



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



**CANDIDATES' ITEMS RESPONSE ANALYSIS REPORT  
FOR DIPLOMA IN SECONDARY EDUCATION EXAMINATION  
(DSEE) 2020**

**733 BIOLOGY**



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*Published by*  
National Examinations Council of Tanzania  
P.O. Box 2624  
Dar es Salaam, Tanzania.

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## **FOREWORD**

This report analyses the performance of candidates who sat for Biology examination for the Diploma in Secondary Education Examination (DSEE) which was conducted in 2020. The DSEE marks the end of two years of Diploma in secondary education programme. It is a summative assessment which evaluates the competences acquired by the candidates in Diploma in Secondary Education. The report has been prepared to provide feedback to candidates, tutors policy makers, curriculum developers and other educational stakeholders on the performance of the candidates in Biology.

The report highlights factors which made the candidates to score either low or high marks in each question. The factors which made some of the candidates fail to score high marks include: inadequate knowledge in the respective topics, failure to understand the requirements of the questions, misconceptions of facts and lack of competences in presenting answers. However, adequate knowledge about the assessed topics, the ability to understand the requirements of the questions, good presentation skills accompanied by mastery of English Language led to good performance of the candidates.

The National Examination Council of Tanzania (NECTA) believes that the feedback given in this report will enable education stakeholders to take appropriate measures to improve the teaching and learning process for better performance of the candidates in future National Examinations.

Finally, the council would like to express its sincere gratitude to all those who contributed in the preparation of this report.



Dr. Charles E. Msonde  
**EXECUTIVE SECRETARY**

## 1.0 INTRODUCTION

This report analyses the performance of candidates who sat for Biology Diploma in Secondary Education Examination in 2020. The examination consisted of questions which intended to measure the candidates' competences in the 2009 Biology academic and pedagogy syllabus for diploma in secondary education.

The Biology DSEE paper comprised 16 questions in sections A, B and C. Section A had 10 short answer question, each carrying four marks making a total of 40 marks. Section B and C had 3 essay type questions in each. Candidates were required to attempt two questions in each section. Each question carried 15 marks. Questions in section A were composed from both academic (content) and pedagogy (teaching) topics. Questions in section B were composed from academic topics while in section C were composed from pedagogy topics.

Data show that 852 candidates were registered for the examination and 840 sat for the national examination where 839 (99.88%) passed and 1 (0.12%) failed. The general performance of the candidates was good as shown by the following Table:

### General Performance of Candidates on Biology

No. of Candidates Registered	No. of Candidates Sat	No. of Candidates and Percentage					
		Passed	Grades				
			A	B	C	D	F
852	840	839	3	106	605	125	1
	98.59	99.88	0.36	12.63	72.11	14.90	1.12

The Table shows that, out of 840 candidates who sat for the examination, 839 (99.88%) passed and 1 (0.12%) failed the examination.

In this report candidates' performance in each question was considered to be good, average or poor if the percentage of the candidates who scored 40% or more of the marks allocated in a question lies between 70 to 100, 40 to 69 and 0 to 39 respectively. In addition, green, yellow and red colours have been used in charts, graphs and appendix to indicate good, average and poor performance, respectively.

The subsequent section of the report analyses the performance of candidates in each question by describing the demands of questions and candidates' responses. The samples of the candidates' responses were inserted as 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, analysis of candidates' performance per topic, conclusion and recommendations. The next section of the report presents the analysis of candidates' responses in each question.

## **2.0 ANALYSIS OF THE CANDIDATES' PERFORMANCE PER QUESTION**

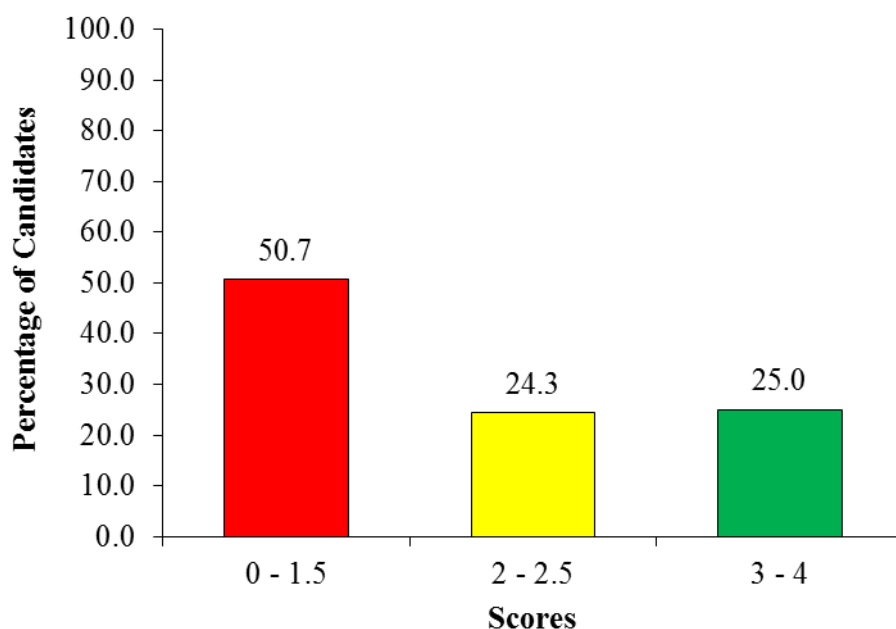
The section analyses the performance of the candidates in each question and item in sections A, B, and C.

### **2.1 SECTION A: SHORT ANSWER QUESTIONS**

This section had 10 questions from both academic and pedagogy topics. Each question carried a total of 4 marks. The candidates were required to answer all the questions in the section.

#### **2.1.1 Question 1: Classification of Living Things**

This question required the candidates to explain four features that categorize mosses and liverworts in the same group. The analysis of the candidates' performance shows that 50.7 percent of the candidates scored from 0 to 1.5 marks out of the 4 marks allocated to this question. The candidates who scored from 2 to 2.5 were 24.3 percent while 25.0 percent scored from 3 to 4 marks. Figure 1 summarizes the candidates' performance in question 1.



**Figure 1:** *The candidates' performance in question 1.*

Figure 1 shows that the candidates' performance in this question was average since 414 (49.3%) candidates scored from 2 to 4 of the total marks allotted to this question. These candidates managed to explain two to four features that categorize mosses and liverworts in the same group. Further analysis shows that 25.0 percent of the candidates performed well in this question. These candidates managed to score 3 to 4 marks. This shows that the candidates had adequate knowledge on the Kingdoms of living things which is taught in the topic of Classification of Living Things. In responding to this question some of the candidates wrote; *they have no vascular bundles, both have no true roots, stems and leaves, both shows alternation of generation and both needs water to facilitate fertilization.* Another candidate wrote; *both are primitive plants without xylem and phloem, both have body called thallus in which leaves and stem emerge and both have roots like structures called rhizoids.* The correct responses given by the candidates suggests that they had adequate knowledge on the Classification of Living Things particularly on Kingdoms of Living Things. Extract 1.1 is a sample of a good response from one of the candidates.



1(a)	Both have alternation of generation where gametophyte generation is dominant over sporophyte generation.
(b)	Both lack true roots stems and leaves.
(c)	Both live in moist and shady areas.
(d)	Both depend on water for fertilization of gametes in which antheridia are to move into archegonia to fertilize the egg.

**Extract 1.1:** A sample of a candidate's good response in question 1.

Extract 1.1 indicates that the candidate had an adequate knowledge thus gave correct features that categorize mosses and liverworts in the same group.

However, 426 (50.7%) candidates obtained 0 to 1.5 marks. They wrote either only one correct point or all irrelevant points. Most of the candidates either gave one correct point or none correct in explaining the features that categorize mosses and liverwort in the same group. For the candidates who scored zero mark, they did not understand the demands of the question. For example, some candidates wrote the characteristics of fern plants such as: *both have leaves called fronds, they have vascular conducting tissues and the mature leaves have sori which produces spores*. Others explained the general features of kingdom plantae. For example, one candidate wrote the general features as *have autotrophic mode of nutrition, both are source of food, they are green plants and they are multicellular eukaryotic organisms*. On the other hand, other candidates demonstrated inadequate knowledge on the concepts, and responded to this question as *both are found in desert places, both have true leaves, both are bryophytes, moss has leaves while liverworts have no leaves, moss produce light spores while liverworts produce no light spores* instead of explaining the features which categorize mosses and liverworts in the same group. These responses suggest that these candidates had inadequate knowledge of the topic particularly Kingdoms of Living Things and consequently these candidates

ended up with poor responses. Extract 1.2 shows a sample of a poor response from one of the candidates.

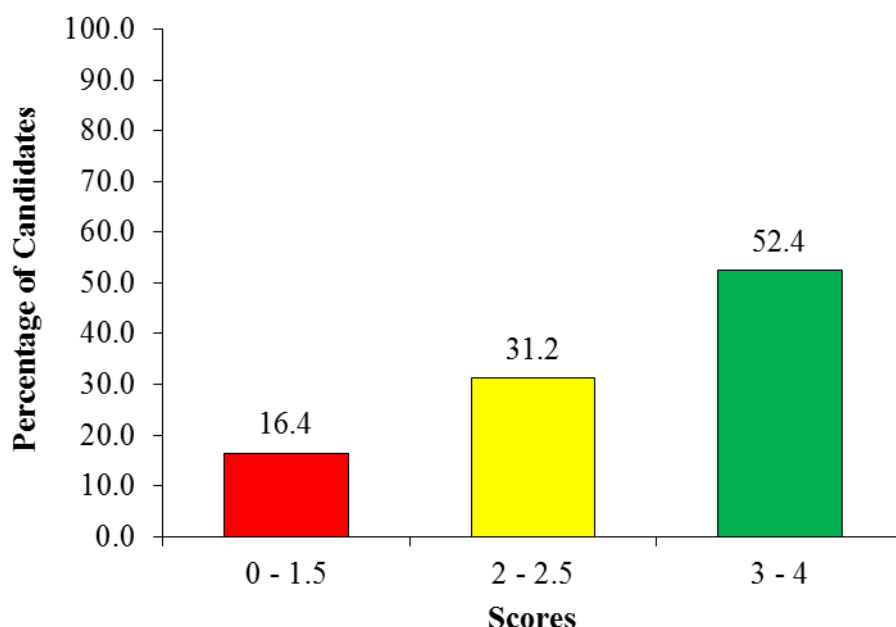
Q1. (i)	They live in dead organic matter.
(ii)	They are saprophytes.
(iii)	They undergo asexual reproduction.
(iv)	They are heterotrophes means they do not able to Manufacture the ir owned food so they depend on dead organic matters.

**Extract 1.2:** A sample of a candidate's poor response in question 1.

In extract 1.2 the candidate wrote the general features of Kingdom Fungi instead of explaining the features that categorize mosses and liverworts in the same group.

### 2.1.2 Question 2: Respiration

This question required the candidates to differentiate between aerobic and anaerobic respiration by giving four points. Data analysis shows that 16.4 percent of the candidates scored from 0 to 1.5 marks, 31.2 percent of candidates scored from 2 to 2.5 marks whereas 52.4 percent scored from 3 to 4 marks. Figure 2 summarizes the performance of the candidates in question 2.



**Figure 2:** *The candidates' performance in question 2.*

Figure 2 shows that the general performance in this question was good because the majority 702 (83.6%) scored from 2 to 4 marks. This shows that the candidates had an adequate knowledge about the tested concepts. The adequate knowledge enabled them to write two to four correct points. For example, some of the responses include: *in aerobic respiration large amount of energy is produced while in anaerobic respiration little amount of energy is produced and in aerobic respiration there is no formation of intermediate organic compound (complete oxidation) while in anaerobic respiration intermediate compounds are formed which is either alcohol or acid (partial oxidation)*. These responses show that these candidates had adequate knowledge of the aerobic and anaerobic respiration. Extract 2.1 is a sample of a good response from one of the candidates.

2.	The differences between	
	Aerobic respiration	Anaerobic respiration
	Is a respiration that occur in presence of Oxygen	Is a respiration that occurs in absence of Oxygen
	It produces water, carbon dioxide and energy	It produces carbon dioxide, lactic acid or alcohol and energy
	It occurs in mitochondria and cytoplasm	It occurs only in cytoplasm
	It occurs in all living cells	It occurs in fungi, bacteria and in germinating seeds

**Extract 2.1:** A sample of a candidate's good response in question 2.

Extract 2.1 indicates that the candidate had an adequate knowledge. The candidate wrote correct differences between aerobic and anaerobic respiration.

Nevertheless, 138 (16.4%) candidates performed poorly in this question. Some of these candidates had either partial or inadequate knowledge about the differences between aerobic and anaerobic respiration. They gave responses with either only one correct point or all incorrect points. For example, one of the candidates wrote *aerobic respiration is the process of breaking down food in the body by the use of energy while anaerobic respiration food is broken down without using energy; aerobic respiration is the type of respiration where there is more oxygen while anaerobic respiration there is more carbon dioxide, aerobic respiration is done inside the body of the living organism while anaerobic respiration is done outside the body of living organism*. Another candidate wrote; *aerobic respiration has large molecular mass while anaerobic has small molecular mass, in aerobic no gaseous exchange that take place while in anaerobic there is gaseous exchange*. Other candidates wrote; *aerobic occurs in blood while anaerobic in cytoplasm, aerobic occurs rapidly while anaerobic occurs slowly, aerobic occurs in animals while anaerobic occurs in plants*. Other candidates interchanged the answers where they wrote the answers of

aerobic respiration in place of anaerobic respiration. Incorrect responses given by the candidate indicates that the candidate had inadequate knowledge of the concept of the aerobic and anaerobic respiration. Extract 2.2 is a sample of a poor response from one of the candidates.

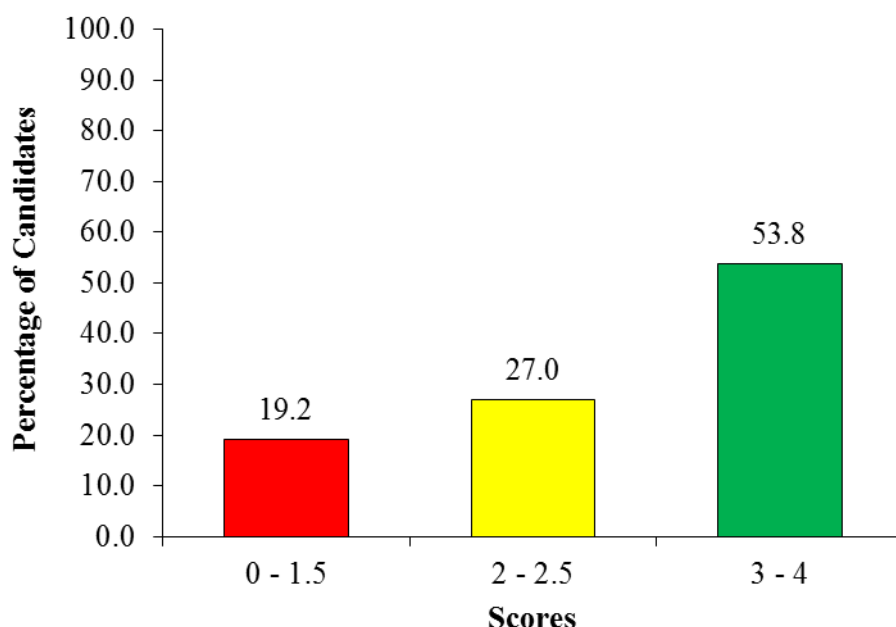
2	Aerobic Respiration	Anaerobic respiration
	i) occurs in the absence of oxygen.	- It require oxygen to breakdown the respiratory substrates
	ii) The end products are carbon dioxide alcohol and energy	- The end products are carbon dioxide water and energy
	iii) Incomplete breakdown of the respiratory substrates.	- The respiratory substrates are completely breakdown.
	(iv) It involves electron transport chain system only.	- It involves glycolysis and electron transport chain.

**Extract 2.2:** A sample of a candidate's poor response in question 2.

Extract 2.2 is a response from the candidate who interchanged the correct answers in (i) - (iii). The candidate also wrote incorrect responses in (iv).

### 2.1.3 Question 3: Body Health and Immunity

This question required the candidates to give four disadvantages of modern methods of birth control with examples. Data analysis shows that 19.2 percent of the candidates scored from 0 to 1.5 marks, 27.0 percent scored from 2 to 2.5 marks whereas 53.8 percent scored from 3 to 4 marks. Figure 3 summarizes the candidates' performance in question 3.



**Figure 3:** *The candidates' performance in question 3.*

Figure 3 shows that 679 (80.8%) candidates passed by scoring from 2 to 4 marks. Such good performance was attributed to their adequate knowledge of the concept tested. Thus, the candidates were able to understand the demand of the question. Moreover, the candidates were able to connect knowledge acquired in the class and real life situation on matters relating to birth control as the media insists daily on the issues concerning modern birth control methods. Most of the candidates responded correctly by giving two to four points in line with the marking guide. The correct responses include: *may lead to irregularities of menstrual cycle, financial constrains can cause some people fail to use them as most of them are expensive, some can cause discomfort during sexual intercourse.* Another candidate wrote; *they can change dates of women menstrual cycle, devises that are inserted in women vagina like intra uterine devices (IUDs) can cause physical health effects, leads to low pleasure during sexual intercourse.* Other candidates wrote; *it may cause health problems like regular nausea and headache, most of these methods are against social and religion values hence their use can cause personal psychological distress, some can cause abnormal body fatness.* From these responses it is clear that the candidates had adequate knowledge of the tested concepts. Extract 3.1 is a sample of a good response from one of the candidates.

3	Disadvantages of modern methods of birth control are follows.
(i)	Some women experience nausea and weight gain after using modern methods of birth control example the use of pills (oral contraceptives)
(ii)	Some methods reduce sexual pleasure among partners example is the use of condoms which can be male condoms or female condoms
(iii)	It can lead to puncture of the uterus. example the use of Intra-uterine devices
(iv)	Some methods are irreversible example Sterilisation which involves male vasectomy and female tubal ligation.

**Extract 3.1:** A sample of a candidate's good response in question 3.

Extract 3.1 is a response from the candidate who correctly wrote the disadvantages of modern methods of birth control.

Despite the good performance of the candidates in this question, 161 (19.2%) candidates scored 0 - 1.5 marks. Some of them had either partial knowledge or did not understand the demands of the question. For example, instead of explaining the disadvantages of modern methods of birth control; some candidates wrote the advantages of modern methods of birth control as *they are efficient on their use, they are easy to apply as any person can, and their accessibility is simple to every person*. Another candidate wrote *they help to control unwanted pregnancy; they are very efficient, their use do not need support of the physical*. Another candidate wrote; *they can be used by a woman of any age, they promote positive relationship among partners*. Other candidates mentioned the modern methods such as *condoms, intra uterine devices, diaphragm and pill methods* instead of giving their disadvantages. This indicates that the candidates did not understand the demands of the question. Extract 3.2 is a sample of a poor response from one of the candidates.

3.	Disadvantage of modern method of birth control.
	1) May cause death
	ii) It causes diseases like cancer
	iii) It lead to discharge of blood during menstruation period
	iv) It lead mental disability to a child born.

**Extract 3.2:** A sample of a candidate's poor response in question 3.

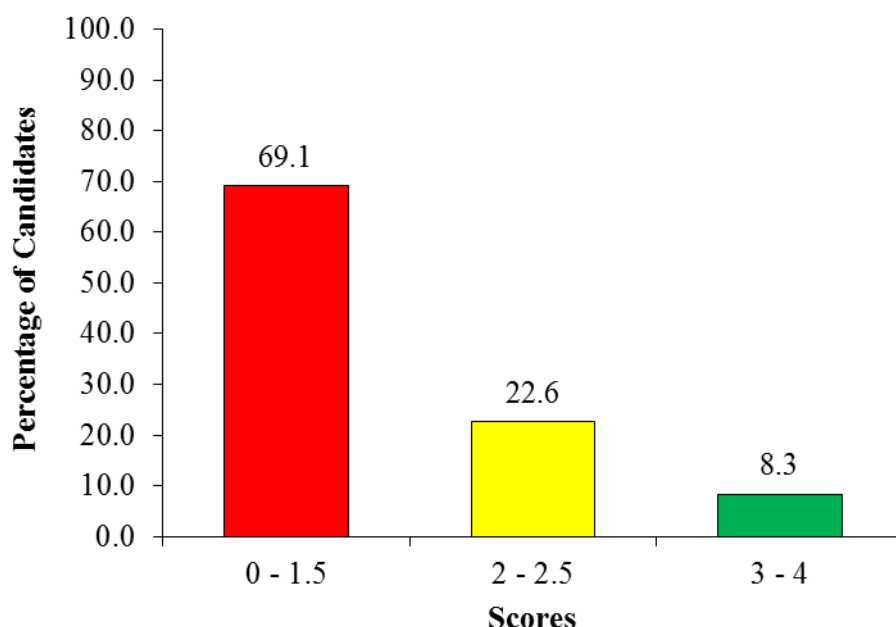
Extract 3.2 is a response from a candidate who wrote incorrect disadvantages of modern methods of birth control.

#### 2.1.4 Question 4: Genetics

In this question the candidates were required to distinguish between: (a) sex determination and sex linkage (b) co-dominance and incomplete dominance.

Data analysis shows that 69.1 percent of the candidates scored from 0 to 1.5 marks out of 4 marks allocated to this question. The candidates who scored from 2 to 2.5 marks were 22.6 percent whereas 8.3 percent scored from 3 to 4 marks. Figure 4 summarizes the performance of the candidates in question 4.





**Figure 4:** *The candidates' performance in question 4.*

Figure 4 shows that the general performance in this question was poor since the majority 580 (69.1%) candidates obtained 0 to 1.5 marks. These candidates failed to distinguish the terms. For example, in part (a), one of the candidates wrote: *Sex determination is the gene that is found in sex but does not involve in sex determination while sex linkage is the gene which carries sex characteristics*. Another candidate wrote: *Sex determination is a process whereby the sex chromosomes are determined while sex linkage is the condition which involves carriage of sex rather than genes*. Another candidate wrote: *Sex determination is a process of determining sex by using germ cells while sex linkage is a process whereby somatic cells can be used to determine sex*. Another candidate wrote: *Sex linkage is a gene linked from one sex to another while sex determination is a process that chromosomes are used*. All these candidates failed to understand that Sex determination is the determination of the maleness or femaleness by sex chromosomes carried by a sperm and egg (XX in case of female and XY in case of male) while sex linkage is a situation whereby a gene for characteristics of an organism is carried by a sex chromosome (usually X) and its phenotype appearance depends on the combination of the carrier chromosome with either Y or X chromosome. The incorrect response indicates inadequate knowledge about the concepts.

Similarly, in part (b) of this question, the candidates were required to distinguish between co-dominance and incomplete dominance. Most of the candidates who scored less than 2 marks gave incorrect responses. For example, one candidate wrote: *co-dominance is a character which mask the expression while incomplete dominance each character can be expressed.* Others distinguished the two terms as seed germination and seed dormancy as they wrote: *Co-dominance is the ability of a seed to germinate while incomplete dominance is a situation where by seed fails to germinate due to lack of some influencing factors.* Another candidate wrote *co-dominance is a dominance in which there is no gene which is dominant to the other but all occur as dominant or recessive gene while incomplete dominance is a dominance in which all genes stay independently.* Moreover, some of the candidates distinguished the two terms as continuous and discontinuous variation as they wrote: *Co-dominance is the type of variation in which there is intermediate forms of characters between two extremes while incomplete dominance there is no intermediate of characters between two extremes.* These candidates failed to understand that: Co-dominance is a type of gene interaction where by two or more allele express in heterozygous condition while incomplete dominance occurs when none of the allele is dominant over the other hence results to intermediate phenotype. These responses show that the candidates had inadequate knowledge of the concepts tested hence contributed to poor performance. Extract 4.1 is a sample of a poor response from one of the candidates.

4. a) SEX determination - is the state of being male or female.
WHILE
sex linkage - is the situation of X-gamete carry other characteristics while Y-gamete doesn't carry that trait because it is very small in size.
(b) Co - dominance is the characteristic which shows is dominant over another.
WHILE
Incomplete dominance. - is the gene which express the presence of one characteristics which is dominant over another.

**Extract 4.1:** A sample of a candidate's poor response in question 4.

Extract 4.1 is a response from the candidate who gave incorrect distinction of the terms in parts (a) and (b).

Nonetheless, 260 (30.9%) candidates scored from 2 to 4 marks. In responding to part (a) one of the candidates wrote; *sex determination is a process whereby sex of zygote is determined by sex chromosomes carried by both sperm and egg while sex linkage is a situation where by a certain characteristic of an organisms is determined by gene carried in X chromosome.* Similarly, in part (b) the candidate wrote *co-dominance is a situation where by two or more alleles are expressed to an organism in a heterozygosity form while incomplete dominance where by all alleles have equal influence on a particular character thus, none of the allele is dominant over the other.* This indicates that the candidate had sufficient knowledge of the concepts tested. Extract 4.2 is a sample of a candidate's good response.

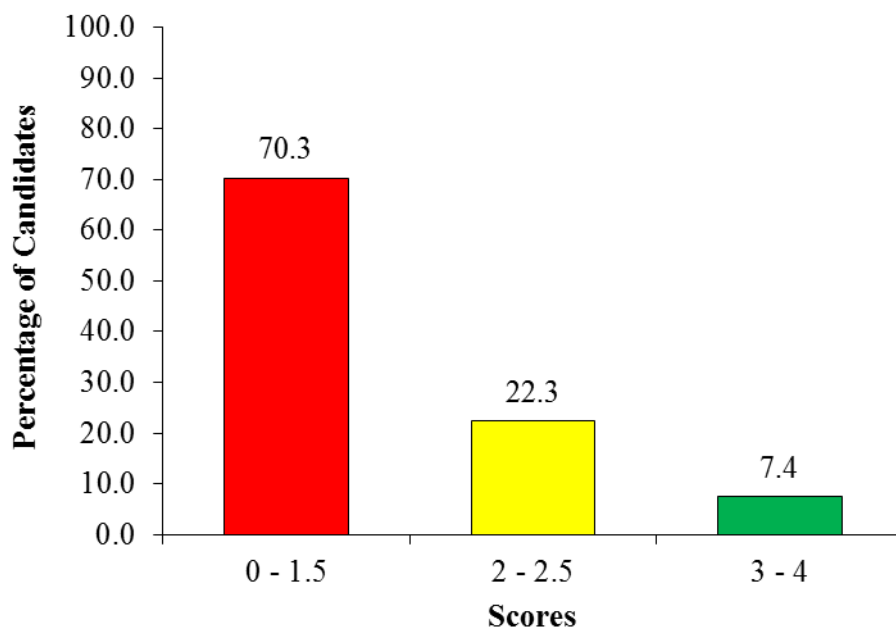
4	(a) Sex determination - is the determination of maleness or femaleness by the sex chromosomes in gametes where male carries XY and female carries XX-chromosomes.
	WHILE
	Sex linkage - is the situation where by genes for characteristics of an organism are carried by X-chromosomes. X-chromosome is the one which influences a certain character.
	(b) Co-dominance - This is the state where by all genes from two parents are dominance and equally expressed on the phenotype of the offspring
	WHILE
	Incomplete dominance - This is the state where by no gene or allele is dominant or recessive to the other and this leads to the intermediate character which do not resemble to both parents

**Extract 4.2:** A sample of a candidate's good response in question 4.

Extract 4.2 is a response from the candidate who correctly distinguished the terms in parts (a) and (b).

### 2.1.5 Question 5: Basic Biology Laboratory Skills

The question required the candidates to give four situations where safety precaution measures should be observed by both students and teachers during teaching and learning of Biology. Analysis shows that 70.3 percent of the candidates scored from 0 to 1.5 marks, 22.3 percent of candidates scored from 2 to 2.5 marks whereas 7.4 percent scored from 3 to 4 marks. Figure 5 summarizes the performance of the candidates in question 5.



**Figure 5:** *The candidates' performance in question 5.*

Figure 5 indicates that the candidates' performance in this question was poor since 591 (70.3%) scored from 0 to 1.5 out of 4 marks allocated to this question. Most of the responses given by these candidates were contrary to the demands of the question. For example, some candidates wrote laboratory rules and regulations to be adhered by both the teacher and students during teaching and learning as *don't eat or drink in the laboratory, avoid pointing burners or hot substances towards other people, both should avoid running in the laboratory and both should not enter into a laboratory without permission from a teacher*. Another candidate wrote the basic information required during preparation of common dilute acids in the laboratory as: *Sample of the solution, distilled water, strong acids and apparatuses*. Furthermore, some of the candidates wrote the basis of

teaching and learning biology as *during conduction of biology examinations, at the time of accidents such as fire, when introducing the biology students in the laboratory for the first time and during preparation of chemicals.* All these responses imply that the candidates did not understand the demands of the question, hence gave incorrect responses which led to poor performance. These candidates failed to recognize that safety precaution measures should be observed by both students and teachers during teaching and learning of Biology at the following situations: during collection of specimens because some animals like snakes, scorpions and spider are dangerous, during experimental work care should be taken so as both students and teachers can avoid accidents; during visiting external laboratory/environments like water bodies and forests and during handling items as some substances are toxic and corrosive in nature. Extract 5.1 is a sample of a poor response from one of the candidates.

5.	Safe precaution measures are
	i> The teaching and learning environment should be conducive to avoid confusion.
	ii> Demonstration and activities should be well prepared in order to avoid confusion of the concept to the learner
	iii> During teaching and learning the feedback is very important in order make clarification
	iv> Related materials should be involve for making meaningful of biology subject during teaching and learning.

**Extract 5.1:** A sample of a candidate's poor response in question 5.

Extract 5.1 is a sample of a response from a candidate who wrote the basis of teaching and learning Biology instead of giving four situations where

safety precaution measures should be observed by both students and teachers during teaching and learning of Biology.

However, 249 (29.7%) candidates gave two to four situations where safety precaution measures should be observed by both students and teachers during teaching and learning of Biology. They were able to give 2 to 4 correct points. In their responses they included answers such as *during collection of specimens outside the laboratory, during handling laboratory equipment and chemicals, during study tour to areas with water bodies and other hazards and during conduction of experiments*. This indicates that the candidates had adequate knowledge of the concepts tested. Extract 5.2 is a sample of a good response from one of the candidates.

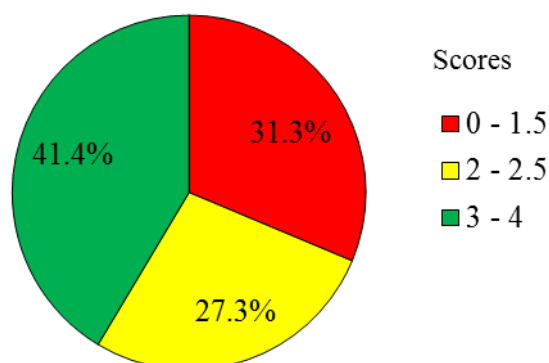
5.	Situations for safe precaution measures to students and teachers during teaching and learning biology are
	(i) When doing experiments/practical using explosive chemicals, students and teacher should be very careful to avoid dangers.
	(ii) When visiting external school environment safe precaution measures should be observed to avoid accidents.
	(iii) When studying different specimens which have poisons(venom) like scorpion and spider and centipedes
	(iv) When handling glass bottles and apparatus they should hold by two hands otherwise will fall and cause injuries.

**Extract 5.2:** A sample of a candidate's good response in question 5.

Extract 5.2 is a response from the candidate who correctly wrote four situations where safety precaution measures should be observed by both students and teachers during teaching and learning of Biology.

### 2.1.6 Question 6: Analysis of the O-level Biology Curriculum

This question required the candidates to give four points on the way teacher's guide assist the teaching and learning process. Data indicates that 31.3 percent of the candidates scored from 0 to 1.5 marks. The candidates who scored from 2 to 2.5 marks were 27.3 percent whereas those who scored from 3 to 4 marks were 41.4 percent. Figure 6 shows the summary of the candidates' performance in question 6.



**Figure 6:** *The candidates' performance in question 6.*

Figure 6 shows that the candidates' performance in this question was average because more than two thirds 577 (68.7%) scored from 2 to 4 marks. Further analysis from candidates' scripts revealed that the candidates in this category had adequate knowledge of analysing Ordinary level (O-level) Biology curriculum materials. Thus, they managed to state two to four ways of how the teacher's guide assist in the process of teaching and learning. According to the marking guide, teacher's guide assist the teaching and learning in the following ways; it indicates specific teaching and learning objectives, it suggests teaching and learning resources, it suggest teaching and learning activities, it shows suggested learning strategies, techniques and tactics and it suggests learners assessment and evaluation instruments. In responding to this question, the candidates wrote: *teacher's guide shows techniques and strategies to be used by the teacher, it shows activities that can be given to students on each topic and subtopic, it suggests materials that can be used for a particular academic content and it suggests the best ways for assessing the students.* Extract 6.1 is a sample of a good response from one of the candidates.

6.	The following are the importance of teacher's guide in teaching and learning
	It helps a teacher on how to conduct assessment
	Teacher's guide contain way on how to assess a learner
	so the teacher know the way can conduct assessment during the process of teaching and learning.
	It helps a teacher to prepare learning activities. so through the use of teacher's guide
	it help to prepare the task to the student
	It helps to know the reference used so
	the teacher use teacher's guide in order to see the reference of books used and so it simplify the process of teaching and learning
	it helps a teacher to select teaching methodology, techniques or strategies in order to teach the student effectively and the student understand the lesson easily.

**Extract 6.1:** A sample of a candidate's good response in question 6.

Extract 6.1 is a response from the candidate who correctly gave four points on the way teacher's guide assist the teaching and learning process.

Despite the average performance in this question, 263 (31.3%) candidates gave one correct point or all incorrect points. Most of the candidates who gave incorrect points explained teachers guide as *a tool that can help to improve a teacher who is incompetent so that he/she become competent, tool that highlights the way a teacher can solve various challenges arising in the class during teaching and learning process, teacher's guide help teachers with limited skills*. Another candidate responded that the teacher's guide *helps teacher to maintain confidence, it help teacher to solve various problems among students in the class, it helps to prepare scheme of work, and teacher's guide shows the area where the teacher should go*. These responses suggest that the candidates had insufficient knowledge of the concept tested. Extract 6.2 is a sample of a poor response from one of the candidates.



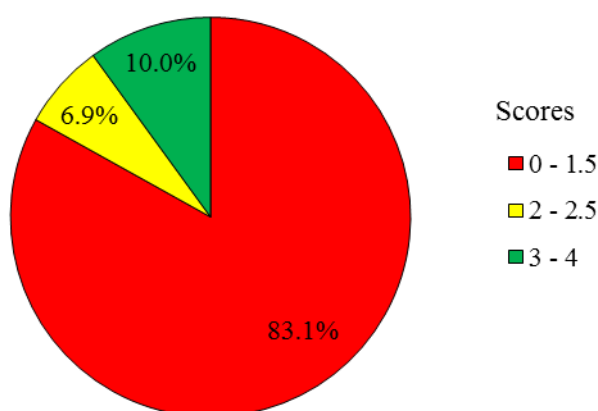
06.	Teacher's guide assist the teaching and learning process by the following points
	✓ The teachers guide assist teacher to teach students to be trust to their teachers
	✓ Teachers guide enable teacher to removal the abstract meaning to learners.
	✓ Teacher's guide builds Confidence for facilitates understanding to the learners.
	✓ Teacher's guide make teacher to be trust for his or her students

**Extract 6.2:** A sample of a candidate's poor response in question 6.

Extract 6.2 is a response from the candidate who lacked sufficient knowledge about teacher's guide. The candidate wrote the importance of using learner centred approaches to teaching and learning process instead of the way the teacher' guide assists the teaching and learning process.

### 2.1.7 Question 7: Biochemistry

This question required the candidates to classify enzymes into four groups according to the type of reaction they catalyse. Data analysis reveals that 83.1 percent of the candidates scored from 0 to 1.5 marks out of the 4 marks allocated to this question. The candidates who scored from 2 to 2.5 marks were 6.9 percent whereas 10.0 percent scored from 3 to 4 marks. Figure 7 summarizes the candidates' performance in question 7.



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

Figure 7 shows that the general performance in this question was poor because the majority 698 (83.1%) scored from 0 to 1.5 marks. This shows that the candidates had inadequate knowledge about enzymes as they gave incorrect classification of the enzymes. Responses such as: *enzyme concentration, PH, enzyme structure, temperature of the enzyme; enzymes are globular, enzymes are specific* were observed in candidates' scripts. Similarly, other candidates mentioned different enzymes such as: *pepsin, trypsin, pancreatic amylase and salivary amylase*. Others wrote types of enzymes and the food substance they catalyse as *amylase to catalyse starch, trypsin to catalyse protein, lipase to catalyse lipids and pepsin to catalyse protein*. Another candidate wrote *oxidative enzymes, reductive enzymes, protease enzymes and digestive enzymes*. Incorrect responses indicate that candidates had inadequate knowledge of how to classify enzymes according to the reactions they catalyse. Extract 7.1 is a sample of a poor response from one of the candidates.

7.	To classify enzymes according to the types of reaction they catalyse
	i) Salivary amylase which catalyse glucose to maltose
	ii) Peptidases
	iii) Renin
	iv) Pepsin - It convert pepsin into pepsogen

**Extract 7.1:** A sample of a candidate's poor response in question 7.

In extract 7.1 the candidate wrote types of enzymes instead of classifying enzymes into four groups according to the type of reaction they catalyse.

Despite the poor performance in this question, 142 (16.9%) candidates scored 2 to 4 marks. These candidates were able to state two to four classes of enzymes correctly as per the marking guide. Specifically one of the candidates responded to this question as *Oxidoreductase which catalyses reactions involving oxidation and reduction, Hydrolases catalyses reactions involving addition of water, Isomerases catalyses the rearrangement of a structure of a molecule and lyases catalyses the*

removal or addition of a chemical group on a molecule. These responses indicate that these candidates had sufficient knowledge on the concepts tested. Extract 7.2 is a good response from one of the candidates.

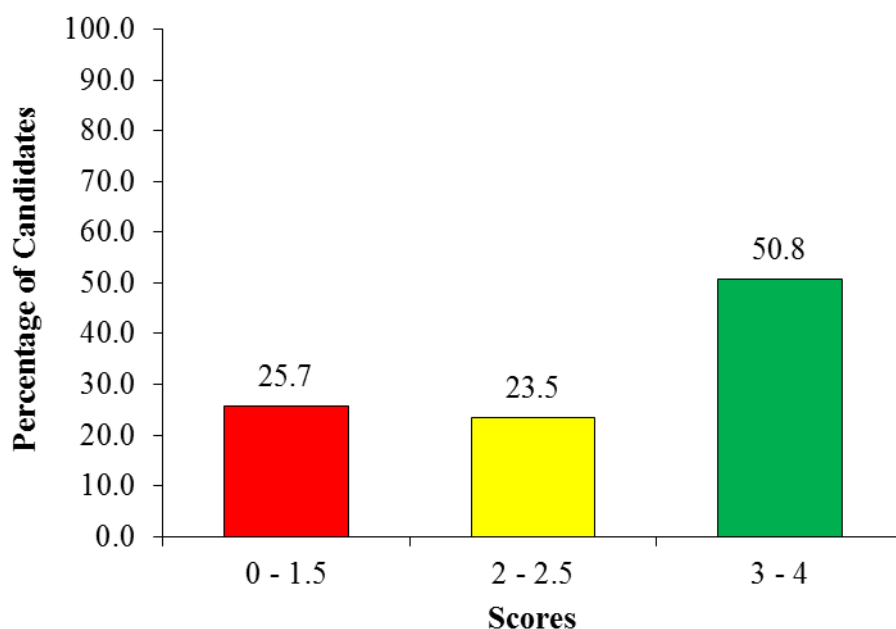
7.	Classifying enzymes into four groups according to the type of reaction they catalyze
i	Hydrolases enzymes
	- Catalyses the hydrolysis of different substances into small molecules. It include protease and lipase enzymes
ii	Oxido-reductase enzymes
	- Catalyses the hydrolysis of both oxidation and reduction processes
iii	Transferases
	- Catalyses the transfer of functional group from one molecule to another
iv	Ligases
	- Catalyses the formation of bonds between two molecules

**Extract 7.2:** A sample of a candidate's good response in question 7.

Extract 7.2 is a response from the candidate who correctly gave a correct classification of enzymes into four groups according to the type of reaction they catalyse.

### 2.1.8 Question 8: Ecology

This question required the candidates to explain four ways on how pollution of air, water and land is a threat to aquatic life. The analysis shows that 25.7 percent of the candidates scored from 0 to 1.5 marks, 23.5 scored from 2 to 2.5 marks whereas 50.8 percent scored from 3 to 4 marks. Figure 8 summarizes the candidates' performance in question 8.



**Figure 8:** *The candidates' performance in question 8.*

Based on the analysis in Figure 8, the general performance in this question was good because 624 (74.3%) candidates scored from 2 to 4 marks. Such good performance in this question was attributed to their adequate knowledge of the pollution and its impact on living things. They thus understood the demands of the question. Most of the candidates responded correctly by giving two to four correct responses. Specifically, one of the candidates wrote *increase of smoke and carbon dioxide in air due to industrialization cause the formation of acidic rains, addition of industrial fertilizers in the soil and spraying of chemicals in plants adds chemicals in water bodies as during rains these chemicals will be drained to water bodies, industrialization cause the raise of temperature hence floods which lowers the quality of saline water and bombs during war cause both air and land pollution which affects aquatic life during rains*. From these responses, it is clear that these candidates had sufficient knowledge of the tested concepts. Extract 8.1 is a sample of a good response from one of the candidates.

8. (i) Water pollution cause death of aquatic organism such as fish example oil spillage can cause shortage of oxygen in aquatic
- (ii) Air pollution can result to formation of acidic rainfall and if falls in water bodies can cause death to aquatic animals and plants
- (iii) Use of pesticides and other chemicals can affect aquatic organisms as this decrease the quality of water
- (iv) Air pollution can result to increase in temperature.

**Extract 8.1:** A sample of a candidate's good response in question 8.

In extract 8.1 the candidate managed to correctly give four ways on how pollution of air, water and land is a threat to aquatic life.

Despite the good performance of candidates in this question, 216 (25.7%) scored 0 - 1.5 marks. These candidates did not understand the demands of the question. For example, some candidates explained the general human activities that can cause pollution without specifying the type of pollution and its effect on aquatic life. Specifically, one of the candidates wrote; *through industries, through hospitals, through mining and through cultivation*. Another candidate responded as *direct industries, land reclamation, gas production and agricultural activities*. Others had inadequate knowledge about the concept and most of their responses were incorrect. Responses such as *facilitate movement of aquatic organisms from one place to another in the water, exchange of carbon dioxide and oxygen, water create safe environment for reproduction and enable aquatic organisms to obtain food* were observed in candidates' scripts. Extract 8.2 is a sample of a poor response from one of the candidates.

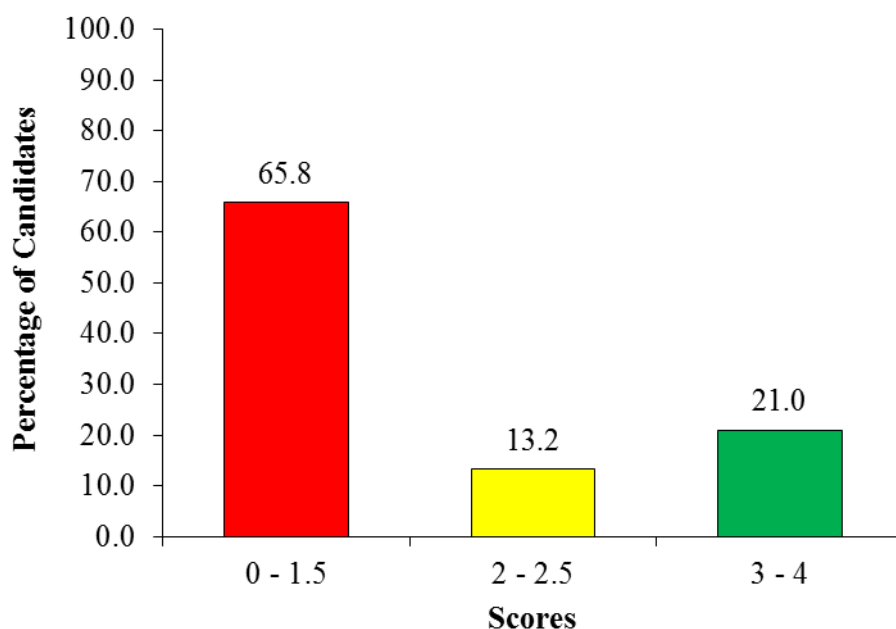
7	i) air : used for respiration process whereby by oxygen enter in and carbon dioxide <del>are</del> remove out to be used in plants
	ii) air used for respiration process whereby by oxygen air produced by plant enter in the body of the living organism for respiration process while carbon dioxide remove out to be used by plant
	iii) water used for drinking which support life and is area where they live
	iv) land is area where living organism are found

**Extract 8.2:** A sample of a candidate's poor response in question 8.

In extract 8.2 the candidate wrote the uses of air, water and land instead of giving four ways on how pollution of air, water and land is a threat to aquatic life.

### 2.1.9 Question 9: Assessment in Biology

This question required the candidates to construct one multiple choice item on plant and animal cells and use it to describe the following concepts (a) stem (b) Destructor and (c) Alternatives. Data analysis shows that 65.8 percent of the candidates scored from 0 to 1.5 marks out of 4 marks allocated to this question. The candidates who scored from 2 to 2.5 marks were 13.2 percent whereas 21.0 percent scored from 3 to 4 marks. Figure 9 summarizes the performance of the candidates in question 9.



**Figure 9:** *The candidates' performance in question 9.*

Figure 9 shows that the general performance in this question was poor because 553 (65.8%) candidates scored from 0 to 1.5 marks. This shows that the candidates had inadequate knowledge of construction of Biology test/examination specifically the multiple choice items. For example, instead of setting a multiple choice question and use it to explain the concepts of stem, destructor and alternative the candidates composed a multiple choice question and used the concepts as alternatives. Specifically one of the candidates wrote *which part of the plant contains bundle sheath (a) stem (b) leaves (c) Destructor*. Another candidate responded as *one of them is part of a plant cell (a) stem (b) alternative (c) Destructor*. Moreover, another candidate wrote *which of the following organisms have stem? (a) rat (b) dog (c) moss plant*. Another candidate wrote *stem is the statement of the matching item that is used to differentiate the column A and B, Destructor is a statement which are termed as correct answer and are very few in matching item and alternatives is a statement which are alternative answers and are very few in number*. These responses suggest that candidate had misconceptions about construction of Biology test/examination specifically construction of multiple choice items. Extract 9.1 is a sample of a poor response from one of the candidates.

9.	a) stem.
	i) A plant cell are found in the following except
	(a) legs (b) Great body (c) liver (d) stem
	( )
	b) Destructor
	i) The animal cell can be damaged by
	(a) Respiration (b) Destructor (c) Coordinator
	(d) protector ( )
	c) Alternatives
	i) The plant and animal cells can be distinguished in the following except
	(a) structure
	(b) Some parts ( )
	(c) Functions
	(d) Movement

**Extract 9.1:** A sample of a candidate's poor response in question 9.

In extract 9.1 the candidate constructed a multiple choice item under stem, destructor and alternative instead of constructing one multiple choice item on plant and animal cells and uses it to describe the concepts.

On the other hand, 287 (34.2%) candidates scored from 2 to 4 marks in this question. This suggests that these candidates had sufficient knowledge of the construction of Biology test/examination specifically multiple choice items. They managed to respond to the question correctly as per the marking guide. According to the marking guide the candidates were required to construct any question from plant and animal cell and use it to describe the terms as follows,

Which feature distinguishes animal from plant cell?

- A Mitochondrion
- B Cell wall
- C Nucleus
- D Cytoplasm

Description of the concepts (a) Stem is a sentence or phrase which contain a question (b) Destructors are wrong answers that are there to attract



students and (c) Alternatives are all choices among which the correct answer is found in this case A, B, C and D. In responding to this question one of the candidates wrote *stem is a main sentence that makes a question, Destructors are the options that destruct the truth and attract the response of students and alternatives are all choices given in a multiple choice question*. Another candidate responded as *stem is the root of the question that has to be understood by the student, destructor is an option that tries to confuse a student and alternatives is a list of all answers in the question*. These responses suggest that these candidates had an adequate knowledge on the concepts tested. Extract 9.2 is a sample of a good response from one of the candidates.

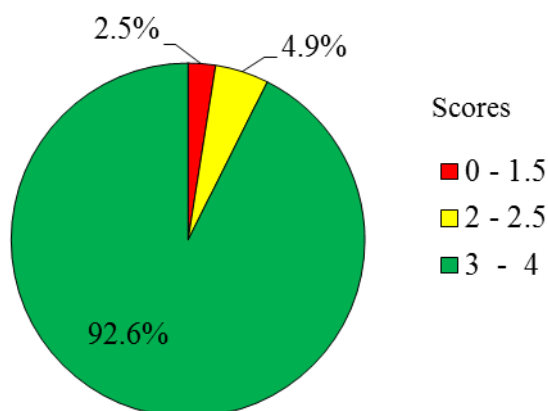
9	Which of the following is found in both plant and animal cells?
(A)	Chlorophyll
(B)	Cell wall
(C)	Cell membrane
(D)	Chloroplast
(a)	Item : Is the question that require answer from choices given. From above item item indicated by sentence below: Which of the following is found in both plant and animal cells?
(b)	Destructor : Are those alternatives in items that prevent - or destroy examinee or candidates from getting correct - answer for question given. From above item destructor indicated by alternatives A, B and D.
(c)	Alternatives are those choices given to examinee to - answer the item given and therefore examinee required to select one of them to become answer of statement or item asked. From above item alternatives was represented by choices A, B, C and D.

**Extract 9.2:** A sample of a candidate's good response in question 9.

In extract 9.2 the candidate had sufficient knowledge of the concepts tested thus the candidate correctly constructed one multiple choice item on plant and animal cells and used it to describe (a) stem (b) destructor and (c) alternatives.

#### 2.1.10 Question 10: Fundamentals of Teaching and Learning Biology

This question required the candidates to explain why it is emphasized to use participatory methods in teaching and learning Biology. The analysis of candidates' performance indicates that 2.5 percent scored from 0 to 1.5 out of 4 marks allocated to the question. The candidates who scored from 2 to 2.5 marks were 4.9 percent and 92.6 percent scored from 3 to 4 marks. Figure 10 summarizes the candidates' performance in question 10.



**Figure 10:** *The candidates' performance in question 10.*

Based on the analysis in Figure 10, the general performance in this question was good because 778 (92.6%) candidates passed by scoring from 2 to 4 marks. The good performance in this question was attributed to adequate knowledge of participatory methods in teaching and learning. Thus the candidates met the demands of the question. Most candidates responded correctly by giving two to four correct responses. Specifically, one of the candidates wrote *it encourages meaningful and active learning, it facilitates creativity, motivate learners in working hard and it expands learners' knowledge through sharing*. Another candidate wrote *it improves the quality of teaching and learning, promotes the culture of cooperation and participation among students, motivates learners to learn in detail and promotes confidence to the learners*. From these responses, it is clear that

these candidates had a sufficient knowledge of the concept tested. Extract 10.1 is a sample of a good response from one of the candidates.

10	i) To encourage active participation in the class between teacher and learners.
	ii) To motivate learners.
	iii) To encourage creativity of learners.
	iv) To promote long lasting memory to students/learners through interaction

**Extract 10.1:** A sample of a candidate's good response in question 10.

In extract 10.1 the candidate correctly explained the reasons participatory methods is emphasized in teaching and learning Biology.

However, 62 (2.5%) candidates scored poor marks. Some of them did not understand the demands of the question. For example, some candidates wrote different methods used for teaching and learning such as *teachers and student can use methods like participatory, non-participatory, lecture method and jig saw to make the process of teaching and learning more meaningful*. Others had inadequate knowledge about the participatory method leading to incorrect responses such as *it makes a teacher get relaxed, promote memorization of both teacher and students and promotes teachers communication skills*. This indicates that the candidates had inadequate knowledge of the concept tested. Extract 10.2 is a sample of a poor response from one of the candidates.

10	This is because of the following reasons.
	To teach the ideas from teachers to students
	To simplify the time in teaching and learning process.
	To make all people in the class
	deserve it in case of cognitive domain

**Extract 10.2:** A sample of a candidate's poor response in question 10.

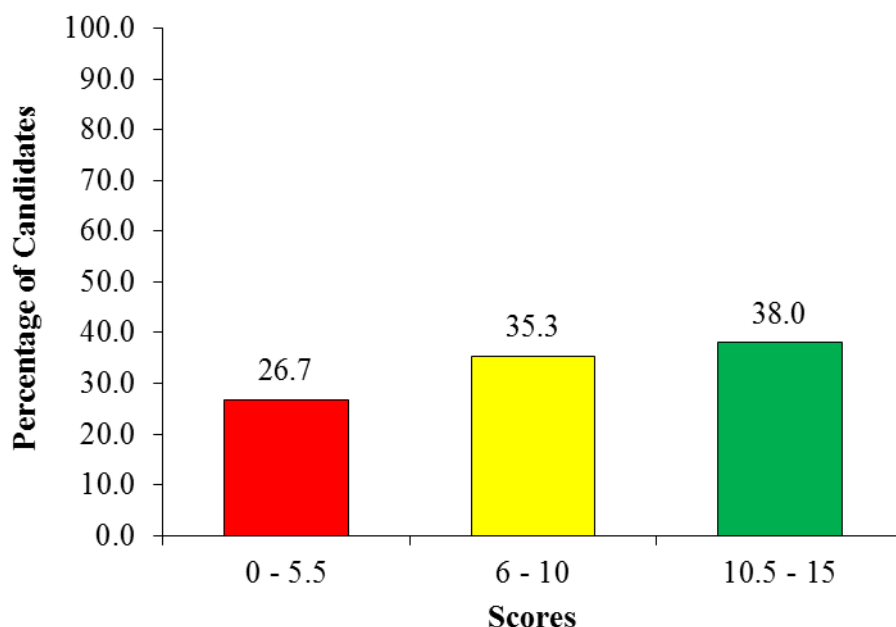
In extract 10.2 the candidate wrote incorrect responses such as it simplify time instead of explaining why participatory methods are emphasized in teaching and learning Biology.

## 2.2 SECTION B: ESSAY TYPE QUESTIONS

This section had three questions from academic topics each carrying 15 marks. The candidates were required to attempt two questions. The performance of the candidates in each question in this section is categorized as poor if the candidates scores from 0 to 5.5 marks; average if the candidates scores from 6 to 10 and good if the candidates scores from 10.5 to 15 marks.

### 2.2.1 Question 11: Classification of Living Things

This question required the candidates to explain six ways on how seed bearing plants are adapted to life on land. The question was attempted by 606 (71.5%) candidates. Analysis of data show that, 26.7 percent of the candidates scored from 0 to 5.5 marks, 35.3 percent scored from 6 to 10 marks whereas 38.0 percent scored from 10.5 to 15 marks out of 15 marks allocated to this question. Figure 11 summarizes the performance of the candidates in question 11.



**Figure 11:** *The candidates' performance in question 11.*

Figure 11 shows that the candidates' performance in this question was good because 616 (73.3%) candidates passed by scoring from 6 to 15 marks. The good performance was influenced by the candidates' adequate knowledge of the concepts tested. Most of the candidates who attempted this question correctly explained the ways in which seed bearing plants are adapted to life on land. Some correct responses given by one of the candidates were *presence of roots for absorption of water and minerals salts, the plants have fertilization process which does not depend on water, have green leaves for ensuring photosynthesis, presence of stomata for gaseous exchange*. Another candidate wrote *seed producing plants adapts to their environment due to presence of cuticle on their leaves to prevent water loss, presence of well-defined vascular system for transportation of water and minerals, presence of true roots for anchoring the plant and absorption of nutrients and mineral salts*. These responses indicate that the candidates had an adequate knowledge on the tested concept. Thus, they managed to write three to six correct points. Extract 11.1 is a sample of a good response from one of the candidates.

11.	<p>Seed bearing plants, are the most succentull and more developed plants in the world. There are several ways in which seed bearing plants are adapted to life on the land as follows</p> <p>They have green leaf for the synthesis of food, for a process known as photosynthesis which enable a plant to produce their own food for more survive of their life on the land and the leaf contain the Stomata that open during a day and close during night.</p> <p>They have tubes in the stem for transportation of both water and minerals from roots and leaves respectively all of these help the plants to survive on their life due to the presence of transported minerals that can be used in growing and developing them.</p> <p>They shed leaves for the conservation of water during the dry season</p> <p>They have Fertilisation process which don't depend on water.</p> <p>They have small leaves for reducing the rate of losing water, a water is lost through a leaf so for a plant to maintain that process losing water the leaf adapt to be small</p> <p>The plant have Stomata in the leaves that prevents losing of water and for ensuring the service of them on the land</p> <p>They have cuticle for preventing the loss of water which make them to survive even on the day time and if the amount of water to be losted the the leaf especially during a day is few due to the presence of cuticle.</p> <p>Therefore as a seed bearing plants adapted to life on the land, all that ways ensure them to survive for a long time of the period without any way of losing water and finally which may lead to death of a plant due to that they avoided to death</p>
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**Extract 11.1:** A sample of a candidate's good response in question 11.

In extract 11.1 the candidate correctly explained the ways in which seed bearing plants are adapted to life on land.

On the contrary, 224 (26.7%) candidates scored from 0 to 5.5 marks in this question. Some of the candidates either gave one correct point while others wrote only two responses but did not explain further. This is an indication that the candidates either lacked enough knowledge or had partial knowledge of the tested concept. For example, one of the candidates explained the features that influence seed dispersal in plants as *seeds are light, their seeds are small and seeds can be transported through water and air*. Another candidate explained the structures of a germinating seed as *seed producing plants are adapted to their environment due to presence of radicle, have plumule, leaf formation to enable seedling synthesize its own food and large food storage for germination*. These responses suggest that these candidates had inadequate knowledge on the concept tested. Extract 11.2 is a sample of a poor response from one of the candidates.

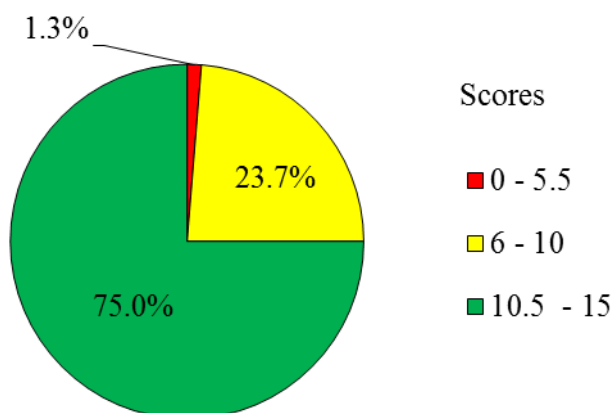
11.	<p>Seed bearing plant, these is the seed of either male plant or female which are in mature can prolong the growth. The following are the adapted to life on land by seed bearing plants.</p> <p>Presence of temperature, this is the degree of hotness and darkness of heat. In order for the seed to adapt the life on the land the first thing should have the presence of temperature.</p> <p>Presence of light, This is the energy from the sun so that in order to the seed to growth on the land the presence of light should be available. Simply because the plant growth to follow the light and also used in the photosynthesis system.</p> <p>Presence of water, In order of the seed to adapt to the land also water should be presence in order to make dispersal of seed and expand ready for growth.</p> <p>Presence of fertility soil, Simply because in order for seed to growth well the soil of the presence environment should be good favourable condition. And also the growth can appear in good condition.</p> <p>Presence of bacteria, It mean that in the soil there are some bacteria which support in decomposition of dead organic matter for feeding. Then after decomposing the material the soil become fertility and favorable for growth.</p> <p>Presence of biological control, Therefore in order to increase the presence of seed in the farm make sure that the pest and diseases should be controlled by introduced animal. Such as spray of chemical which help to kill the harmful bacterial which can hinder the growth or adaptation of seeds on the land.</p> <p>Therefore the seed plant also can die if there is poor climatic condition which help to favor the environment. And can found that the adaptation of seed plant on land life fail to succeed.</p>
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**Extract 11.2:** A sample of a candidate's poor response in question 11.

In extract 11.2 the candidate wrote conditions necessary for seed to germinate such as presence of temperature, water and light instead of explaining the ways in which seed bearing plants are adapted to life on land.

### 2.2.2 Question 12: Biochemistry

This question required the candidates to evaluate the usefulness of protein in human body by giving six points. The analysis shows that 841 (99.2%) candidates attempted this question. Data show that 1.3 percent scored from 0 to 5.5 marks out of 15 marks allocated to this question. The candidates who scored from 6 to 10 marks were 23.7 percent whereas 75.0 percent scored from 10.5 to 15 marks. Figure 12 summarizes the performance of the candidates in question 12.



**Figure 12:** The candidates' performance in question 12.

Considering Figure 12, the general performance of the candidates in this question was good because the majority 829 (98.7%) passed by scoring from 6 to 15 marks. These candidates had adequate knowledge of the concept tested thus gave correct responses in this question. For example, the candidates wrote the usefulness of protein as follows *proteins are used for body repair, used for growth, used for catalysing different metabolic activities, used as part and parcel of different body structures used for synthesis of different hormones, helps in blood clotting, helps in transportation of gases and can be used as alternative respiratory substrate*. These responses suggest that these candidates had adequate



knowledge on the tested concept. Extract 12.1 is a sample of a good response from one of the candidates.

12	<p>Protein is the food substrate that are made up of amino acid, when two amino acid join together by condensation reaction by forming water and give out they form protein, and the bond between two amino acid in forming protein is called a peptide bond. When more amino acid joined together these bond are called polypeptide bond. Protein are very useful in the human body. The following are the uses of protein in human body.</p> <p>Growth and development of the body, protein used to in growth and development where as the child need to take diet with enough protein food for example eggs, fish, soya beans and meat, for the growth and development so as to support the cell division, cell expansion to accelerate the body growth and development.</p> <p>It used in transportation of respiratory gases, such as oxygen gas and carbon dioxide gas. by haemoglobin. Haemoglobin is protein in nature where as it takes in oxygen gas from the lungs to the whole parts of the body and take carbon dioxide from the body to the lungs for giving it out. Both oxygen and carbon dioxide are respiratory gases.</p> <p>It build the structure of the body, like hair, nails, Protein provides the structure of the body by knits, the hair made up of keratin which are protein and also a nails are made up of protein, and hence provide the shape of the human body.</p> <p>It used in repair of the damage tissues like skin, protein help to repair the damaged tissue such as healing of wound on the skin, and also used to build the muscle tissue as the structure of the body.</p> <p>It used as metabolic substrate, that can be catalyzed by the specific enzyme so as to yield the energy and build up the body. There are three main food substrate there are carbohydrate, lipid and protein.</p> <p>It used as catalyst, enzymes are protein in nature which is used to speed up and alter the chemical reaction, there are several enzymes with several function which are protein in nature. And always enzyme can not be consumed but can be denatured.</p> <p>The growth and development of the human body depends on the diet of enough protein substance like fish, soya beans, meat and eggs.</p>
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**Extract 12.1:** A sample of a candidate's good response in question 12.

In extract 12.1 the candidate correctly evaluated the usefulness of protein in human body.

Contrarily, 11 (1.3%) candidates scored from 0 - 5.5 marks. Some managed to give one to two correct points which lacked explanation thus led to low marks. For example, some of the candidates gave the general functions of proteins as *protein is a source of body nutrients, proteins are good for children health, provide good functions of the brain, they promote strength of bones*. These candidates' responses demonstrate that they had inadequate knowledge of the tested concept. Extract 12.2 is a sample of a poor response from one of the candidates.

12.	The usefulness of protein in human body are;
	Production of Energy in the human
	body. Protein in the human body used as building
	block in production of energy.
	Production of cellulose in the plant
	body cellulose are used in the plant body as a
	support molecules.
	Protein used in production of molecules
	These are used in the human body as a transport
	function.
	Protein used to manufacture or make
	the structure in the human body. Example bones
	Also, protein used to store minerals
	used in the repairing of skin.

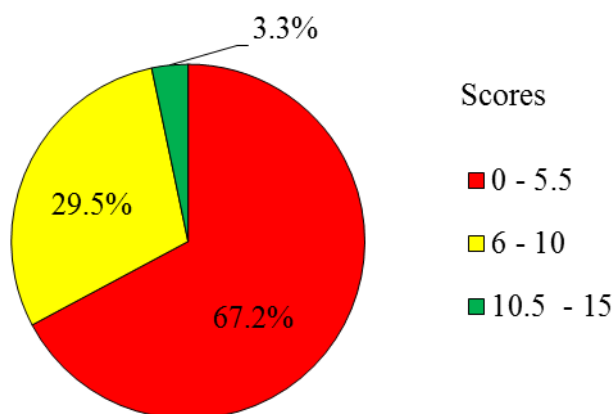
**Extract 12.2:** A sample of a candidate's poor response in question 12.

In extract 12.2 the candidate evaluated the usefulness of carbohydrate in living organisms instead of evaluating the usefulness of protein in human body.

### 2.2.3 Question 13: Respiration

This question required the candidates to explain how they can teach Form Three students about Krebs` cycle by using provided guiding questions (a) state two raw materials for the Krebs cycle (b) Draw the cycle to show eight major steps involved in energy production (c) Name the step in which reduced NAD are used to produce ATP (d) How many molecules will be produced in the absence of oxygen?

The question was attempted by 241 (28.4%) candidates. Data analysis indicate that, 67.2 percent scored from 0 to 5.5 marks, 29.5 percent scored from 6 to 10 marks and 3.3 percent of the candidates scored from 10.5 to 15 marks. Figure 13 summarizes the performance of the candidates in question 13.

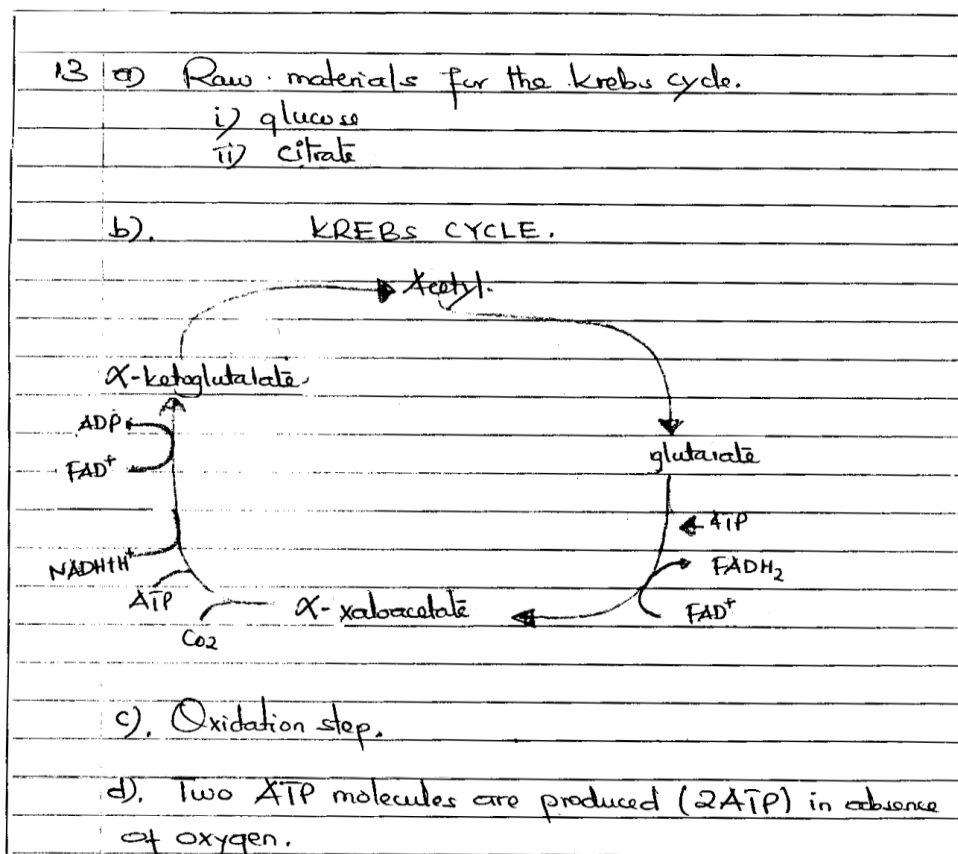


**Figure 13:** *The candidates' performance in question 13.*

The trend of performance indicated in Figure 13 shows that the general performance in this question was poor because 564 (67.2%) candidates scored low (0 to 5.5) marks. These candidates responded partially correct or they provided irrelevant responses as demanded by the question. Most of the candidates concentrated on explaining different methods which they will use to enable students learn and understand the concepts instead of explaining in detail. For example, some of the candidates wrote *the first step to prepare a lesson plan in which the guiding questions will be used as specific objectives on the part of teachers' activities I will use cooperative method by leading and facilitating group discussion on the questions provided; students' activities will be involving in group discussion on the*

asked questions. Other candidates explained about how to teach the concepts by using participatory methods that *I will divide the students into groups and give those guiding questions to discuss and I will be facilitating and lead the groups.*

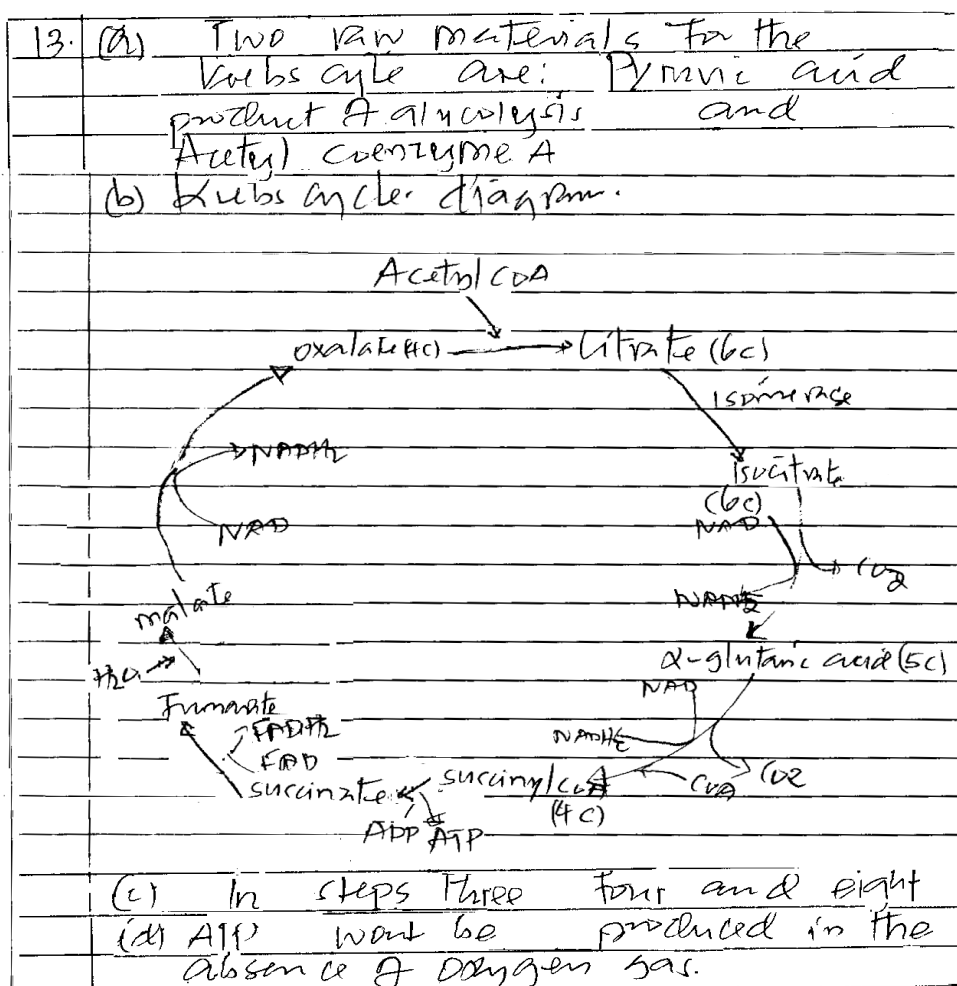
Others gave incorrect responses on the concepts. Some of the candidates wrote *raw materials for Krebs cycle are glucose and NAD, in the absence of oxygen there will be 8 ATPs that will be produced by Krebs` cycle.* Moreover, another candidate responded *raw materials for Krebs` cycle are FAD and ATP.* Another candidate wrote *NAD is reduced to ATP at oxaloacetic acid, and a total of 30 ATPs will be produced in Krebs cycle in the absence of Oxygen.* Further analysis of candidates` scripts indicated that most of them managed to draw Krebs` cycle and indicate only few correct steps while others interchanged the steps. These responses suggest that these candidates had inadequate knowledge of the tested concepts. Extract 13.1 is a sample of a poor response from one of the candidates.



**Extract 13.1:** A sample of a candidate's poor response in question 13.

Extract 13.1 shows the response of a candidate who had inadequate knowledge about the tested concepts. For example, the candidate wrote glucose and citrate as raw materials of the Krebs cycle instead of pyruvate and Acetyl CoA.

Conversely, 276 (32.8%) candidates scored from 6 to 15 marks. Some of these candidates wrote correct responses giving four to eight correct steps of Krebs cycle. Other candidates correctly explained the concepts and draw Krebs cycle indicating all the eight steps. This shows that these candidates had adequate knowledge of the tested concepts which enabled them to score from 6 to 15 marks. Extract 13.2 is a sample of a good response from one of the candidates.



**Extract 13.2:** A sample of a candidate's good response in question 13.

Extract 13.2 shows the good response of a candidate who had adequate knowledge about the tested concepts and wrote correct responses in all the parts.

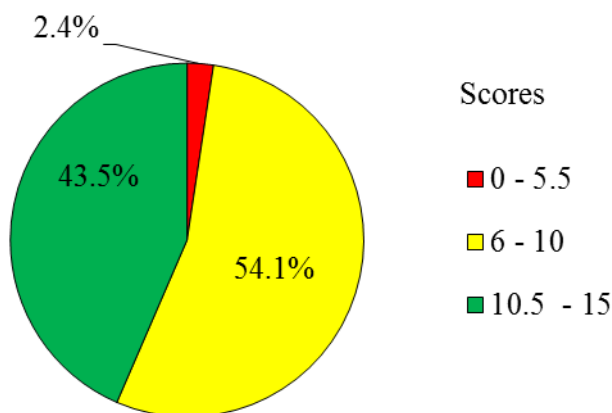
## 2.3 SECTION C: ESSAY TYPE QUESTIONS

This section had three questions from pedagogy topics; each carrying 15 marks. The candidates were required to attempt two questions.

### 2.3.1 Question 14: Planning and Preparation for Teaching

The question consisted of two parts. In part (a), the candidates were required to explain what will happen if one teaches without a syllabus by giving six points. In part (b), candidates were required to analyse three strengths of using the centralized syllabus in teaching and learning of Biology subject.

The question was attempted by 795 (93.8%) candidates. Data analysis indicates that 2.4 percent scored from 0 to 5.5 out of 15 marks allocated to this question. The candidates who scored from 6 to 10 marks were 54.1 percent whereas 43.5 percent scored from 10.5 to 15 marks. Figure 14 summarizes the performance of the candidates in question 14.



**Figure 14:** *The candidates' performance in question 14.*

Considering Figure 14, the general performance in this question was good because 820 (97.6%) candidates scored from 6 to 15 marks. The good performance was attributed by the candidates' adequate knowledge of the tested concepts. For example, in part (a) some of the candidates wrote

without syllabus teachers will not be able to set time for teaching, poor test and examinations construction, poor setting of objectives, teacher cannot be able to determine breadth and depth of the content to be covered.

Similarly, in part (b), the candidates managed to write two to three usefulness of the centralized syllabus in teaching and learning of Biology subject. Responses such as it suggests how students can be evaluated country wide, it gives logically organized teaching and learning across the country and it suggests resources needed for teaching certain topic were seen in candidates' scripts. This indicates that these candidates had an adequate knowledge of the concept tested. Extract 14.1 is a sample of a good response from one of the candidates.

14	<p>syllabus is the summary of topics arranged in logical sequence which help a teacher and student to know what is to be covered in a specific level. syllabus is prepared by the Tanzania Institute of Education so as to guide teaching and learning of a specific subject for the certain course example we have syllabus for ordinary level (Form I-IV) which shows all topics to be covered.</p> <p>The following are thing which will likely to occur if a teacher teach without syllabus</p> <p>The teacher will teach in poor arrangement becuase syllabus help a teacher to teach in logical sequence so if a teacher dont have syllabus will fail to do so.</p> <p>Teacher will fail to choose proper Materials in Teaching and learning process this is becuase in syllabus there is suggest ed teaching and learning materials which should be used in Teaching or learning a specific topic or subtopic</p> <p>Teacher will fail to use time properly then fail to meet education goals as planned. In syllabus it shows number of periods which should be spent in teaching specific topic so if a teacher does not have syllabus can use much time or inadequate time in Teaching.</p>
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14	<p>A teacher might fail in selecting appropriate teaching and learning strategies just because in syllabus is where we can get suggested teaching and learning strategies for a certain topic. If a teacher can use brainstorming or group discussion.</p> <p>A teacher will find difficult in writing scheme of work because the scheme of work should be derived from syllabus is where general objectives, competences to be developed and specific objectives are found.</p> <p>A teacher also will be troubled in the proper method of evaluating student achievements after learning topic or content without syllabus teacher will fail to choose the evaluation tool which is suitable if it is examination, test or portfolio.</p> <p>The following are strengths of using the centralized syllabus in teaching and learning of biology subject.</p> <p>centralized syllabus help a teacher to teach in logical sequence across the country.</p> <p>centralized syllabus help a teacher to choose the evaluation tool countrywise.</p> <p>centralized syllabus help teacher to ensure the materials which are taught can be equaled by all learners of the same level.</p>
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**Extract 14.1:** A sample of a candidate's good response in question 14.

Extract 14.1 shows the response of a candidate who managed to explain what will happen if one teaches without a syllabus in part (a). The candidate also correctly analysed three strengths of using the centralized syllabus in teaching and learning of Biology subject in part (b).



On the other hand, 20 (2.4%) candidates showed poor performance by scoring from 0 to 5.5 marks. These candidates either lacked enough knowledge or had partial knowledge of the tested concepts. Further, the analysis indicates that most of the candidates failed to respond part (b) of the question. The candidates wrote the importance of using a syllabus during teaching which was asked in part (a) instead of analysing the strengths of using centralized syllabus. For example, some of the candidates wrote *centralized syllabus is important because it enables teachers to prepare practical lessons, it helps to reach specific objectives, it helps to select teaching methodologies and teaching aids*. Others wrote *centralized syllabus make a teacher to have confidence, increases concentration, help to deliver the materials to students, it helps a teacher to teach reliable materials, it helps to determine the number of periods per topic and it can help a teacher to determine instructional objectives*. These responses suggest that these candidates had insufficient knowledge of the concept tested. Extract 14.2 is a sample of a poor response from one of the candidates.

	(b) (i) Help in preparation of scheme of work
	as a long plan for teaching
	(ii) Help in preparation of lesson plan
	as a short plan for teaching
	(iii) A syllabus help in preparation of lesson
	notes for teaching and learning process.

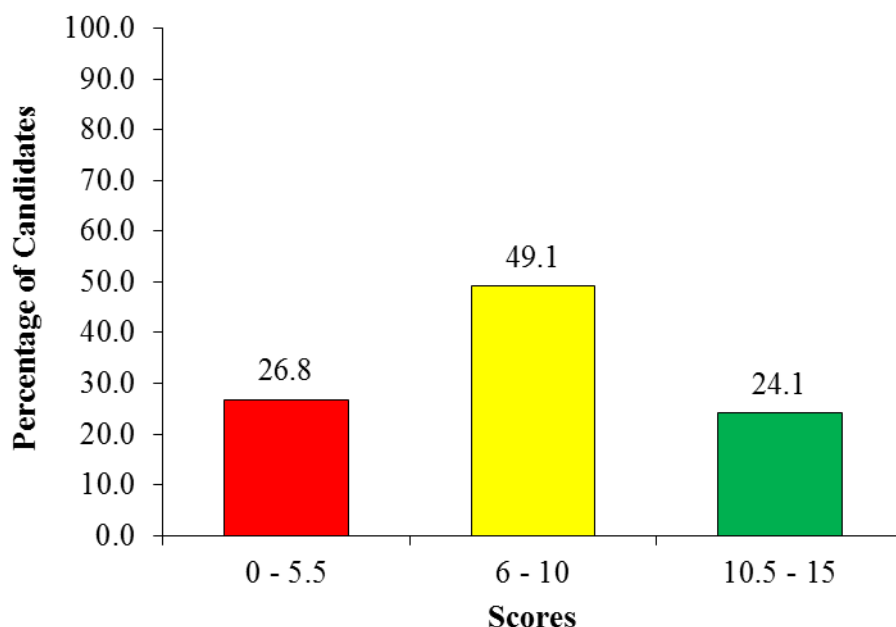
**Extract 14.2:** A sample of a candidate's poor response in question 14(b).

In extract 14.2, the candidate wrote the importance of a syllabus instead of analyzing the strengths of using the centralized syllabus in teaching and learning of Biology.

### 2.3.2 Question 15: Fundamentals of Teaching and Learning Biology

This question required the candidates to explain six reasons as to why the principle of creating learning environment that promotes cooperative learning has to be adhered during teaching and learning process. The analysis shows that 630 (74.3%) candidates attempted this question. Data

indicate that 26.8 percent scored from 0 to 5.5 marks, 49.1 scored from 6 to 10 marks whereas 24.1 percent scored from 10.5 to 15 marks. Figure 15 summarizes the performance of candidates in question 15.



**Figure 15:** The candidates' performance in question 15.

Based on Figure 15 the candidates' performance in this question was good because, 615 (73.2%) scored from 6 to 15 marks. The good performance was attributed by the candidates' adequate knowledge of the tested concepts. Thus, they gave correct responses such as *cooperative learning fosters creativity and curiosity among students, promotes discovery learning, promotes active participation, promotes learners interest to learn and it promotes interpersonal skills among learners*. Others wrote *cooperative learning promotes learners attention in the teaching and learning process, impart the culture of good relationship among learners themselves, it motivate learners and it enhance the understanding of the students in the process of learning*. These responses suggest that the candidates were knowledgeable about the tested concepts. Extract 15.1 is a sample of a good response from one of the candidates.

15

Cooperative Learning; is one of the principles of teaching and learning biology which enhance cooperation between a teacher and his or her learner or students during teaching and learning process. It is mostly used by teachers during teaching and learning process due to the following reasons.

If motivates the learners; through creating learning environment which promotes cooperation during teaching and learning process, the learners are being motivated to engage much in the lesson.

If creates the class to be active; As the learning environment supports cooperation between a teacher and learners also the class becomes more active as every one has to participate in the lesson.

It enhances meaningful learning; This also bring about meaning learning where the learners understand well what they learn and discovery new knowledge as they are given room to participate rather than wait each and everything from a teacher.

It makes the learners more creative. It is true that as the learners participate in teaching and learning process effectively they become very creative as they play a role even in teaching and learning aid construction.

15	<p>It simplifies the teaching and learning process; This due to the fact that a teacher is just to facilitate the process of learning so this become very simple because it allows interactions of learners with the Materials.</p>
	<p>It helps the learners to acquire skills and knowledge when this principle is well employed in teaching and learning process it gives them a room to interact with the Materials and themselves.</p>
	<p>Therefore; In Teaching and learning Biology a teacher has to employ this principle during his or her lesson and other principle like inquiry learning as this will make the learners feel happy.</p>

**Extract 15.1:** A sample of a candidate's good response in question 15.

Extract 15.1 shows the response of a candidate who correctly explained the importance of the principle of creating learning environment that promotes cooperative learning during teaching and learning process. The candidate also had good command of the English Language.

Despite good performance in this question, 225 (26.8%) candidates scored low marks from 0 - 5.5. These candidates had either little or no knowledge of the tested topic which led them to write incorrect responses. Some candidates wrote about scientific stages of problem solving as *this principle should be adhered through investigation of the problem, formulation of the hypothesis, experimentation, conducting a follow up and drawing conclusion*. Others explained about the issues to consider during teaching and learning as they wrote *the teacher should organize the class, use teaching and learning aids, use good media, select good medium of instruction and use of practicals*. Moreover, another candidate wrote *helps to save accidents in the laboratory, helps to conduct experiments, helps to*

organize chemicals and facilities in the laboratory and helps to use laboratory resources effectively. These responses suggest that the candidates had an inadequate knowledge on the tested concepts. Extract 15.2 is a sample of a poor response from one of the candidates.

15	<p>Learning environment This is the place where by a teacher conduct effective teaching and learning process without any interation. The following are the process which favour the environment to learn comfortable.</p> <p>It help both the teacher and learners to avoid- confusion which will happen during the lesson presented. And make sure that the learner learn carefully and make understanding the lesson well.</p> <p>It help the learner to be readiness of listening what the teacher taught. And to concentrate only on learning due to the attractive environment.</p> <p>It help the learner to concentrate only on making note taking and listening the knowledge or skills provided from the teacher. According to the good environment available the learning process will operate effectively.</p> <p>It bring hope to the learners during teaching - and learning. Due to the process of providing environment safe the learner and teacher learn the lesson well affair without any interation.</p> <p>It help both learner and teacher to be safe on danger occur which can cause obstacle. On the way of teaching and learning process.</p> <p>It help the learner to understand well the lesson from the teacher. Since holds they are in a good-environment condition and well safe.</p> <p>Therefore in case of the environment there are many different obstacles which can hinder the lesson such as noise and lack of enough properties such like dark and cause the lesson damage or not performed well attention.</p>
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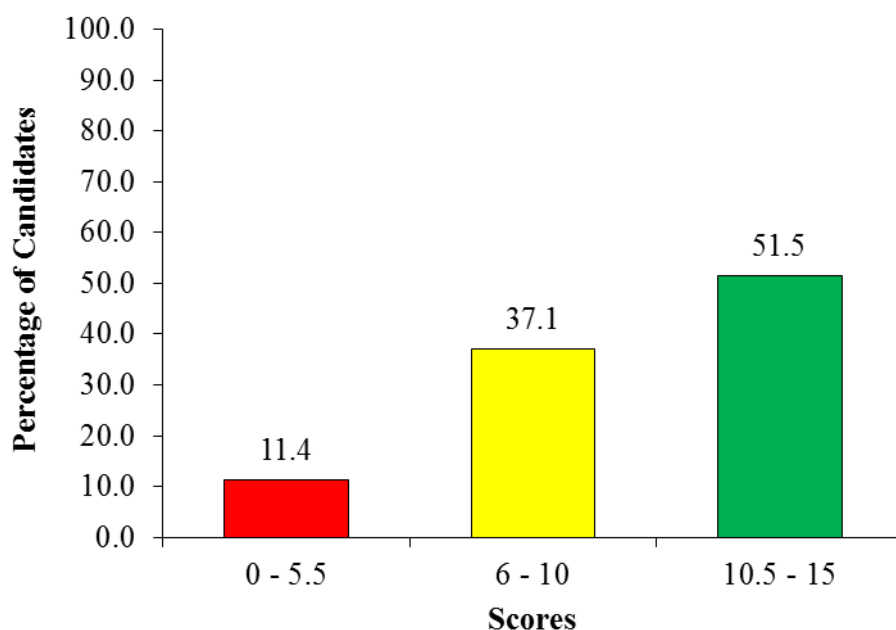
**Extract 15.2:** A sample of a candidate's poor response in question 15.

Extract 15.2 shows the response of a candidate who explained the importance of creating learning environment during teaching and learning process instead of explaining the importance of cooperative learning.

### 2.3.3 Question 16: Assessment in Biology

This question had parts (a) and (b). In part (a) candidates were required to explain the terms (i) Standard deviation of scores (ii) Test item analysis (iii) Difficulty index of a test item and (iv) Discrimination index of a test item as used in assessment. In part (b) the candidate were required to calculate (i) Z-score and (ii) T-score if a Form One student scored 80% in a midterm test and the average mark was 60% while standard deviation was 4.

The question was attempted by 272 (32.1%) candidates. The analysis indicates that 11.4 percent of the candidates scored from 0 to 5.5 marks, 37.1 percent scored from 6 to 10 marks, whereas 51.5 percent scored from 10.5 to 15 marks out of the total marks allocated to this question. Figure 16 summarizes the candidates' performance in question 16.



**Figure 16:** *The candidates' performance in question 16.*

Figure 16 shows that the candidates' performance in this question was good as 744 (88.6%) scored from 6 to 15 marks. Further analysis from

candidates' scripts revealed that the candidates had an adequate knowledge of the tested concepts. Thus, they managed to explain two to four terms and calculate either Z or T scores or both. In responding to part (a) some of the candidate wrote: *Discrimination index of a test item is a proportion of passed difficult of test item to difficult indices of high scorers and low scorers, Item analysis is the process of determining the performance of individual test item, Standard deviation is the measure that shows how a score deviate from the mean, Difficult index is a proportion of students who get correct the test item.*

Similarly, in part (b), most of the candidates were able to calculate Z -score or T-score or both. The candidates who scored full marks were able to explain all the terms as they are used in assessment. Also they used correct formula and correctly incorporated the given data to calculate Z-score and T-score. Extract 16.1 is a sample of a good response from one of the candidates.

16a)	Standard deviation of scores is the average amount by which the scores differ from mean scores
ii)	Test item analysis, is the process of identifying an item whether too easy or difficult for replacement or moderation of test item.
iii)	Difficulty index of test item (I.D) is the technique that show number of students who answered the item correctly to the total number of students selected in item analysis expressed in percentage.
iv)	Discrimination index of a test item (I.D) refers to the technique that show test item that discriminate the more capable students from less capable/lower achievers in a test.
b)	Solution. $Z\text{-score} = \frac{(X - \bar{X})}{S.D.}$ <p>where <math>X = 80</math>  <math>\bar{X} = 60</math>  <math>S.D = 4</math></p> $\frac{(80 - 60)}{4}$ $Z\text{-score} = 5$ $T\text{-score} = 10Z + 50$ $= (10 \times 5) + 50$ $= 50 + 50$ $T\text{-score} = 100$

**Extract 16.1:** A sample of a candidate's good response in question 16.

In extract 16.1 the candidate correctly explained the terms (i) Standard deviation of scores (ii) Test item analysis (iii) Difficulty index of a test item and (iv) Discrimination index of a test item in part (a). The candidate also applied the correct formula to calculate Z-score and T-score respectively.

Conversely, 96 (11.4%) candidates scored from 0 to 5.5 marks. Some of these candidates gave responses which do not relate to the question while others gave points which lacked clear explanations. Hence, they did not get



full marks. For example, in part (a) some of the candidates were explaining terms with the word difficult thinking that they are used for tests which are difficult. For example, some of the candidates wrote *standard deviation refers to the situation of directing the scores to the mean, item analysis is a process of determining the consistence of the test, discrimination index is the rate of a test item and difficult index is the rate to the way students perform a test*. Others wrote *item analysis is the process of constructing a test, difficult index is the process of measuring how the test is suitable for a test, standard deviation is a summation of students' scores and difficult index is used to determine students who fail the test*.

Similarly, in part (b), some of the candidates used incorrect formula to calculate T and Z score. Others used correct formula but interchanged the formula for calculating Z and T-score. For example, some candidates wrote the formula  $T\text{-score} = 50Z + 10$  and  $Z\text{-score} = (\text{Mean score} - \text{Raw score}) / \text{S.D.}$  Others wrote  $Z\text{-score} = (\text{Mean score} - \text{Raw score}) / \text{S.D.}$  and  $T\text{-score} = 60Z + 10$ . These responses suggest that these candidates had inadequate knowledge of the testes concepts. Extract 16.2 is a sample of a poor response from one of the candidates.

16	(a) i) standard deviation of score this is the average of scores that deviates from the raw scores.
	(ii) Test item analysis this is the process of determining the student who has got the item right.
	(iii) Difficulty index of a test item this is the determination of the consistency of the item.
	iv) Discrimination index of test items these are the items which tends to deviate from students mean scores.

16	(b) From the data provided Standard deviation = 4. Average mark = 60% student score = 80%.
(i)	From $Z = \frac{ X - \bar{X} }{S.D}$ but $S.D = \sqrt{\frac{\sum (X - \bar{X})^2}{N}}$ hence $4 = \sqrt{\frac{\sum (X - \bar{X})^2}{N}}$ but $N = 1$ . $(4)^2 = \left( \frac{\sum (X - \bar{X})^2}{1} \right)^2$ <i>squaring both sides</i> $\sqrt{16} = \sqrt{\sum (X - \bar{X})^2}$ $\sum (X - \bar{X}) = 4.$ from the formula $Z = \frac{ X - \bar{X} }{S.D}$ $Z = \frac{4}{4}$ $Z = 1.$ Therefore Z-score = 1.
16(b)	(ii) from T-score $= 10Z + 60$ $= 10 \times 1 + 60$ $= 10 + 60 = 70.$ $\therefore T\text{-score} = 70\%.$

**Extract 16.2:** A sample of a candidate's poor response in question 16.

Extract 16.2 shows the response of a candidate who incorrectly explained the terms in part (a). Also the candidate used the correct formula but failed to incorporate the given data and therefore got Z score = 1 instead of 5 and this automatically lead to incorrect T score = 70 instead of 100 in part (b).

### 3.0 ANALYSIS OF CANDIDATES' PERFORMANCE IN EACH TOPIC

A total of eleven (11) topics were examined in Biology examination for the DSEE 2020. The analysis shows that candidates demonstrated good performance in *Planning and Preparation for Teaching* (97.6%), *Fundamentals of Teaching and Learning Biology* (85.4%), *Body Health and Immunity* (80.8%) and *Ecology* (74.3%). The topics with average performance were: *Analysis of the O-level Biology Curriculum Materials* (68.7%), *Assessment in Biology* (61.4%), *Classification of Living Things* (61.3%), *Respiration* (58.2%) and *Biochemistry* (57.8%). The topics with poor performance were *Genetics* (30.9%) and *Basic Biology Laboratory Skills* (29.7%). The summary of the candidates' performance in Biology DSEE 2020 topic-wise is attached in the Appendix.

The factors which made some of the candidates fail to score high marks include: Inadequate knowledge in the respective topics, failure to understand the requirements of the questions, misconceptions of facts and lack of competences in presenting answers. However, adequate knowledge about the assessed topics, the ability to understand the requirements of the questions, good presentation skills accompanied by mastery of the Language led to good performance.

### 4.0 CONCLUSION

The analysis which was done on the Biology DSEE examination 2020 shows that, questions which had good performance were 12 (98.7%), 14 (97.6%), 10 (97.5%), 16 (88.6%), 2 (83.6%), 3 (80.8%), 8 (74.3%), 11 (73.3%) and 15 (73.2%). Questions which had average performance were 6 (68.7%) and 1 (49.3%). On the other hand, the questions with poor performance were 9 (34.2%), 13 (32.8%), 4 (30.9%), 5 (29.7%) and 7 (16.9%), respectively. Generally, the performance of the candidates in Biology examination for the DSEE 2020 was good since 839 (99.88%) candidates passed the examination. Summary of the performance of candidates in each topic is shown in the appendix.

## 5.0 RECOMMENDATIONS

Generally, the candidates' performance was good. Considering this performance, the following recommendations are put forward so as to reinforce the performance of forthcoming candidates:

- (a) In order to resolve the problem resulting from the candidates' inability to identify the demand of the question, prospective candidates should be given exercises, assignments, tests and examinations accompanied with immediate tutors' feedback to enable them build up confidence, skills and experience needed for meeting the demands of the questions.
- (b) Students should engage in activities such as debates, reading novels, and speaking English in colleges all the time. This will improve proficiency in the English Language.
- (c) For the students to acquire enough competences of the topics with poor performance the following are recommended:
  - (i) For the topic of *Genetics*, tutors should display pictures/photographs/charts showing flow diagrams of progenies and different plants and animals phenotypes inherited in a Mendelian and non Mendelian fashion. Then lead class discussion on their patterns of inheritance, make clarifications and conclusions. This will enable them to understand well the concepts.
  - (ii) For the topic of *Basic Biology Laboratory Skills*, tutors should lead students to conduct microteaching where they will role play and demonstrate situations where safety precautions should be adhered by both students and teachers and the tutor to make clarification and conclusions.

**SUMMARY OF THE CANDIDATES' PERFORMANCE IN BIOLOGY  
SUBJECT**

S/N.	Topic	Question Number	Performance in Each Question (%)	Average Performance Per Topic (%)	Remarks
1.	Planning and Preparation for Teaching	14	97.6	97.6	Good
2.	Fundamentals of Teaching and Learning Biology	10	97.5	85.4	Good
		15	73.2		
3.	Body Health and Immunity	3	80.8	80.8	Good
4.	Ecology	8	74.3	74.3	Good
5.	Analysis of the O-level Biology Curriculum Materials	6	68.7	68.7	Average
6.	Assessment in Biology	9	34.2	61.4	Average
		16	88.6		
7.	Classification of Living Things	1	49.3	61.3	Average
		11	73.3		
8.	Respiration	2	83.6	58.2	Average
		13	32.8		
9.	Biochemistry	7	16.9	57.8	Average
		12	98.7		
10.	Genetics	4	30.9	30.9	Poor
11.	Basic Biology Laboratory Skills	5	29.7	29.7	Poor

