Province of the
EASTERN CAPE
EDUCATION

EXAMINATIONS AND ASSESSMENT CHIEF DIRECTORATE
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2019 NSC CHIEF MARKER'S REPORT

SUBJECT:	**LIFE SCIENCES**
PAPER:	**1**
DURATION OF PAPER:	**2 ½ HOURS**
DATES OF MARKING:	**30 / 11 / 2019 – 13 / 12 / 2019**

SECTION 1: (General overview of Learner Performance in the question paper as a whole)

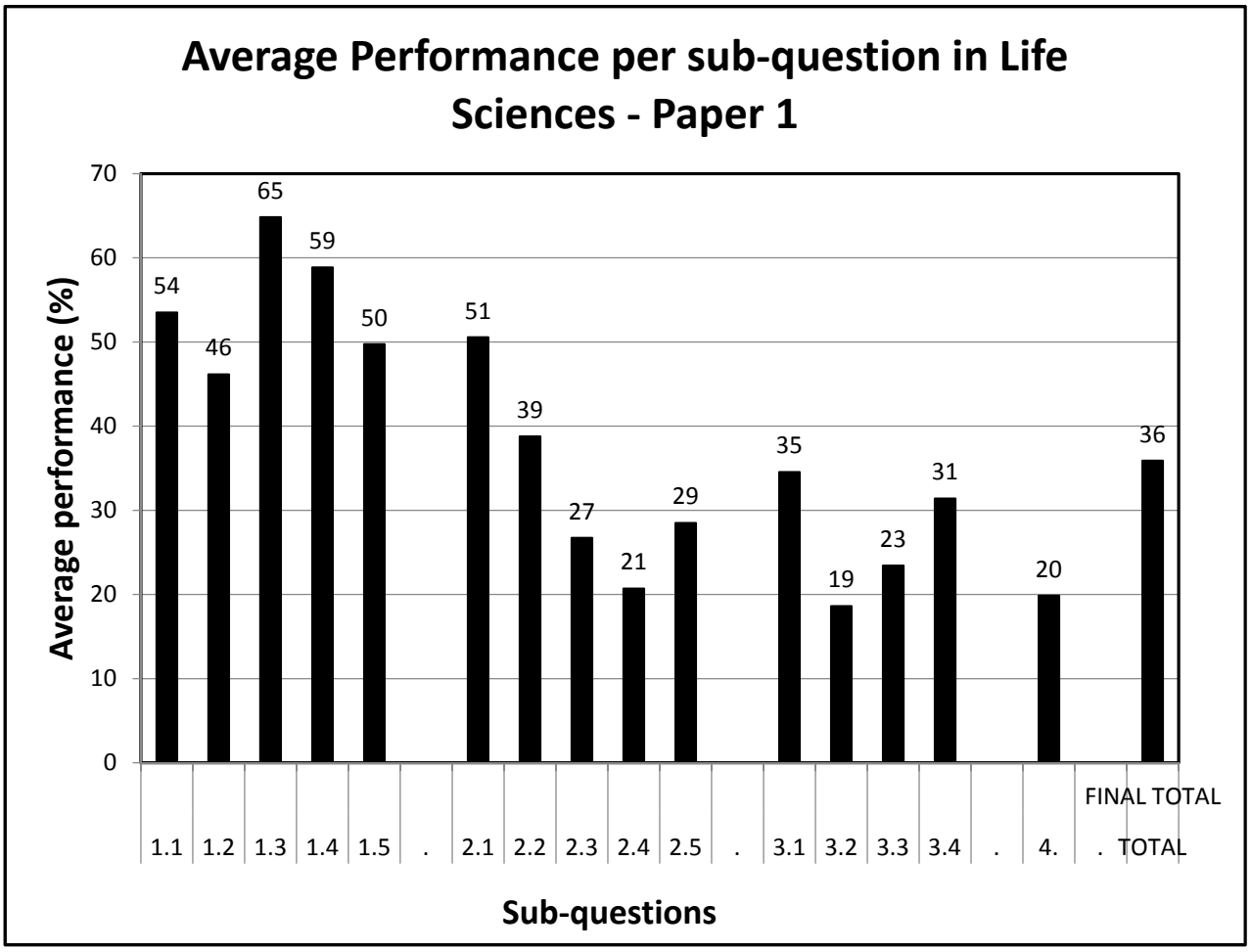
Life Sciences Paper 1 was a fair, standardised and well-balanced question paper. All questions were carefully designed to accommodate candidates of different cognitive and academic abilities. The difficulty level of the paper is generally regarded as moderate to difficult. There were some challenging questions included in the paper to distinguish between low academic achievers and top-academic achievers. There were sufficient opportunities provided to low academic achievers to score at least a pass mark.

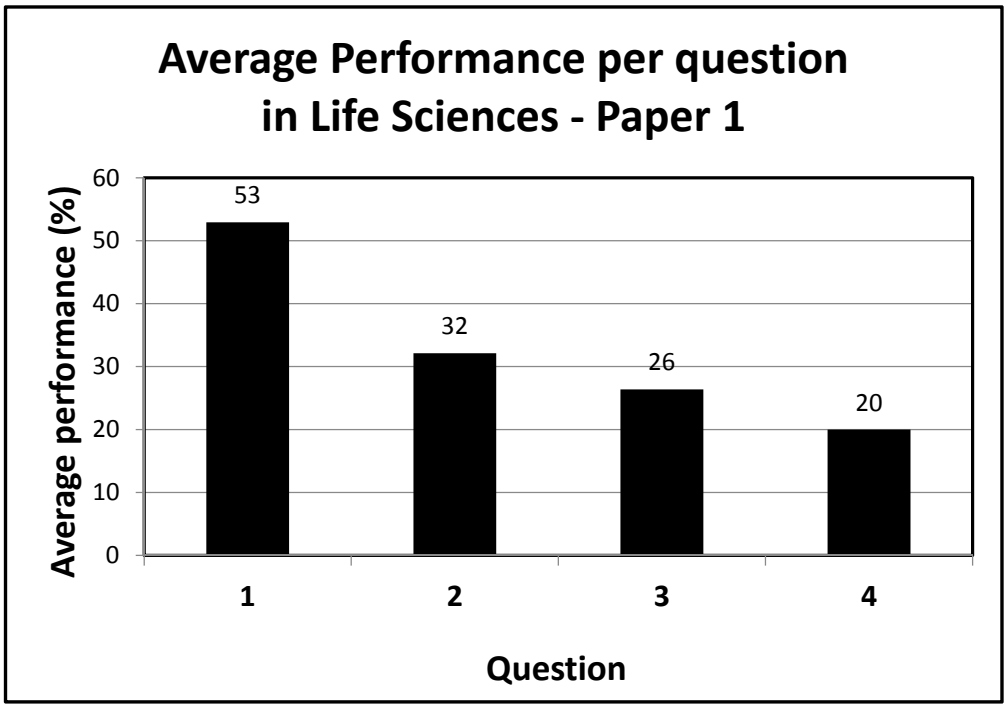
Although the majority of our learners thought that this paper was reasonably easy, the results do not correspond with this opinion. Not all learners (both low and top achievers) performed as well as would have been expected. The number of distinctions declined, to an extent.

SECTION 2: Comment on candidates' performance in individual questions

(It is expected that a comment will be provided for each question on a separate sheet).

The average performance per sub-section in Life Sciences Paper 1 is given below. The data provided below was extracted from 100 randomly selected scripts (Rasch analysis).





QUESTION 1

General comment on the performance of learners in the specific question. Was the question well answered or poorly answered?

QUESTION 1 RASCH ANALYSIS -(AVERAGE PERCENT PER SUB-SECTION)				
1.1	1.2	1.3	1.4	1.5
54	46	65	59	50

Question 1 (1.1; 1.2; 1.3; 1.4 and 1.5) was answered by all candidates; they performed well as compared with the rest of the question paper. This question included mainly level 1 and 2 type questions. This section was designed to build confidence in all learners at the start of the examination.

1.2 This question tested candidates' comprehension and understanding of basic biological concepts. Learners are expected to score well in this question, but very few candidates were able to achieve the maximum marks for this section.

1.2.3 The vast majority of candidates did not score this mark as they did not give the complete answer.

1.2.7 Many learners wrote Pregnancy instead of gestation here.

1.5.1 Some learners either did not understand or did not read the instruction clearly and hence some of them wrote the 'letter' only, and not the 'label' as well. Some did not write the 'letter" but wrote only the labels.

QUESTION 2

QUESTION 2 – RASCH ANALYSIS – AVERAGE PERCENT PER SUB-SECTION				
2.1	2.2	2.3	2.4	2.5
51	39	27	21	29

2.1. This question was generally well answered with most candidates scoring marks for the question as this question was mostly at level A.

2.2 On average candidates understood the scenario given in this question.

2.2.1 The majority of candidates lost marks because they were unable to define the concept accurately. In addition, the marks allocated for the definition were awarded only if it was completely correct.

2.3 This question was poorly answered with the majority of learners not being able to explain

the concepts required.

2.3.2 (a) Some candidates lost a mark because they were unable to identify the part of the eye that becomes opaque. They wrote cornea or pupil instead of lens. They also did not explain how this cloudy lens caused visual impairment for the second mark. Candidates do not answer the "Explain" questions fully. "Explain" questions require a cause and effect type answer. Candidates, however, only write the cause and not the effect.

2.3.3 They were not able to apply knowledge to explain the reason for wearing biconvex glasses.

2.3.5 The majority of candidates only scored 2 marks for this question. They were not equipped to draw a pie chart. Most of them did not have the necessary equipment such as protractor and compass.

2.4 This question was very poorly answered. Most candidates did not perform well.

2.4.1 Most of the candidates could not answer this question although it had been taught in class as an example of the negative feed-back system. This shows that candidates had not been taught to apply their prior knowledge in a different but related scenario from daily life.

2.4.2 Candidates were not able to extract evidence from the graph to support their answer.

2.4.3 Some candidates were able to respond correctly by giving the second option as an answer.

Only the top- achievers were able to give the first option in the memo as an answer.

2.5 Although this was a level 2 type question, it was disappointing to see that some candidates were struggling to describe the events correctly in the correct sequence. Some candidates lost marks as they used a flow chart instead of providing a description.

In this case, principle 7 applied. (Reference to the marking principles given on page 2 of the marking guideline). Many candidates described the process of fertilisation and unrelated events.

QUESTION 3

QUESTION 3 - RASCH ANALYSIS – AVERAGE PERCENT PER SUB-SECTION			
3.1	3.2	3.3	3.4
35	19	23	31

3.1 Most candidates managed to score marks here as it was the best performing subsection of question 3.

3.1.4 Most of the candidates lost marks because they answered the question without relating to the scenario presented in the form of diagrams.

3.2 Most of the candidates struggled to answer this investigative question. Candidates had clearly not been exposed to the procedures followed in conducting scientific investigations. Candidates scored the lowest average percentage on this question as compared to rest of the questions on the examination paper.

3.2.1 Some learners could not name the gland that secretes glucagon. Some of them wrote liver instead of pancreas.

3.2.2 Most of the candidates failed to identify the independent variable.

3.2.3 The majority of candidates could not answer this question and hence lost three marks. Most of the candidates were able to pick up the constant variables mentioned in the question paper. This means that the candidates had failed to read and comprehend what was required to answer this question. The question required candidates to write any

three variables that **should have** been kept constant during the investigation. This automatically excludes all those mentioned in the question paper itself.

3.2.4 Some candidates partially explained the reason for measuring the blood glucose levels before injecting adrenalin.

3.2.5 This is another high order type question, that tests the candidates' ability to apply their knowledge in a different situation. Most of the learners did not perform well in this question.

3.2.7 The majority of candidates were unable to answer correctly. Most of the candidates lost marks because they wrote only the word reliability, without including the word "increase".

3.3 This question was also very poorly answered.

3.3.1 Some of the candidates could not answer this question adequately. They are expected to be able to explain how the building of a dam affects the biodiversity in the river. The candidates should have responded directly by referring to the negative impact of building a dam on the biodiversity in the river. This direct answer should have been supported by a valid substantive fact.

3.3.2 Most of the learners were able to score some marks for this question. What was required, was a standard description of eutrophication and subsequent events that cause

negative
effects on the quality of water.

3.3.3 Candidates lost marks because they did not explain the economic benefit. Instead they discussed the social and geographical impact of the dam in the region.

3.4 Candidates managed to score marks here due to the calculation.

3.4.1 The majority of candidates were able to perform this simple arithmetic calculation. A few candidates did not pay attention to the part of the question requiring that the answer be given **in billion tons**.

3.4.2 The candidates lost marks because they failed to indicate the direct impact of burning plastic on global warming – i.e. it **increases** global warming.

3.4.3 Many candidates could not formulate practical strategies to improve recycling. They also provided strategies for households and government rather that those that the municipality could implement.

QUESTION 4

QUESTION 4 – RASCH ANALYSIS - AVERAGE PERCENT - ESSAY
20

This question was surprisingly very poorly answered as candidates had been exposed to the concepts of geotropism and balance in previous examinations. Candidates wrote on phototropism in stems which was irrelevant to this essay and did not discuss the effect of gravity on stems. Many learners scored very low marks for a question that was mostly level A.

Why the question was poorly answered? Also provide specific examples, indicate common errors committed by learners in this question, and any misconceptions.

QUESTION 1

1.2 This question tested candidates' comprehension and understanding of basic biological concepts. Learners are expected to score well in this question, but very few candidates were able to achieve the maximum marks for this section.

1.2.1 The term "villi" was not accepted as the correct response because this is a general Term, and these structures are also found on the inner walls of the small intestine and proximal convoluted tubules in the nephron.

Learners also wrote chronic instead of chorionic villi

1.2.3 The vast majority of candidates did not score this mark. The term "alien species" was not accepted because the question referred to alien species that outcompete the indigenous species in an area. All invasive species are alien species, but, not all alien species are invasive. i.e. the ones that outcompete the indigenous species of an area.

1.2.4 Luteotropic hormone was accepted as alternative to hormone prolactin.

1.2.7 "Pregnancy" was not accepted as an alternative response to gestation. Pregnancy refers

to the overall changes in a woman during gestation. (e.g. hormonal changes, physical and emotional changes, eating habits. etc.) Gestation refers specifically to a period of foetal development from conception to childbirth). A woman may have two (twins) or three (triplets) gestations during pregnancy.

1.4.1 (c) Acrosomal vesicle was accepted as an alternative to acrosome.

1.4.2 Ovigenesis was accepted as an alternative to oogenesis.

1.5.1 Some learners either did not understand or did not read the instruction clearly and hence

some of them wrote the 'letter' only, and not the 'label' as well. Some did not write the 'letter" but wrote only the labels.

(a) Cerebral cortex was accepted as an alternative to cerebrum.

Common mistakes were:

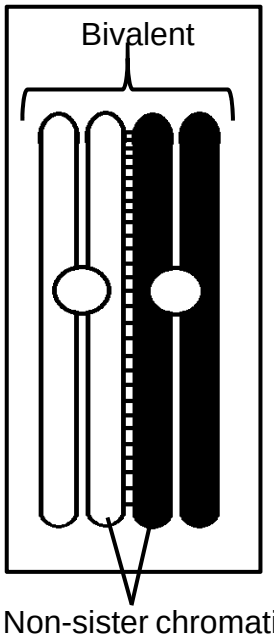
1.5.1 (a) wrote medulla oblongata instead of spinal cord

1.5.2 (b) wrote corpus luteum instead of corpus callosum

QUESTION 2

2.1.1 (a) Centrosome was not accepted as the correct label for label A.

(b) Responses such as "homologous pairs" and "chromosomes" were not accepted as They do not represent the part shown in the diagram. "Bivalent" is also not accepted because:



The term "bivalent" refers to a pair of homologous chromosomes which lie side by side just before crossing over, and establish synaptic connections between non-sister chromatids, before exchanging genes. At this stage they function as one unit.

Bivalent refers to homologous chromosomes at a particular stage; not all homologous chromosomes are bivalent. Homologous chromosomes may be scattered in the nucleoplasm, singly.

After crossing over homologous chromosomes are no longer considered as a bivalent, but are, nevertheless still homologous chromosomes.

Learners also wrote homozygous instead of homologous chromosome

(c) "Spindle" was not accepted, as this term refers to a particular shape.

2.1.2 Only Anaphase II is marked correct, not Anaphase alone.

2.1.4 What distinguishes Metaphase I from Metaphase II is the manner in which the chromosomes are arranged in the cell, rather than the position at which they are arranged. In Metaphase I, (homologous)chromosomes are arranged in **pairs** whereas in Metaphase II they are arranged as **single** chromosomes. In both cases, chromosomes are arranged at the equator and therefore, this is not regarded as a difference.

(Chromatids are not accepted as an alternative to chromosomes in Metaphase II.)

2.2.1 The majority of candidates lost marks because they were unable to define the concept accurately. In addition, the marks allocated for the definition were awarded only

if it was completely correct.

Ovovivipary is a mode of reproduction in animals in which eggs are retained (kept inside) the female's body until they hatch inside, and the young are then born alive (released from the mother's body). The vast majority of candidates understood the first part of the definition, but failed to mention the release of **live** young from the mother.

2.3.2 (a) Some candidates lost a mark because they were unable to identify the part of the eye

that becomes opaque. They wrote cornea or pupil instead of lens. They also did not explain how this cloudy lens caused visual impairment for the second mark.

2.3.3 Many candidates could not explain why long-sighted people need to wear glasses with convex lenses as a corrective measure. The candidates were expected to explain the cause of the disorder, and the reason(effect) of wearing glasses with convex lenses. Many candidates wrote details about accommodation, which was not relevant. Furthermore, some candidates had the misconception that wearing convex lenses would somehow alter the convexity of a person's own lens. The fact is that wearing convex lenses actually compensates for the inadequacy of the person's own lens.

2.3.5 The majority of candidates were not equipped to draw a pie chart. Most of them did not have the necessary equipment such as protractor and compass. Therefore, the angles were incorrectly constructed. Furthermore, they lost marks as they failed to label each sector. Some candidates lost marks for the heading, because they did not include both variables as well as indicate their relationship. e.g. "Percentage of people VS different visual defects" – was not accepted as this does not show any relationship between the two variables. Some candidates had clearly completed the calculations correctly, as the correct answers (number of degrees) were given by the candidates. However, they failed to show their calculations on the paper and so lost marks for their calculations. Only very few candidates were able to score maximum marks for correctly drawing the pie chart.

In future, even if calculations are not asked for specifically, they must be shown.

2.4.1 Most of the candidates could not answer this question although it had been taught in class as an example of the negative feed-back system. This shows that candidates had not been taught to apply their prior knowledge in a different but related scenario from daily life.

2.4.2 In this question, candidates were expected to draw evidence from the graph provided to substantiate their conclusion, by a supporting fact. Not all candidates were successful in their attempt.

2.4.3 Some candidates were able to respond correctly by giving the second option as an answer.

Only the top- achievers were able to give the first option in the memo as an answer.

2.5 Although this was a level 2 type question, it was disappointing to see that some candidates were struggling to describe the events correctly in the correct sequence.

Some candidates lost marks as they used a flow chart instead of providing a description.

In this case, principle 7 applied. (Reference to the marking principles given on page 2 of the marking guideline).

Many candidates described the process of fertilisation and unrelated events.

Candidates also wrote blastocyte instead of blastocyst

QUESTION 3

3.1.4 Most of the candidates lost marks because they answered the question without relating to the scenario presented in the form of diagrams. The candidates made no reference to where in the body the levels of water and salt increase or decrease. They were expected to mention that the increase in salt level and decrease in water level occur specifically in the blood not in any other parts of the body. Some candidates assumed that the hormone ADH is only secreted when the level of water decreases drastically below the normal level. The hormone is constantly secreted to adjust the correct levels of water in the blood. This means that the reabsorption of water takes place all the time as a normal process. When the scenario changes as mentioned in the question, there is a necessity to secrete **more** ADH than normal in order to reabsorb **more** water. This results in the release of **less** water and hence more concentrated urine is produced.

The candidates also made the same error in explaining how correct levels of salt are maintained in the blood. The **high** levels of salt in the blood cause the adrenal gland to secrete **less** aldosterone so that **less** salt is reabsorbed, resulting in releasing **more** salt in the urine. The use of words such as '**more**' and '**less**' are imperative in providing the correct explanations.

3.2 Most of the candidates struggled to answer this investigative question. Candidates had clearly not been exposed to the procedures followed in conducting scientific investigations. Candidates scored the lowest average percentage on this question as compared to rest of the questions on the examination paper.

3.2.1 Some learners could not name the gland that secretes glucagon. Some of them wrote liver instead of pancreas.

3.2.2 Most of the candidates failed to identify the independent variable.

3.2.3 The majority of candidates could not answer this question and hence lost three marks. Most of the candidates were able to pick up the constant variables mentioned in the question paper. This means that the candidates had failed to read and comprehend what was required to answer this question. The question required candidates to write any three variables that **should have** been kept constant during the investigation. This automatically excludes all those mentioned in the question paper itself.

3.2.4 Some candidates partially explained the reason for measuring the blood glucose levels before injecting adrenalin. A baseline or control was required, in order to compare the effect of injecting additional adrenalin, on glucose levels. Most of the candidates ended their explanation abruptly, by indicating only that "it is to compare", with no further supporting fact.

3.2.5 This is another high order type question, that tests the candidates' ability to apply their

knowledge in a different situation. Most of the learners did not perform well in this question.

3.2.6 The candidates interchanged glucagon and glycogen.

3.2.7 The majority of candidates were unable to answer this question correctly. When one increases the sample size or repeats the investigation several times, the degree of reliability progressively increases. So, the word "increase" is very significant. Most of the candidates lost marks because they wrote only the word reliability, without including the word "increase".

3.3.1 Some of the candidates could not answer this question adequately. They are expected to be able to explain how the building of a dam affects the biodiversity in the river. The candidates should have responded directly by referring to the negative impact of building a dam on the biodiversity in the river. This direct answer should have been supported by a valid substantive fact.

3.3.2 Most of the learners were able to score some marks for this question. What was required, was a standard description of eutrophication and subsequent events that cause negative effects on the quality of water. The candidates were required to comment directly on the impact of high amounts of nutrients on the water quality. Candidates also wrote algae grow instead of algal bloom (increased algal growth). Algae grow in all water bodies naturally and do not block sunlight. Algal bloom is a phenomenon (a massive abundance of algae) that blocks the sunlight. Many candidates are also of the misconception that the algal bloom causes a decrease in oxygen and do not have the clear understanding that it is due to plants dying and the resultant increased decomposition that depletes oxygen in the water. Some candidates lost one mark when they mentioned that it is the carbon dioxide released during the decomposition process that killed aquatic life. Higher levels of carbon dioxide do not imply that there is a lack of oxygen. It is the depletion of oxygen (complete removal oxygen) due to increased bacterial activity (increased decomposition) that brought about the death of organisms in the water.

3.3.3 Candidates were asked to explain one economic benefit of the constructed dam to The people living in village 2 as shown in the diagram. It was an open-ended question that required candidates to apply their minds to generate practical responses. Many candidates lost marks because they did not explain the economic benefit. Instead they discussed the social and geographical impact of the dam in the region.

3.4.1 The majority of candidates were able to perform this simple arithmetic calculation. A few candidates did not pay attention to the part of the question requiring that the answer be

given **in billion tons**. Instead they gave the answer in tons. This was not accepted.

3.4.2 The candidates lost marks because they failed to indicate the direct impact of burning plastic on global warming – i.e. it **increases** global warming. Candidates lost marks because some mentioned that when plastics were burnt, methane is released instead of carbon dioxide. Some candidates lost marks because they referred to the greenhouse effect instead of the **enhanced** greenhouse effect. Others lost marks because they wrote about burning plastic causing global warming instead of that it **increased** global warming. The greenhouse effect and resultant global warming are natural phenomena which make planet earth habitable. Some lost marks because they mentioned incorrectly that high levels of carbon dioxide lead to ozone depletion and resultant exposure to UV-rays. **Ozone depletion does not contribute to global warming.** This misconception of ozone depletion contributing global warming needs to be corrected.

3.4.3 This question required candidates to explain two strategies that municipalities could implement to increase the amount of plastic that is recycled by a community. Many candidates could not formulate practical strategies to improve recycling. Some candidates lost marks because they answered that providing jobs (giving employment) would be an effective strategy as an alternative to giving incentives to recycle more plastics. Employing people does not necessarily increase the amount of plastic being recycled, but giving incentives can be a real motivation for people to recycle more plastic.

QUESTION 4

The majority of candidates misinterpreted this question and lost marks for the first part of the essay. The majority described the effect of a unilateral light stimulus (phototropism) rather than describing the effect of gravity (geotropism) on the stem and the root. There were sufficient hints given to the candidates to enable them to identify the phenomenon involved. The opening statement gave the candidate the first hint: "both plants and humans respond to gravity". The second hint was given as "receiving light equally from all directions". This statement served to indicate that the effect of unilateral light on growth movements (phototropism) was excluded. It is clear that the candidates did not pay attention to these details and hence lost marks for describing the wrong process.

Many candidates also lost marks because they did not understand the fact that the cells on the lower side of both stem and root have differential sensitivity to the hormone auxin. In a stem, a **high** concentration of auxin at the lower side **stimulates** cell elongation or causes them to divide faster than the cells on the upper side. This differential cell elongation and rate of cell division lead to the tip of the stem bending upwards.

In the root, the higher concentration of auxin **inhibits** cell elongation and the rate of cell division. Hence the lower level of auxin on the upper side of the root **stimulates** cell elongation and the rate of cell division. This leads to the tip of the root bending downwards.

Many candidates lost marks because they mentioned that in roots, a higher concentration of auxin on the lower side actually stops growth. This is not the case. In fact, both upper and lower sides are growing, but at a different rates.

Some candidates lost marks because they mentioned that the plant grows upwards or downwards. It is actually the tip of the root or stem that bends, not the entire plant.

There was also a common misunderstanding that phototropism takes place in the stem while geotropism only takes place in the root. Both these tropisms affect both root and stem.

The second part of the essay, the role of the maculae in maintaining balance, was well answered in general. It was clear that this section had been given a lot of attention by educators and learners alike. Some learners lost marks because they included irrelevant facts, such as details about the semi-circular canals, cristae, and ampulla to describe the process.

Candidates lost marks in the essay because they were unable to distinguish between the terms listed below:

Wrote:

axon instead of auxin

store instead of restore

Auditory canal instead of auditory nerve

Cristae instead of maculae

Cerebrum instead of Cerebellum

Provide suggestions for improvement in relation to Teaching and Learning
Drill all biological terms after the completion of a topic. Learners need to be familiar with correct terms as well as the spelling of these terms. Using crosswords is one method to improve spelling. Tests on biological terms should require the correct spelling. Ensure that candidates become familiar with all diagrams, labels and functions. Using clear annotated diagrams (as provided in Mind the Gap) is useful for studying. More exercises on Scientific investigation and questions that requires application of knowledge. Leaners need to become familiar with the scientific method at a young age. It should be emphasized from Grade 8. Learners need to be exposed to practical examples in order to understand the concept. Conducting class investigations or giving learners investigative type projects to do themselves will improve their understanding. Revise grade 11 content: human impact, osmoregulation, salt regulation, regulation of carbon dioxide and glucose content. etc. Many teachers do not put too much emphasis on these sections as they were previously taught. However, it can be seen that many learners did not have a good understanding of this work. Candidates must be made aware the "Explain" and "describe" questions need a full explanation in a cause and effect manner.

(d) Describe any other specific observations relating to responses of learners and comments that are useful to teachers, subject advisors, teacher development etc.
Standardized and error free common tasks and informal tasks should be administered to improve the quality and standard of assessment. The present content gap amongst the teachers must be addressed by conducting regular workshops. Workshops on Human Impact on the Environment are necessary. Many teachers are not aware of the current environmental issues. Teachers that are aware of the issues do not have a deep enough understanding to give an educated argument and valid solutions to the problem. Teachers also need to update their own understanding of the content. Many teachers are only using the selected textbook as reference. Examinations are not set according to textbooks but rather the Examination Guidelines. Teachers need to therefore ensure that they have a much broader understanding of each topic by referring to various textbooks, reference books and credible online sources. Teachers must always consult the latest assessment guidelines while teaching and select relevant and prescribed content from various text books. Although previous Marking Reports have emphasized the need for intervention when it comes to the Scientific investigation, candidates still struggle to understand the concept. More emphasis needs to be place on this in the GET phase so that learners can build on their knowledge year by year. The GET phase should also include practical investigations and

projects for learners to do so that learners have the practical experience

Points that need to be carried over to teachers:

(1) Details of the explanations of tropic movements in plants. Differentiation between Phototropism and Geotropism, as well as the fact that these tropisms affect both the stem and root.

(2) The concept of homologous chromosomes and bivalents needs to be clarified as explained in this report.

(3) Homeostatic control of hormones occurs on a continuum. E.g. ADH as explained in this report.