EXAMINATIONS AND ASSESSMENT CHIEF DIRECTORATE
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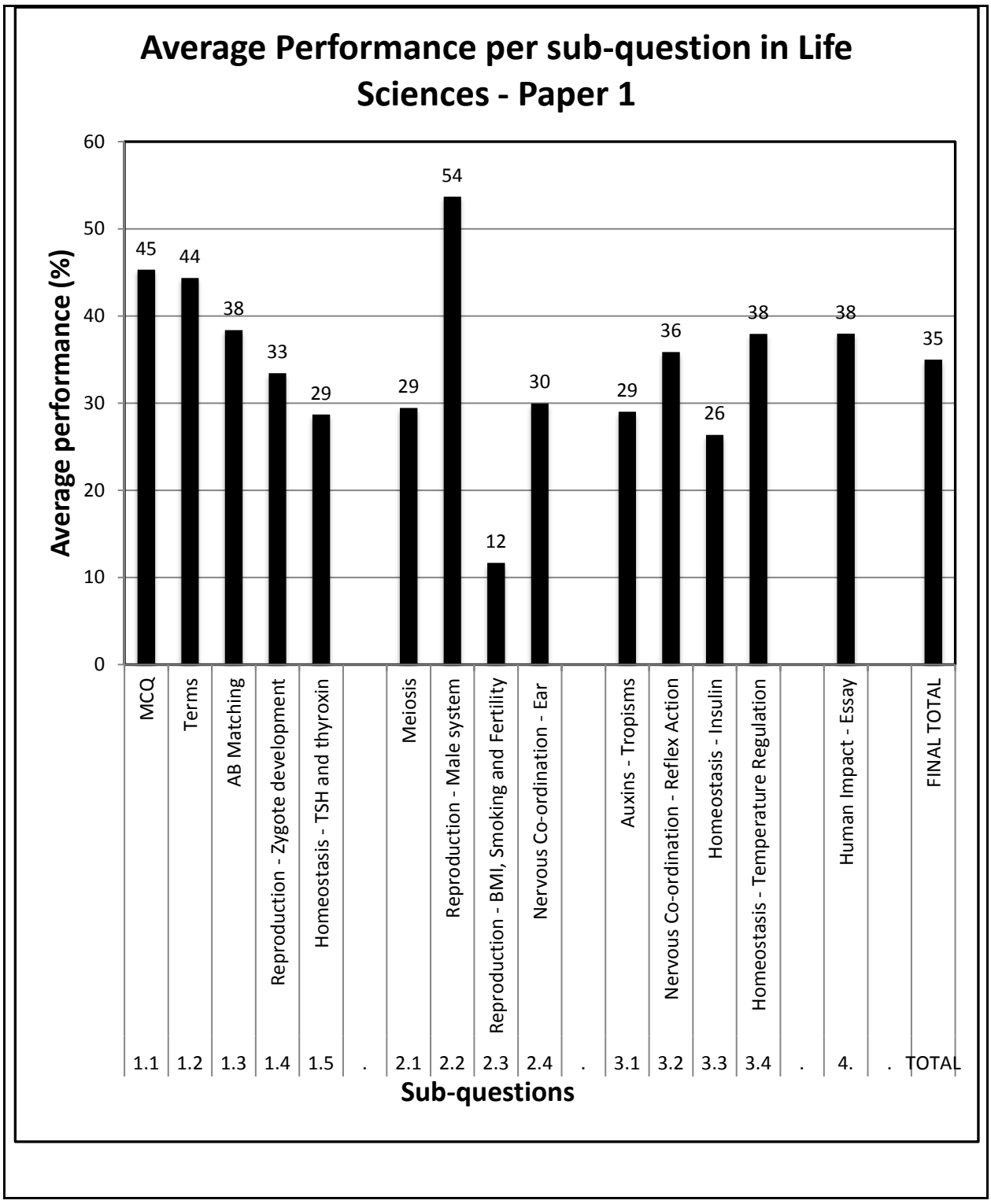
2018 NSC CHIEF MARKER'S REPORT

SUBJECT:		**LIFE SCIENCES**
PAPER:		**1**
DURATION OF PAPER:		**2½**
DATES OF MARKING:		**01-12-2018 TO 14-12-2018**

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

Although the Life Sciences Paper 1 was credible and a well-balanced paper, most of the learners were unable to do well in answering higher order questions. The overall performance was lower than that of learners in previous years. Most of the candidates struggled to answer high order questions adequately and therefore, could not improve their levels of performance in the examination. Only a few candidates were able to attempt higher order questions satisfactorily.


Average Performance per sub-question in Life Sciences - Paper 1
Average performance (%)
60
50
40
30
20
10
0
45
44
38
33
29
29
54
12
30
29
36
26
38
38
35
MCQ
Terms
AB Matching
Reproduction - Zygote development
Homeostasis - TSH and thyroxin
Meiosis
Reproduction - Male system
Reproduction - BMI, Smoking and Fertility
Nervous Co-ordination - Ear
Auxins - Tropisms
Nervous Co-ordination - Reflex Action
Homeostasis - Insulin
Homeostasis - Temperature Regulation
Human Impact - Essay
FINAL TOTAL
1.1
1.2
1.3
1.4
1.5
.
2.1
2.2
2.3
2.4
.
3.1
3.2
3.3
3.4
.
4.
.
TOTAL
Sub-questions

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

The following table represents the average percentage achieved on each sub-sections of the question using the scores from the Rasch analysis.

1.1	1.2	1.3	1.4	1.5
Multiple choice	Terminology	Matching column **I** & **II**	Zygote development	Homeostasis
45	44	38	33	29

Learner performance was relatively adequate on this question.

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

1.1 The majority of candidates performed well in answering the multiple-choice questions.

1.1.7 Candidates should be able to distinguish between replicated and un-replicated chromosomes.

An **un-replicated chromosome** contains one double stranded DNA molecule whereas a **replicated chromosome** contains two identical double stranded DNA molecule, the chromatids, that are joined at the centromere. In other words, it is a chromosome with two identical DNA molecules resulting from replication. (The centromere is not a **structure** as such but a site where two chromatids are held together).

1.2 Candidates were not able to answer questions based on biological terms, although they were advised to learn all biological terms thoroughly.

1.2.1 The term **cleidoic** egg is also a correct term to denote an amniotic egg, but it was not in the CAPS assessment guidelines and hence it was not included in the official signed memorandum.

1.2.2 The majority of candidates mis-spelled 'precocial' as "pricotia". Candidates are expected to learn the correct spelling of all biological terms.

1.2.4 Candidates could not distinguish between the choroid and chorion.

1.2.5 Candidates could not distinguish between corpus collosum and corpus luteum.

1.2.7 CO was not accepted since it represents carbon monoxide.

1.2.8 Only tropism was accepted as the correct answer. Types of tropisms (Phototropism and gravitropism/geotropism) were not accepted.

1.2.9 Pesticide was not accepted as a correct answer. (A pesticide kills both animal and plant pest organisms.)

1.2.10 Specific examples of poaching were **not** accepted. e.g. rhino-poaching.

1.3 This question was not answered satisfactorily by the majority of candidates. Many candidates were confused by similar terms and processes. e.g. Prophase I and Prophase II; ovipary and ovovivipary.

1.4

1.4.1 Many candidates gave a definition instead of identifying the process.

1.4.2 Some candidates wrote meiosis instead of mitosis.

1.4.3 Some wrote choroid instead of chorion. Some wrote chorionic villi which was not accepted as a correct answer. Allantois and yolk sac were not correct answers since they are not functional membranes in humans. Some wrote amniotic fluid instead of amnion.

1.4.4 Some candidates could not correctly identify the stages of development depicted in the diagram. e.g. identified zygote as 'fertilised egg' which was not accepted because the learners were asked to identify the stage rather than describe the stage. Many candidates could not identify the morula.
Some candidates wrote "blastocyte" which is not a biological term.

1.4.8 Candidates were asked to write the exact chromosome number, but many wrote 23 +24 or 46+1; these were not accepted as correct responses.

1.5

1.5.2 Many candidates wrote feed-back mechanism instead of negative feedback mechanism.

(c) Provide suggestions for improvement in relation to Teaching and Learning
Teachers should: • Use multiple choice questions from previous papers for practice as part of daily classwork. • Drill terminology consistently. • Emphasize the importance of diagrams with correct labels and functions. • Scientific investigation including the analysis of data must receive on-going attention.

(d) Describe any other specific observations relating to responses of learners and comments that are useful to teachers, subject advisors, teacher development etc.
• Emphasize functions of different parts of the brain. • Poaching was poorly spelled.

(e) Any other comments useful to teachers, subject advisors and teacher development.
• Regular workshops on various topics to improve the content knowledge and comprehension of teachers.

QUESTION 2

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

The following table represents the average percentage achieved on each sub-sections of the question using the scores from the Rasch analysis.

2.1	2.2	2.3	2.4
Meiosis	Reproduction Male system	Reproduction - BMI, smoking and fertility	Nervous co-ordination Ear
29	54	12	30

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

2.1

2.1.1 (a) Many learners did not specify the exact phase Prophase **I** instead wrote only Prophase, which was not credited.

(b) Some learners wrote Anaphase instead of Anaphase **I**. Marks were not awarded.

Many learners could not distinguish between Metaphase I and Anaphase I

2.1.2 The candidates were expected to draw cells that would be formed at the end of meiosis from diagram **C**. This is one of the higher order questions with high difficulty level.

Candidates lost marks due to the following errors:

- Drew two separate nuclei without cell membranes. The nuclei do not represent two cells and therefore, candidates lost marks.
- Drew only one cell instead of two cells.
- Drew four cells instead of two.
- Drew incorrect chromosome combinations in terms of shape and size.
- Drew replicated chromosomes with centromeres.
- Labelled outer membrane as nuclear membrane and its content as cytoplasm. (lost marks for both labels)
- Used wrong labels such as chromatids, daughter chromosomes and centromere.

Candidates could not distinguish between chromatids, daughter chromosomes and chromosomes.

Chromatids – each half of the replicated chromosome is known as a chromatid.

Daughter chromosome – this term is used for the chromatids once they have separated during Anaphase **I** and **II**.

Chromosomes – these include both the replicated structures (as found in prophase) as well as the single structures found in the nuclei of daughter cells at the conclusion of meiosis.

2.2.1 Some candidates lost marks because they linked the hormone testosterone to female

secondary sexual characteristics.

Some answers were too vague such as "stimulates puberty"; while others were completely inaccurate e.g. "stimulates the development of secondary sexual characteristics in sperms"; "makes you stronger". etc.

2.3 The questions on scientific investigation were very poorly answered. The candidates were unable to identify that there were two independent variables, BMI and smoking.

2.3.1 Some learners scored no marks because they wrote that it is to determine the **effects** of Body Mass Index on sub-fertility (they wrote the aim of the investigation).

2.3.2 Some candidates were unable to do this basic arithmetic calculation.

2.3.3 The great majority of learners were unable to answer this question correctly. Some wrote 'how long the women have been pregnant' instead of writing 'how long it took them to fall pregnant'.

Some wrote why unplanned pregnancies were not included in the investigation instead of writing why only planned pregnancies were included in the investigation.

2.3.4 The majority of candidates could not identify the constant variables. This question was also poorly answered by many candidates.

2.3.5 The candidates were expected to mention **both variables**: BMI range and smoking, in order to score 2 marks (all or none principle applied to the allocation of marks since it is a higher order question).

2.3.6 Most learners included "increasing sample size" as part of their answer. This was not accepted as a correct response because no credible information was given in the question to suggest that the investigation conducted in the other country had used a higher sample size.

2.4

2.4.1 (a) Many candidates lost marks because they wrote "it transmits sound waves to The inner ear" instead of "middle ear".

(b) Some candidates lost marks because they wrote "equalises pressure on the either side of the ear" instead of ear drum/tympanic membrane.

2.4.3 Candidates failed to mention the part of the brain that interprets auditory information. They lost a mark for not mentioning the cerebrum.

2.4.4 Only a few candidates were able to explain how structures in the middle ear are structurally adapted to amplify sound vibrations. As a higher order question, learners were expected to analyse the diagram using acquired knowledge to synthesise a scientific conclusion.

2.4.5 Candidates wrote everything that they had learnt about balance and equilibrium. Most of them could not distinguish between receptors in the semi-circular canals and those in the utriculus and sacculus. They included the macula (receptor) and its functioning along with the functioning of the cristae. Most of them could not specify the part of the brain that controls and maintains balance.

(c)	Provide suggestions for improvement in relation to Teaching and Learning
	• Teacher competence will be improved by expanding their understanding through referring to more than only one text book. Teachers should strive to have a deeper understanding of the topics they are teaching than just what is expected by the guidelines. They should be encouraged to research topics in textbooks, on the internet and through other credible sources. • Diagrams should form the base of any explanations given. • All diagrams must have captions as well as labels. • Workshops on scientific method. • The relationship between structure and function as well as adaptations of structures for their function.

(d)	Describe any other specific observations relating to responses of learners and comments that are useful to teachers, subject advisors, teacher development etc.
	• Learners must not round off calculations to whole numbers unless instructed to do so. • Answers must be given correct to the two-decimal place.

(e)	Any other comments useful to teachers, subject advisors and teacher development.
	• Teach learners to **follow instructions**. • Teach all aspects of the process of a scientific investigation. • Use questions based on scientific investigations found in previous question papers to prepare learners. • Detailed descriptions of biological processes need to be given not only a summary contained in one sentence.

QUESTION 3

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

The following table represents the average percentage achieved on each sub-sections of the question using the scores from the Rasch analysis.

3.1	3.2	3.3	3.4
Auxins- Tropism	Nervous co- ordination reflex action	Homeostasis insulin	Homeostasis temperature control
29	36	26	38

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

3.1

3.1.1 IAA (Indole acetic acid) was not accepted as an answer since the question was asking for a **group** of hormones and not to identify a **specific** hormone.

3.1.2 Some candidates failed to identify the external stimulus. The arrows indicated in the diagram represents the stimulus.

3.1.3 Some candidates incorrectly wrote that the labelled plant part is growing upwards instead of bending towards light.

3.1.4 Some candidates lost marks because they explained the effect of **light** on auxin. They failed to see the inhibitory effect of a high concentration of auxin in the plant Root (response to **gravity**).

3.2

3.2.1 Most of the candidates successfully identified the pathway representing the reflex arc.

3.2.2 Most candidates failed to give a reason why they chose the option representing the reflex arc pathway. They failed to explain that the brain is not involved in a reflex action.

3.2.3 The majority of learners were able to answer this question fully or partially. A compulsory mark was introduced to emphasize the main purpose of a reflex action.

3.2.4 Most of the learners had difficulty identifying label 1 as the spinal cord. Instead they identified it as the myelin sheath. (The myelin sheath envelops only one and not both of the neurons shown in the diagram).

3.2.5 Many candidates lost marks because they wrote the consequence of myelin deterioration rather than mentioning the role of the myelin sheath in the transmission of impulses.

3.2.6 Most candidates were able to answer this question either partially or fully.

3.2.7 Two compulsory marks were introduced to distinguish and implement differential

treatment of correct (complete description of pathway **B**) and partially correct answers (description of reflex pathway **A**). This prevents candidates from scoring full marks for the partially correct answer. Mention of the brain and its role were imperative.

3.3

3.3.1 The majority of candidates were able to answer it correctly.

3.3.2 This question was designed to assess candidates' insight and ability to analyse the information. The candidates with good insight and knowledge base were able to analyse the information given in the graph and make a valid comparison. Unfortunately, the majority of our learners were not sufficiently equipped to analyse new information to make comparative conclusions. There are 5 possible comparisons between consuming few larger meals and many smaller meals:

1. Maximum insulin concentration
2. Minimum insulin concentration
3. Frequency of rise and fall in insulin concentration
4. Range of insulin concentration
5. Minimum insulin concentration in relation to minimum level of glucose

3.3.3 This question requires the candidates to explain why many small meals per day are better for a diabetic person than eating fewer large meals a day. Many learners could not answer this question satisfactorily. This question tests learners' ability to draw logical inferences from a graphical data. It was expected that learners mention the problem of diabetics with glucose control.

3.4

3.4.1 The majority of candidates answered this question correctly.

3.4.2 Most of the candidates were able to answer this question satisfactorily.

3.4.3 The majority of learners could not answer this question.

3.4.4 Most of the candidates explained why person **B** had a lower temperature. They lost marks because they failed to explain why person **A** had a higher body temperature.

(c) Provide suggestions for improvement in relation to Teaching and Learning

- Teaching using diagrams is important.
- Teachers should encourage critical thinking when analysing data. Learners should be given data and asked to draw conclusion in test and exams. This can be done by using previous question papers.
- Teachers should stress to learners that they should answer the question being asked. E.g. 3.4.4. Learners had to explain why the temperature of **A** was higher. Instead many explained why **B**'s temperature was lower. No marks were awarded for this response.

(d) Describe any other specific observations relating to responses of learners and comments

that are useful to teachers, subject advisors, teacher development etc.

- Learners do not have a full understanding on topics. Many just repeat what they have read but do not really have an understanding.

(e) Any other comments useful to teachers, subject advisors and teacher development.

- Workshops should give teachers a deeper understanding of topics taught. Qualified teachers and university lecturers could be asked to update teachers on new information and research. Teachers need continuous enrichment on a higher level.

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

QUESTION 4

According Rasch analysis, the average percentage (for 100 random scripts) is 38%. This means that most of the candidates were able to write the essay to a certain extent compared with previous years' learner performance.

The essay question was based on the role of humans in global warming and its impact on weather patterns and subsequent negative effects on food security.

The essay was marked under three sub-sections as follows:

(i) The human induced causes of global warming.

(ii) Impact of global warming on weather patterns

(iii) How changes in weather patterns affect food security

The following facts were accepted as answers:

(a) Main cause of global warming – the greenhouse gas emissions with examples such as CO_2, Methane, CFCs, Nitrous oxide etc.

(b) Sources of greenhouse gases:

- burning fossil fuels, use of vehicles, fires, industries. etc.
- Deforestation and its impact (Removing less CO_2 from the atmosphere) the global warming.
- Human induced decomposition of organic wastes: landfill sites, rice paddies release methane gas into the atmosphere.

(c) Greenhouse gases traps heat and cause **enhanced** greenhouse effect leading to global warming.

(ii) Impact of global warming on weather patterns

Higher temperatures, heat waves, more severe storms; change in the distribution of rainfall patterns, (some areas getting excessive rainfall and other areas getting decreased rainfall and drought)

(iii) How changes in weather patterns affects food security

Changes in rainfall patterns cause

- Desertification, increased flooding, wildfires, all of which increase soil erosion.
- Consequences of soil erosion.

Effects of higher temperatures

Impacts on food availability and food security.

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

- Learners confuse global warming with ozone depletion, pollution, fertilizers and eutrophication.
- Learners have the misconception that ozone depletion causes global warming.

(c) Provide suggestions for improvement in relation to Teaching and Learning

- learners should be trained to write a proper essay using topics covered in the previous papers.
- Teach learners to identify and underline key concepts in the given topic as part of planning process.
- Teach them the difference between global warming/greenhouse effect, ozone depletion, eutrophication, pollution and overuse of fertilizers.

(d) Describe any other specific observations relating to responses of learners and comments that are useful to teachers, subject advisors, teacher development etc.

- Learners lost a mark for logic if they wrote in bullet form. They should write in paragraphs.
- Memos often show bullet form for ease of marking but learners should be discouraged from this habit.
- Learners need to be taught to explain in a logical sequence.

(e) Any other comments useful to teachers, subject advisors and teacher development.

- Use past papers to practice long questions in **ALL** sections of work.