Q?*

      (ii)   *Why is it important for a Biology student to know the habitat of the specimen Q?*

      (iii)   *Identify three observable features which help specimen Q to adapt its habitat.*

(d)   *In what ways the representative members of Kingdom in which the specimen Q belongs are advantageous to industrial development in Tanzania. Give three advantages.*

The analysis of candidates' performance shows that most of the candidates scored average (57.5%) marks for all alternative papers (A, B and C). However, 10.8 percent of the candidates performed well in this question. They gave correct responses in most parts of the question. This indicates that the candidates had adequate knowledge of the topic of Classification of

Living Things. Extract 18.1 is a sample of candidates' good response in question 2 paper 2A.

2. a) i) Classification:-
    Specimen P:-
       Kingdom : Fungi
       Phylum : Basidiomycota

    Specimen Q:-
       Kingdom : Plantae
       Division : Angiospermophyta.

    Specimen R:-
       Kingdom : Animalia
       Phylum : Arthropoda

a) ii) Observable features of specimen P used to place it in its respective kingdom are:-
    → It has hyphae, which are thread like structures forming the specimen's body.
    Observable features of specimen Q used to place it in its respective kingdom are:-
    They have leaves green in colour to indicate that it can photosynthesize (green leaves).

c) i) The habitat of the specimen Q is terrestrial.
    ii) It is important for a Biology student to know the habitat of specimen Q because it helps a student to obtain them when they are needed.

2. b) A WELL LABELLED DIAGRAM OF SPECIMEN P.
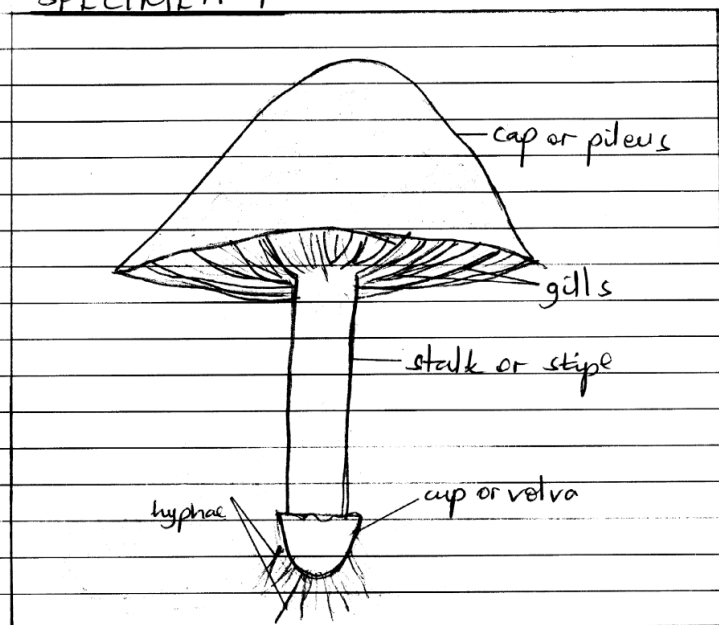
c) iii) Observable features which help specimen Q to adapt its habitat are :-
→ It has roots for attachment to the soil from which it gets nutrients such as mineral salts and water .
→ It has stem for conduction of water and mineral salts from roots to other parts of the plant such as leaves which have veins.
→ It has green leaves for photosynthesis.

d) Advantages of the representative members of Kingdom in which the specimen Q belongs to industrial development in Tanzania are :-
i) Some members are used to provide raw materials for industries for example cotton is used in textile industry to manufacture clothes and sisal to manufacture fibres.
ii) Some for example conifers, provide timber for construction and paper industries
iii) They produce materials for rubber industries.

Extract 18.1: Candidate's good response in question 2 paper 2A.

In Extract 18.1, the candidate wrote correct reponses in all the parts. This indicates that the candidate had adequate knowledge on classification of living things and practical skills in identifying and classifying various organisms.

Conversely, there were candidates, who scored low marks. They wrote incorrect responses in most parts of the questions signifying lack or inadequate knowledge of Classification of living things. For example, in part (a) (i), most of the candidates incorrectly classified the specimens P (mushroom), Q (bean seedling) and R (crab). For instance, one candidate classified mushroom into *Kingdom Plantae* instead of Kingdom Fungi. Also mushroom was classified into *Phylum Ascomycota* instead of Phylum Basidiomycota. Others correctly classified the specimens into their Phylum/division without following the hierarchical order which starts from the highest rank Kingdom to the lowest rank phylum and hence led to loss of marks. Also, there were other candidates who wrote correct responses but misspelt them. For example, one candidate classified mushroom as *Phylum Basdomycot* instead of *Basidiomycota*. Another candidate classified bean seedling into division *Angospermophta* instead of Angiospermophyta/Angiospermatophyta. These candidates did not understand that these are scientific terms which cannot be awarded when they are misspelt. In part (a) (ii), most of the candidates wrote general features of Kingdom fungi which were not observable. For example, one candidate wrote *they are heterotrophic*, *they have cell wall made up of chitin, they are saprophytes* and *they store food in form of glycogen* instead of the observable features.

In part (b), some of the candidates drew diagrams of different organisms apart from the mushroom. For instance, one candidate drew the diagram of *fern plant*. Others drew the diagrams of *yeast and breadmould* instead of mushroom. In part (c) (i), some candidates wrote the habitat of specimen Q as *aquatic, in the market, stores, shops and home* instead of terrestrial/farm/garden. In part (c) (ii), they wrote incorrect responses such as *it is important for student to know the habitat so as to classify them* and *it is important to know the habitat of specimen Q so as to improve its production.* In part (c) (iii), they wrote the structures without explaining how they are adapted to their functions. For example, one candidate wrote *they have roots, they have stem and they have green leaves.* Another candidate wrote *they produce flowers, they are long, and they have tissues.*

These candidates failed to realize that adaptation means structural development which enables the structure to perform its function. In part (d), some of the candidates gave incorrect advantages while others gave one to two correct advantages and some gave incorrect advantages such as *they are helpful to make soil fertility, they are habitat to some organisms* and *they are used for study* without connecting to the industrial development in Tanzania and hence loss of marks. This shows that the candidates had inadequate knowledge about the tested concepts. Extract 18.2 is a sample of candidate's poor response in question 2 paper 2A.

Extract 18.2: Candidate's poor response in question 2 in paper 2A.

In Extract 18.2, the candidate wrote incorrect responses in all parts of the question. For example, he/she drew moss plant instead of mushroom. He/she incorrectly classified specimen P and Q into phylum Anthropoda and Monocotledon instead of phylum Basidiomycota and Angiospermophyta/Angiospermatophyta.

3.2.2   033/2B Biology 2B

The question had five parts (a) - (e) carrying a total of 25 marks. In this question, the candidates were provided with specimens Q (Tick), R (Beetle), S (Sisal leaf) and T (Bee) and were required to answer the questions that follow:

 (a)   *Classify the specimens Q, R and S from Phylum/Division to Class level.*
 (b)   *What distinctive features of the specimen R makes it typical representative of the Class it belongs?*
 (c)   *What are the three observable differences between the specimens Q and R at Class level?*
 (d)   (i)   *What is the habitat of each of the specimens S and T?*
        (ii)   *Identify three observable features which help the specimen T to adapt its habitat.*
 (e)   *Give three advantages of the products produced by each specimens S and T for the development of processing industry in Tanzania.*

The analysis of candidates' responses shows that the candidates who performed well in this question gave correct responses in all the parts of the question. These candidates had adequate knowledge of identifying and classifying various organisms. Extract 19.1 is a sample of candidates' good response in question 2 paper 2B.

02. a)

Specimen	Phylum/Division	Class
Q	Arthropoda	Arachnida
R	Arthropoda	Insecta
S	Angiospermophyta.	Monocotyledonae

b) i) Have three pair of jointed appendages.
ii) Have three body parts (head, thorax and abdomen)
iii) Have both simpe and compound eyes.

c)

Specimen Q	Specimen R.
i) Have four pair of jointed appendages.	i) Have three pair of jointed appendages.
ii) It's body divided into two parts (cephalothorax and abdomen)	iii) Its body divided into three parts (head, thorax and abdomen)
iii) Have no wings	iii) Have wings.

d) i) Specimen S - Terrestial areas
Specimen T - Terrestial places (on plants)

ii) - Presence of sting for defence
- Presence of wings for flying
- Presence of compound eyes for seeing far.

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Advantages of products produced by specimen S is it helps in manufacture of ropes which can be used in different activities such as drying clothes and be sold to obtain money.

ii) Specimens helps in producing decorations such as synthetic human hair.

iii) Specimens helps to obtain raw materials for making carpets.

Advantages of products produced by specimen T (honey bee).

i) Specimen T produce wax which helps in making candles which are used as source of light.

ii) Specimen T produce honey which acts as medicine for various diseases. For example Traditional medicines industry.

iii) Specimen T is used in production of antidont.

Extract 19.1: Candidate's good response in question 2 paper 2B.

In Extract 19.1, the candidate wrote correct responses in all parts of the question indicating adequate knowledge of identifying and classifying various organisms.

However, some of the candidates scored low (0 – 7) marks. These candidates gave incorrect responses in all parts of the question. For example, in part (a), some wrote incorrect ranks while others had correct ones but misspelt them. For instance one wrote the Phylum of specimen Q and S as *Anthopoda* and *Angospemophta* instead of Arthropoda and Angiospermophyta respectively. In part (b), some of them wrote general features of Phylum Arthropoda such as *they are multicellular, they have heterotrophic nutrition* and *they have exoskeleton.* Others wrote the distinctive features of Class Arachnida as they wrote *they have bodies*

divided into two parts and *they have four pairs of legs* instead of the distinctive features of class Insecta in which specimen R belongs. In part (c), some of the candidates wrote *specimen Q is small in size while specimen R is big in size and specimen Q have false wings while specimen R had true wings.* Other candidates had correct answers but interchanged them. They wrote features of class Arachnida in place of class Insecta. Other candidates correctly outlined observable features of either specimen Q or R instead of giving the differences between the two specimens. In part (d) (i) some candidates wrote the habitat of specimen S as *moist soil* and specimen T *as damp areas, dirty places, homes*. These candidates failed to understand that specimens **S** can be found in terrestrial/dry areas/semiarid while specimen **T** can be found in terrestrial/flower/beehives/forest. In part (d) (ii), most of the candidates gave features of specimen T such as *has stings, has eyes and has antennae* instead of explaining how they adapt the organism to its habitat. In part (e) some of the candidates gave the general advantages of specimens T and S as used as *source of income*, *increase national income* and *brings foreign currency to the country*. Another candidate wrote *create employment opportunities* and *encourage developmental trade,* Other candidates gave one to two correct advantages while others failed which led them to obtain low marks. Extract 19.2 shows the sample of candidate's poor responses in question 2 paper 2B.

2.	DIVISION	PHYLUM	CLASS	
Q)	kingdom Animali	Athropoda	Diplopoda	
R)	kingdom plantai Animali	Athropoda	chropoda.	
S)	kingdom plantae	Byscomycota.	Daccolytelydon.	

b) It haw one pair of antena

c)
Q	R
i) Have a many legs	Have a fore and hind legs only.
ii) Have a two antena	Haven't antena.
iii) Have a small abdomen	Have a big abdomen.

d) S leaves keep to the soil
T leaves to the air

(ii) (i) Have wings
(ii) Have abdomen
(iii) Have legs that are fore and hindre

e) T It is a source of Food

J It is a source of fruit that as pineapple are used
to making dri soft drinking.

Extract 19.2:Candidate's poor response in question 2 paper 2B.

In Extract 19.2, the candidate wrote incorrect responses in all parts of the question. For example he/she wrote the class of specimen Q as Diplopoda instead of Arachnida. Also he/she misspelt the phylum as Athropoda

instead of Arthropoda. The candidate also gave incorrect differences between specimen Q and R hence lost marks.

3.2.3 033/2C Biology 2C

The question had four parts (a) - (d) carrying a total of 25 marks. In this question, the candidates were provided with specimens T (bean seedling), U (Sisal leaf) and V (tilapia) and were required to study them carefully and answer the questions that follow:

(a) (i) *Classify the specimens T and V to Class level.*

(ii) *Give two observable distinctive structures of each of the specimens T and V used to place them in their respective Classes.*

(b) (i) *Give the habitat for each of the specimens U and V.*

(ii) *How do the specimens U and V adapted to their habitats? Give three points for each.*

(c) *Why the specimen V dies when taken out of its habitat?*

(d) (i) *Why specimen U was formally placed in the Kingdom Plantae? Give two reasons.*

(ii) *State three economic importance of the specimen U in our daily lives.*

The analysis of candidates' responses shows that the candidates who scored high marks (16.5 – 25) gave correct responses in most parts of the question. This indicates that the candidates had adequate knowledge of identifying and classifying living things. Extract 20.1 is a sample of candidates' good response in question 2 paper 2C.

2. a)i)

Specimen	Kingdom	Division	Class
T	Plantae.	Angiosperm ophyta.	Dicotyludonae

Specimen	Kingdom	Phylum	Class
V	Animalia	Chordata	Osteichthyes.

a)ii) Specimen T.
- has tap root system.
- has network of veins in floral parts.

2. a)ii) Specimen V
- It has bony skeleton.
- position of mouth is terminally placed

	Habitat.	
b)i) Specimen U	- Terrestrial.	
Specimen V	- Aquatic (in water).	

b)ii) Specimen U- terrestrial.
i) Presence of extended root system which absorbs water and mineral salts from the soil.

ii) Presence of spines and cuticle to protect it against excessive water loss.

iii) presence of chlorophyll which enable it to produce it's own food.

Specimen V - Aquatic.

i) presence of gills which is the site for gaseous exchange.

ii) Presence of scales which protect its interior parts.

iii) Presence of lateral line for detection of waves and other changes in water.

2. c) Specimen V dies when take out of its habitat because gills absorb oxygen ⇒ dissolved in water when taken out of its habitat the gills collapses and can't absorb oxygen and therefore the specimen V lack oxygen suffocates and then dies.

d)i) Specimen U was formally placed in kingdom plantae because;.

a) It has chlorophyll which enabled it to manufacture its own food.

b) It has cell wall made up of cellulose.

Extract 20.1: Candidate's good response in question 2 paper 2C.

In Extract 20.1, the candidate wrote correct responses in all parts of the question indicating adequate knowledge of identifying and classifying various organisms.

On the other hand, some of the candidates scored low (0 – 7) marks. These candidates gave incorrect responses in some or all parts of the question. For

example, in part (a) (i), some wrote incorrect ranks while others had correct ones but just wrote the classes for the two specimens without starting from the highest rank Kingdom. Also, there were other candidates who had the correct response but misspelt them. For instance one candidate wrote the Class of specimen V as *Ostchthyes* instead of Osteichthyes. In part (a) (ii), some of them wrote general features of Classes Monocotyledonae and Osteichthyes such as *it has green leaves, it is a plant, it is a fish* instead of the observable distinctive features. In part (b) (i), some candidates wrote the habitat of specimen U as *dessert and dry places* while V as *muddy*. These candidates failed to understand that specimens U can be found in terrestrial while specimen V can be found in aquatic. In part (b) (ii), most of the candidates gave features of specimen V such as *has scales, has eyes and has fins* but they did not explain how these features helps the organism to survive in their habitat.

In part (c) most of the candidates gave incorrect responses as one candidate wrote *because there will no be oxygen*, *because it uses gills, because there are combination of gases*. They failed to understand that specimen V dies when taken out of its habitat because its respiratory organ, the gills are adapted to take dissolved oxygen in water, so when they are taken out of water the gills cannot take the oxygen in air. In part (d) (i), they gave general features as *they are multicellular*, *they are heterotrophic* instead of the distinctive features which are; have chlorophyll for photosynthesis and a body cell wall made of cellulose. In part (d) (ii), they gave one to two correct advantages while others failed. This led them to obtain low marks. Extract 20.2 shows the sample of candidate's poor responses in question 2 paper 2C.

2. a) i) T - Angiospermetophyta.
   V - Nematoda.

ii)

T	V
- They had dirct leafs	- It had Anal fin.
- It had fibrous roots and main roots.	- It had dorsal fin.

2 b) i) U - Soil
      V - Water

ii) • Specimen V
- Water has oxygen which enable it to breath.
- Water has materials which enable it to eat.
- Water contain other organisms which enable it to do reproduction.

• Specimen U
- Soil had fertility which enable it to grow.
- Soil had water which enable it to manifacture its own food.
- Soil had mineral salts which enable it to survive.

c) Specimen V dies when taken out of its habitat because it fail to breath out of its habitat due to their habitat to had Oxygen and Hydrogen.

d) i) Because it grow on fertile soil and water
   ii) iii) Used as a source of development

Extract 20.2: Candidate's poor response in question 2 paper 2C.

In Extract 20.2, the candidate wrote incorrect responses in all parts. For example, he/she just incorrectly wrote *T- Angiospermetophyta* instead of division Angiospermophyta and specimen *V- Nematoda* instead of Phylum Chordata in part (a). He/she understood the concept of adaptation but the adaptive features given in part (b) (ii) were incorrect.

4.0 ANALYSIS OF CANDIDATES' PERFORMANCE IN EACH TOPIC

The analysis of the candidates' performance in different topics indicates that out of 17 tested topics in Biology Paper 1 CSEE 2020 through 15 examination questions, seven (7) questions had average performance while eight (8) questions had poor performance. Question 1 (Multiple Choice Items) had average performance of 64.5 percent. Question 1 consisted of ten items derived from ten (10) topics which are: *Gaseous Exchange and Respiration, Introduction to Biology, Classification of Living Things, Nutrition, Coordination, Reproduction, Safety in Our Environment, Evolution, Transport of Materials in Living Things and Cell Structure and Organisation.* The other topics with average performance were: *Introduction to Biology* (30.9%), *Growth (35.8), Genetics (39.2%), Healthy and Immunity (40.9%), Nutrition (49.3%)* and *Movement (49.8%)* which were examined in questions 2, 7, 12, 13, 14 and 15, respectively.

The topics with weak performance were *Safety in Our Environment* (23.8%), *Classification of Living Things* (1.3%), *Balance of Nature* (25.7%), *Transport of Materials in Living Things (22.7%)*, *Coordination* (15.2%), *Excretion* (7.3%), *Regulation* (17.9%) and *Reproduction* (12.6%). These topics were examined in questions 3, 4, 5, 6, 8, 9, 10 and 11, respectively. Appendix I summarizes the candidates' performance in paper 1 CSEE 2020 topic-wise. In the actual practical papers, the topics of Coordination and Classification of Living Things had average performance of 33.3 and 57.5 percent respectively.

In comparing the candidates' performance in the years 2019 and 2020 topic wise in paper 1, the analysis shows that in the CSEE 2020, the performance has improved from weak to average in the topics of Nutrition and Genetics. This implies that there were some efforts directed toward improving teaching and learning in Biology subject. On the other hand, the performance of the topics of Movement, Health and Immunity and Introduction to Biology has maintained average performance. However, the topics of Classification of Living Things and Safety in Our Environment dropped from average in 2019 to weak in 2020. Also, the topics of Reproduction, Excretion, Coordination, Regulation and Transport of Materials in Living Things maintained the weak performance. The comparison of performance year wise is summarized in Appendix II.

5.0   CONCLUSION AND RECOMMENDATIONS

5.1   Conclusion

The analysis which was done on the Biology CSEE examination 2020 shows that, the questions which had average performance were 1 (64.5%), 2 (30.9%), 7 (35.8%), 12 (39.2%), 13 (40.7%), 14 (49.3%) and 15 (49.8%). On the other hand, the questions with poor performance were 3 (23.8%), 4 (1.3%), 5 (25.7%), 6 (22.7%), 8 (15.2%), 9 (7.3%) and 10 (17.9%).

Further analysis shows that, in theory paper, the topics of Coordination and Classification of Living Things had weak performance of 15.2 and 1.3 percent while in practical paper, the performance was average (33.3% and 57.5%). This shows that students gain more understanding and easily remember the taught materials when they learn by doing. Generally, the performance of the candidates in Biology subject CSEE 2020 was average as 55.1 percent of the candidates passed the examination.

The analysis conducted on the candidates' responses indicated that, good performance to some candidates was attributed to factors such as sufficient knowledge of the tested concepts, good understanding of the questions demand and proficiency in the English language. On the other hand, weak performance to some candidates was due to the following factors;-

(a)   Insufficient knowledge or lack of enough knowledge of various concepts which led them to give incorrect or insufficient answers.

(b)   Failure of the candidates to understand the demands of the questions which caused them to give incorrect responses.

(c)   Lack of proficiency or poor command of English language which made the candidates to experience difficult in understanding questions and expressing their concepts or terminologies.

5.2   Recommendations

Based on the observations made through the candidates' item response analyses report, the following recommendations are put forward for improvement of candidates' performance in Biology subject.

(a)   Teachers and students are advised to read the Candidates' Item Response Analysis report (CIRA). This will enable them to find the factors which affect candidates' responses and take appropriate

measures in the classroom teaching and learning process so as to improve the candidates' performance.

(b)   Students and teachers are urged to use English Language during the discussion of various topics in class and in other extracurricular activities. This will help students to be fluent with the language.

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

   (i)   For the topic of *Classification of Living Things,* teachers should give students charts/pictures/photographs/specimens of different living organisms for them to classify. For example students may collect information from different books for each class of Phylum Chordata then explain, draw and label representative organisms for each class.

   (ii)   For the topic of *Excretion,* particularly excretion in plants, teachers should use *charts* which show different plants and their excretory products. Then lead discussion about ways through which plants get rid of the excretory products. Students should explain the ways and the examples of excretory products for each way.

   (iii)   For the topic of *Reproduction* in the subtopic of pollination, teachers should use different flowers such as hibiscus, rose, maize flower or bean flower to lead students to observe and identify characteristics and agents of pollination of those flowers. Then teachers to clarify and make conclusions on the characteristics of wind and insect pollinated flowers.

   (iv)   For the topic of *Coordination,* particularly sense organs such as the eye, teachers should provide students with charts/models/photographs of the eye. Students should observe and discuss the role of the eye and its adaptive features.

   (v)   For the topic of *Regulation,* teachers should use charts/pictures/diagrams which show the structure of nephrone to lead students to mention factors which affect the contents of salt and water in the body. Then they should lead

students to categorize the factors which affect the contents of salt and water in the body and the teacher to give clarifications and conclusions.

(vi)   For the topic of *Transport of Materials in Living Things,* teachers should use charts/models/photographs/specimens of arteries, veins and capillaries to identify their structure. Students should draw well labelled diagrams of each blood vessel and discuss the differences between arteries, veins and capillaries.

(vii)   For the topic of *Safety in our Environment,* teachers should provide different materials such as knives, kerosine, medicines fire etc which can cause accident at home and school. Then they should lead discussion on common accident which occur at home and in school and the ways to prevent them.

(viii)   For the topic of *Balance of Nature,* teachers should use charts and photographs which show different living organisms and lead discussion on food chains and food webs. Students should construct food chains and food webs using examples from their environment.

A summary of the candidates' performance topic-wise in CSEE 2020

S/N	Topic	CSEE 2020		
		Question Number	Percentage of the candidates with a Score of 30% or Above	Remarks
1.	Gaseous Exchange and Respiration, Introduction to Biology, Classification of Living Things, Nutrition, Coordination, Reproduction, Safety in Our Environment, Evolution, Transport of Materials in Living Things and Cell Structure and Organisation.	1	64.5	Average
2.	Movement	15	49.8	Average
3.	Nutrition	14	49.3	Average
4.	Health and Immunity	13	40.7	Average
5.	Genetics	12	39.2	Average
6.	Growth	7	35.8	Average
7.	Introduction to Biology	2	30.9	Average
8.	Balance of Nature	5	25.7	Weak
9.	Safety in Our Environment	3	23.8	Weak
10.	Transport of Materials in Living Things	6	22.7	Weak
11.	Regulation	10	17.9	Weak
12.	Coordination	8	15.2	Weak
13.	Reproduction	11	12.6	Weak
14.	Excretion	9	7.3	Weak
15.	Classification of Living Things	4	1.3	Weak

Comparison of the Candidates' Performance topic-wise in CSEE 2019 and 2020

S N	Topic	CSEE 2019			CSEE 2020		
		Question number	Percentage of Candidates With a Score of 30% or Above	Remarks	Question number	Percentage of Candidates With a Score of 30% or Above	Remarks
1.	Introduction to Biology, Safety in Our Environment, Nutrition, Balance of Nature, Transport of Materials in Living Things, Regulation, Growth, Coordination, Genetics and Evolution.	1	65.1	Good	1	64.5	Average
2	Classification of Living Things	4	1.3	Weak	14	62.7	Average
3	Safety in Our Environment	3	23.8	Weak	4	62.2	Weak
4	Movement	15	49.8	Average	2	55.8	Average
5	Health and Immunity	13	40.7	Average	13	48.7	Average
6	Introduction to Biology	2	30.9	Average	3	45.4	Average
7	Reproduction	11	12.6	Weak	7	26.1	Weak
8	Genetics	12	39.2	Average	15	22.8	Weak
9	Nutrition	6	21.4	Weak	14	49.3	Average
10	Excretion	9	7.3		11	20.8	Weak
11	Coordination	8	15.2	Weak	5	11.8	Weak
12	Cell Structure and Organisation	10	10.3	Weak			
13	Gaseous Exchange and Respiration	9	6.9	Weak			
14	Regulation	12	6.1	Weak	10	17.9	Weak
15	Transport of Materials in Living Things	6	22.7	Weak	8	4.8	Weak