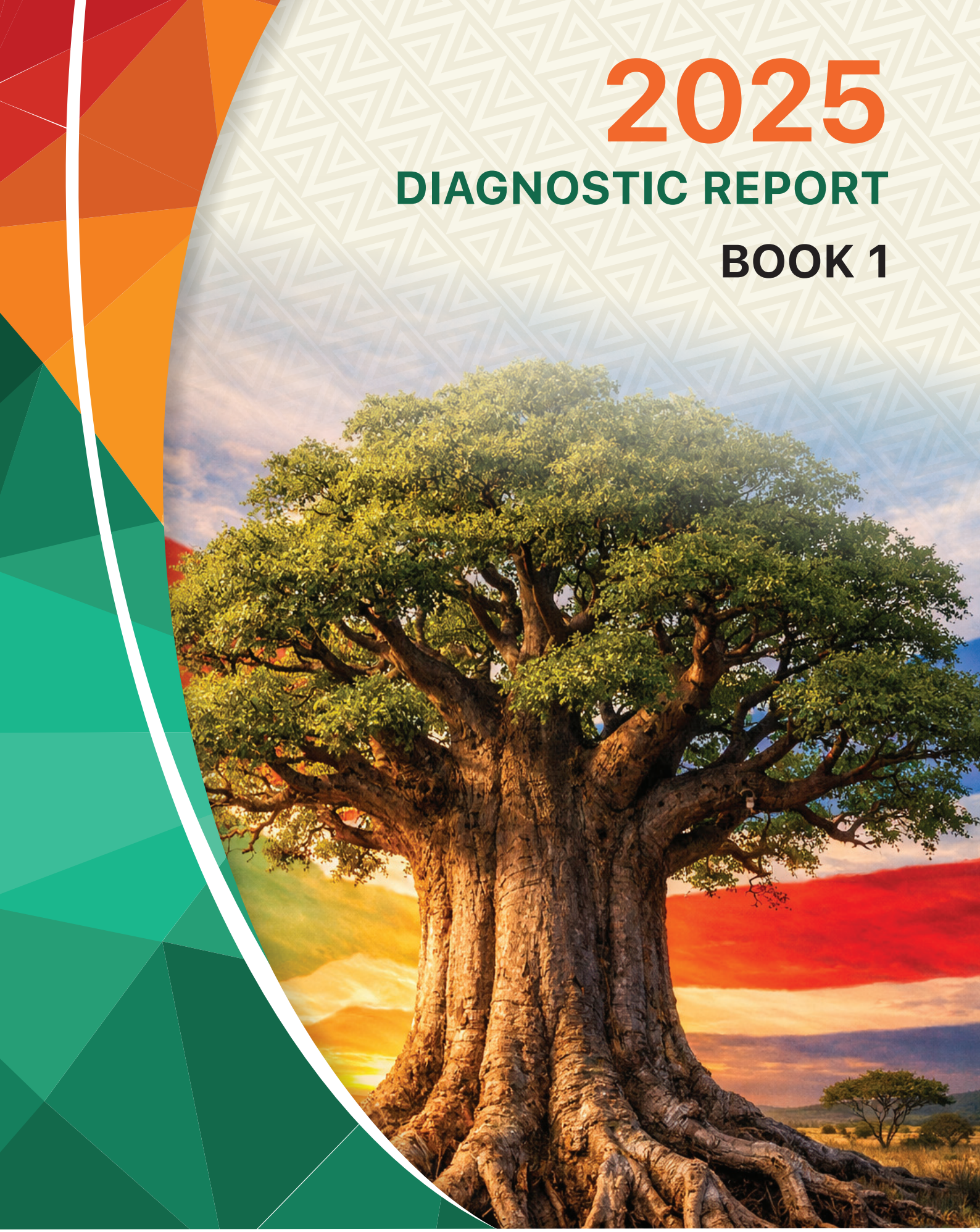
2025

DIAGNOSTIC REPORT

BOOK 1



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Read to Lead
A Reading Nation is a Leading Nation

2030 NDP

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CHAPTER 8

LIFE SCIENCES

The following report should be read in conjunction with the Life Sciences question papers of the November 2025 NSC examinations.

8.1 PERFORMANCE TRENDS (2021–2025)

The number of candidates who sat for the Life Sciences examination in 2025 increased by 7 657 compared to that of 2024.

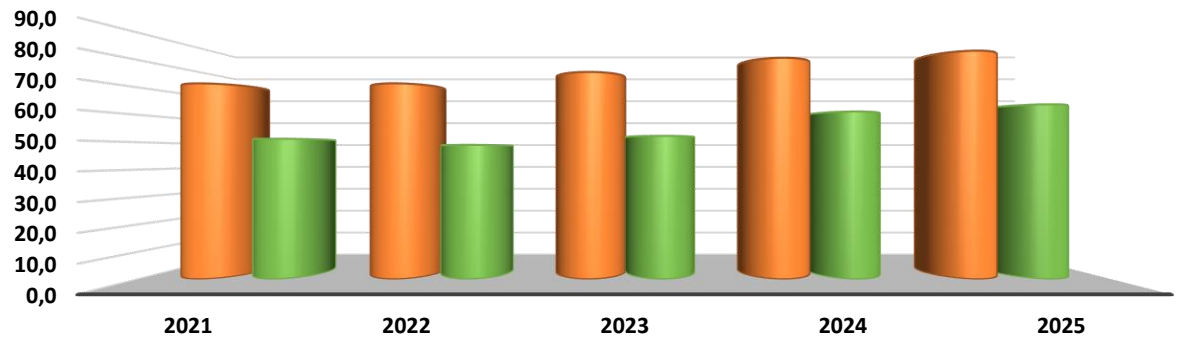
There is a definitive and sustained upward trajectory in the pass rate for Life Sciences from 2021 to 2025. Candidates who passed at the 30% level and above increased from 80,8 % in 2024 to 83,4% in 2025. There was a significant improvement in the pass rate at the 40% level and above over the past two years from 61,2% to 63,8%. There has been a small increase in the distinction rate from 4% in 2024 to 4,1% in 2025, which translates to 382 more candidates receiving distinctions (between 80% and 100%). A total of 15 677 candidates obtained distinctions in 2025 – the highest number achieved since 2021.

Life Sciences is a relatively high enrolment subject and a high pass rate in this subject only bodes well for an increase in the overall NSC pass rate. It is therefore a worthy strategy of provincial and district education departments to focus on interventions for increasing performance in Life Sciences. This appears to have been the case in 2025, since the statistics show that numbers for candidates achieving below 20% is significantly less.

Table 8.1.1 Overall achievement rates in Life Sciences

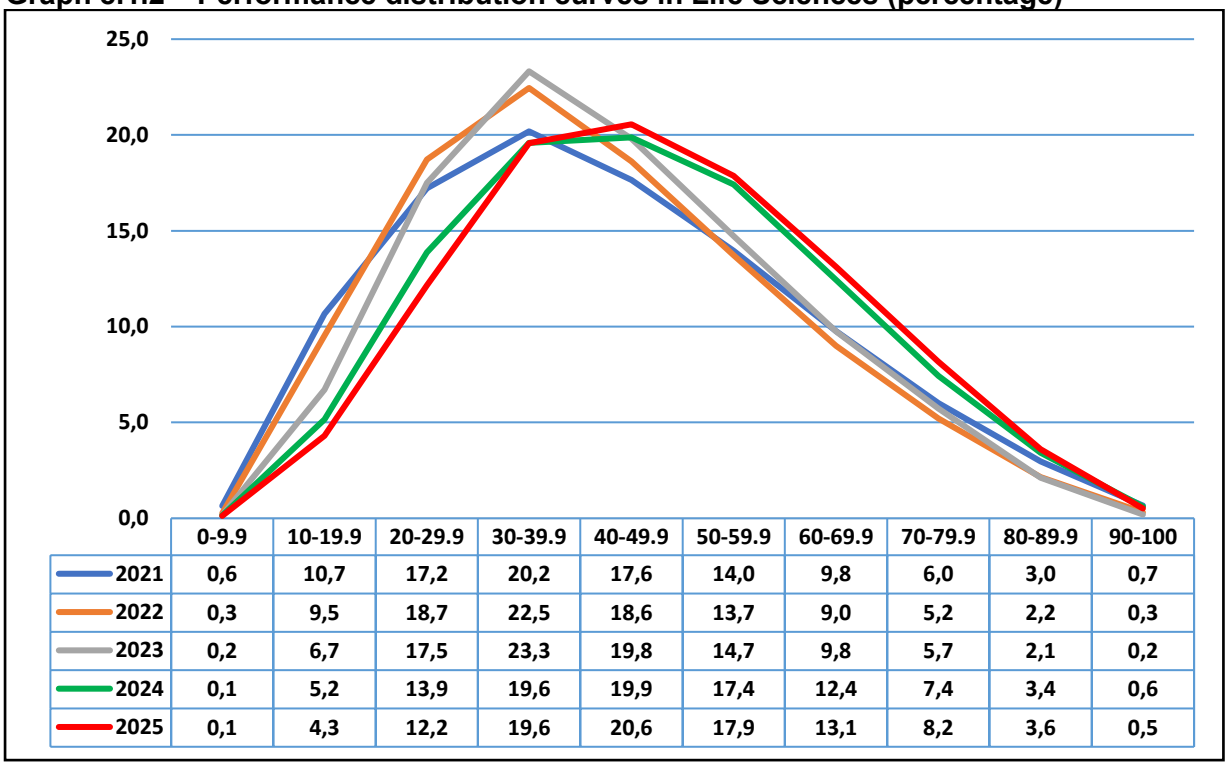
Year	No. wrote	No. achieved at 30% and above	% achieved at 30% and above	No. achieved at 40% and above	% achieved at 40% and above
2021	384 216	274 584	71,5	197 017	51,3
2022	399 007	285 217	71,5	195 620	49,0
2023	379 024	286 708	75,6	198 309	52,3
2024	374 722	302 793	80,8	229 361	61,2
2025	382 379	318 949	83,4	244 105	63,8

Graph 8.1.1 Overall achievement rates in Life Sciences (percentage)



	2021	2022	2023	2024	2025
% achieved at 30% and above	71,5	71,5	75,6	80,8	83,4
% achieved at 40% and above	51,3	49,0	52,3	61,2	63,8

Graph 8.1.2 Performance distribution curves in Life Sciences (percentage)



	0-9.9	10-19.9	20-29.9	30-39.9	40-49.9	50-59.9	60-69.9	70-79.9	80-89.9	90-100
2021	0,6	10,7	17,2	20,2	17,6	14,0	9,8	6,0	3,0	0,7
2022	0,3	9,5	18,7	22,5	18,6	13,7	9,0	5,2	2,2	0,3
2023	0,2	6,7	17,5	23,3	19,8	14,7	9,8	5,7	2,1	0,2
2024	0,1	5,2	13,9	19,6	19,9	17,4	12,4	7,4	3,4	0,6
2025	0,1	4,3	12,2	19,6	20,6	17,9	13,1	8,2	3,6	0,5

General comments on Paper 1 and Paper 2

It was encouraging to note that more candidates could relate to the scientific nature of the subject. Even English Second Language candidates could formulate their responses quite close to the expected standard. This upward trend in the quality of responses may be due to improved curriculum delivery, intervention plans by the various provincial education departments and the mediation of previous diagnostic reports by subject specialists. Although most of the candidates were better able to engage with texts, diagrams and data presented in different formats, many fell short of scoring marks in higher-order questions. When there was scaffolding within a question based on source material, candidates scored well in the lower-order questions. This meant that they understood the source material and had the necessary background knowledge, but were unable to apply their knowledge to the new scenario presented. This was especially evident in the questions based on scientific investigations, where candidates were able to extract data directly from the resource, but lacked the necessary skills to analyse, evaluate, apply and synthesise the data. These skills have a higher cognitive demand and may only be acquired through regular practice of higher-order questions. It is imperative that school-based assessments adhere to the *CAPS* requirement for setting questions across all cognitive and difficulty levels, from Grade 10 onwards.

There was generally a better performance in Section A, since many of the questions were of a lower order. This meant that the candidates have been well taught and were able to understand the work, but appeared to be intimidated by the higher-order questions. Candidates, for example, knew that a grey coloured mouse offspring produced by crossing a black coloured mouse with a white coloured mouse is an example of incomplete dominance, but they could not extend this knowledge when a similar scenario of horses was presented. Candidates knew the function of a particular structure, but were unable to extrapolate the impact of its absence in a physiological disorder.

8.2 OVERVIEW OF CANDIDATES' PERFORMANCE IN PAPER 1

General comments

(a) It is a positive development that most candidates attempted all the questions in the paper.

(b) Candidates scored well in Section A, where one-word or single letter responses were required. It was evident from Section B (Q2 and Q3), that candidates knew the content, but had difficulty using the correct scientific terms, explaining ideas in a logical order, and writing clearly. This showed a need for more practice in scientific writing, especially for questions that required explanations, descriptions or the application of knowledge to new situations.

(c) Candidates also lost credit in some questions because they did not understand the question fully or did not read carefully. This highlights the need to focus on reading and comprehension skills.

(d) The questions that required the interpretation of data from scientific investigations presented the greatest challenge. Scientific investigations (Q2.5 and Q3.5) were particularly poorly answered, reflecting a void in candidates' understanding of the scientific process. It was apparent that candidates were taught to provide standard responses without looking at the specifics of the particular investigation presented. Candidates also quoted entire phrases directly from the investigation description without extracting only the relevant variables.

(e) Some candidates lost marks due to incorrect spelling, for example:
- *Evolution* instead of *ovulation* in Q1.2.3
- *Choroid* instead of *chorion* in Q1.2.6
- *Auxin* instead of *axon* in Q1.5.2(a)
- *Multiply sclerosis* instead of *Multiple Sclerosis* in Q1.5.4
- *Testone* instead of *testosterone* in Q2.2.3
- *Circular* instead of *ciliary muscles* in Q3.3

(f) The identification of certain disorders was a challenge for many candidates. The following disorders were tested in this question paper:
- Cataracts
- Multiple sclerosis
- Growth hormone deficiency
- Astigmatism
- Hearing loss (as an application of hearing)
- Diabetes mellitus

(g) Some candidates neglected to bring calculators. This was evident where they managed the steps of the calculation but failed to complete the computation and provide the correct final answer. Some candidates did not have rulers and drew the bar graph freehand, thereby losing credit for 'the equal space and width of bars'. The calculation question requested that candidates include the unit. Many candidates only included the unit in the final answer and not in the preceding steps.

(h) As indicated in previous reports, the sections on *reproductive strategies* and *plant responses to the environment* were poorly answered. These are relatively short topics, and it appeared as if some teachers merely glossed over them. It is important to

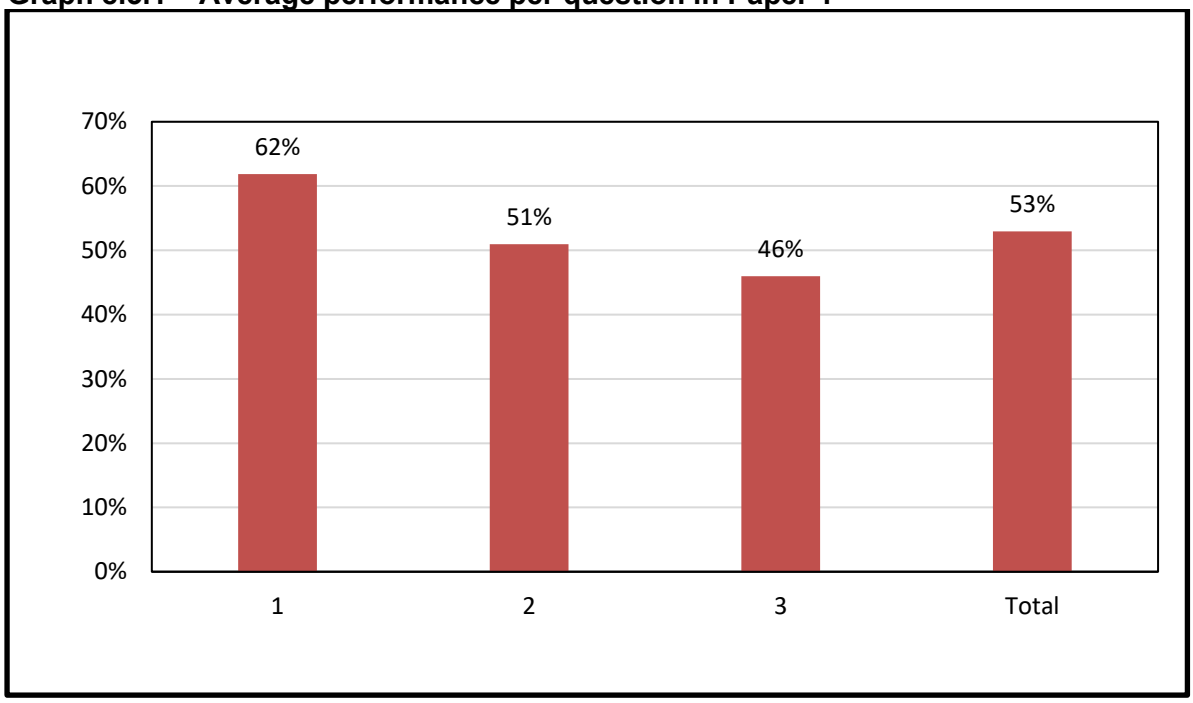
concentrate on these two topics, as they are a compulsory inclusion in the paper for 8 and 13 marks respectively.

8.3 DIAGNOSTIC QUESTION ANALYSIS FOR PAPER 1

Based on the item analysis, the weakest performance by candidates was recorded in the subquestions on *thermoregulation,* the *scientific investigations* (*endocrine system* and *glucose homeostasis*) and the human ear (*balance* and *hearing*). The question on *neurons* recorded the best performance across all provinces. It appeared that it was not really the content that posed the greatest difficulty, but rather the cognitive demand. The top performing questions were all lower order and those that candidates found challenging were all higher order.

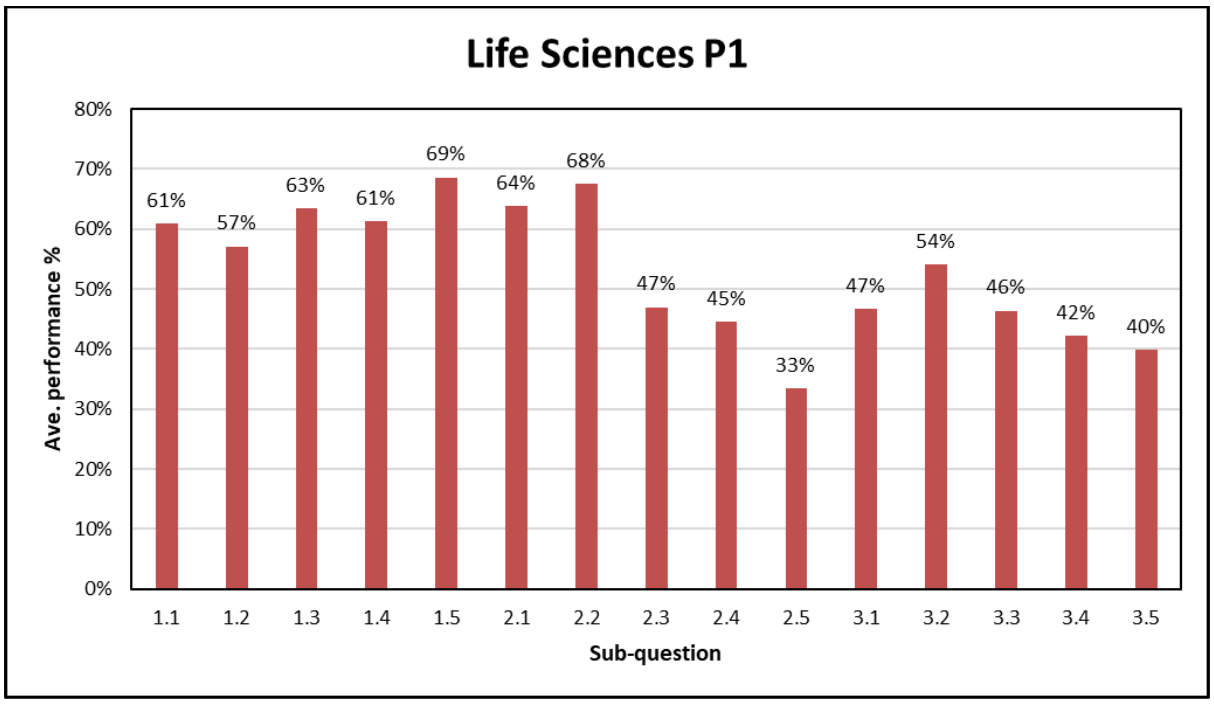
The following graph shows the average candidate performance obtained from the Rasch analysis data across all the provinces. While this graph might not accurately reflect national averages, it is useful in assessing the relative degrees of challenge of each question as experienced by candidates.

Graph 8.3.1 Average performance per question in Paper 1



Question	Topic	Ave. performance %
1	Multiple choice, Terminology, Matching items, Responding to the environment (Plants) Responding to the environment (humans)	62%
2	Reproductive strategies, Male reproductive system, Female reproductive system (menstrual cycle), Homeostasis (thermoregulation), Endocrine system (scientific investigation)	51%
3	Human eye (disorder), Human nervous system (brain and reflex arc), Human eye (accommodation) Human ear (Balance and hearing), Homeostatic control of blood glucose levels (scientific investigation)	46%
Total		**53%**

Graph 8.3.2 Average performance per subquestion in Paper 1



Subquestion	Topic	Ave. performance %
1.1	MCQ	61%
1.2	Terminology	57%
1.3	Matching items	63%
1.4	Plant Growth Responses	61%
1.5	Human Responses (Neurons)	69%
2.1	Reproductive Strategies	64%
2.2	Male Reproduction	68%
2.3	Menstruation	47%
2.4	Homeostasis – Thermoregulation	45%
2.5	Investigation on Growth Hormone	33%
3.1	Eye Defect (Astigmatism)	47%
3.2	Brain and Spinal Cord	54%
3.3	Accommodation (Distant Vision)	46%
3.4	Hearing and Balance	42%
3.5	Scientific Investigation on Insulin Treatment	40%

8.4 ANALYSIS OF CANDIDATES' PERFORMANCE IN EACH QUESTION IN PAPER 1

QUESTION 1: MULTIPLE CHOICE, TERMINOLOGY, MATCHING ITEMS, PLANT GROWTH RESPONSES, NERVOUS SYSTEM (NEURON STRUCTURE)

Common errors and misconceptions

(a) In multiple-choice questions in Life Sciences, there is only one correct answer. Candidates who gave multiple responses were *not* credited, even if the correct response appeared in their selection.

In Q1.1 candidates performed well except for Q1.1.8, which was a higher-order question which necessitated the analysis of a drawing of an abnormal *sperm*. As always, candidates struggled when they were presented with a new scenario and they had to compare it to something with which they were familiar. Also, the options had two parts, the structure and its function. There were two options that had the correct structure, but only one with the correct associated function. Candidates did not read through the entire phrase and only based their response on the first part, thereby incorrectly choosing option 'B'.

(b) There has been a noticeable improvement in the section on biological terminology. Spelling in this section was also generally better.

(c) The following errors are still being encountered in this section where candidates write:
- Q1.2.2 *Astigmatism* instead of *cataracts*
- Q1.2.3 *Ovulation* or *ovarian cycle* instead of *oogenesis*
- Q1.2.4 *Yellow spot* instead of *blind spot*
- Q1.2.5 *Menstrual/Ovarian cycle* instead of *ovulation*
- Q1.2.6: *Chorionic villi/Amnion/choroid* instead of *chorion*
- Q1.2.7: *Gibberellins/Auxins* instead of *abscisic acid*
- Q1.2.8: *Negative feedback* instead of *homeostasis*

(d) In Q1.3 the description in Column I is stated in the singular but can apply to both items in Column II. Some candidates did not understand this concept. Furthermore, candidates had to use the options provided exactly as they were in the instructions, namely 'A only'; 'B only'; 'both A and B' or 'none'. Candidates who changed the format/wording lost marks.

(e) The topic in Q1.4 on *plant growth responses* should have been better answered. It is a small section and constituted 13 marks in the question paper. This is almost a guarantee that it will feature in every examination, yet it is overlooked by teachers.

(f) In Q1.4.1(b), most candidates received only 1 mark; they ignored the mark allocation, thus failing to realise that two responses were required.

(g) Q1.5 was one of the best answered questions in the paper. Most candidates only lost one mark for using the terms *unipolar, multipolar* or *efferent neuron* instead of *sensory neuron* and for not noting the direction of the impulse indicated in the diagram. A number of candidates were not *au fait* with the disorders, and many of them wrote *Alzheimer's disease* instead of *multiple sclerosis*

QUESTION 2: REPRODUCTIVE STRATEGIES, MALE REPRODUCTIVE SYSTEM, THE MENSTRUAL CYCLE, HOMEOSTASIS – THERMOREGULATION, ENDOCRINE SYSTEM – SCIENTIFIC INVESTIGATION

Common errors and misconceptions

(a) Q2.1 was based on the relationship between *yolk size*, *precocial* and *altricial development* and the *need for parental care*. The opening sentence in the stem, 'the yolk is the main source of energy for the developing embryo' was crucial in understanding the link between yolk size and the type of *embryo* development. Many candidates did not read the stem and went directly to the data in the table and the questions that followed. This resulted in their being unable to respond correctly. In questions based on data, it was not sufficient that candidates merely provided the

values given, they needed to expand that these were a higher or lower value and they had to state the significance thereof. Some candidates merely said that the value for ducks was 35,4% and did not expand on its significance.

(b) Q2.2 clearly highlighted the importance of the instruction(s) within questions. In Q2.2.1, candidates were required to *give the letter* AND *the name of structures*. Many candidates lost marks for only giving either the one or the other and not both.

(c) Q2.2.2 asked candidates to 'Explain' the role of the *scrotum* in *sperm* production. Too many candidates lost marks for only providing a description and not an explanation.

(d) Q2.2.3 required candidates to 'name AND describe' the process of *sperm* production. Some candidates looked at the mark allocation and correctly deduced that they had to describe *spermatogenesis*, but they failed to name the process.

(e) In Q2.2.3 many candidates used the terms *spermatogonia, spermatocyte, spermatid* and *spermatozoa* when describing *spermatogenesis.* This content was included in the previous curriculum but is no longer required. Educators who are still teaching it are confusing learners who are presenting these terms in an incorrect context. The role of *meiosis* in the processes of *oogenesis* and *spermatogenesis* is crucial. It must, therefore, be emphasised that candidates who did not mention the *diploid* and *haploid* cells were not credited.

(f) In Q2.3 candidates were once again, presented with a data table from which they had to make inferences. They were asked to EXPLAIN the changes in *endometrial thickness.* Most candidates lost marks because they:

- Only described the change that was represented by the data, without giving reasons for the change;
- Referred to *gonadotropic hormones*, when the question asked for *ovarian hormones*;
- Only referred to the role of one of the *ovarian hormones*, instead of both;
- Wrote 'maintains pregnancy' as a role of the *endometrium*. This is too vague and the specifics must be provided, viz. allowing for implantation of the embryo/development of the placenta/increased blood supply for nutrition of the foetus, etc.; and
- Were unable to quantify the changes that occurred in the *endometrium*. Candidates had to specify that the *endometrium* became **MORE *vascular* and MORE *glandular*.**

(g) Q2.3.4 required candidates to draw a bar graph. Although there is a definite improvement in candidates' graphing skills, many lost marks by providing an incorrect caption. The data provided was *discontinuous* and *endometrium* thickness was given for specific days only. Many candidates erroneously wrote that the data was over the 28-day cycle. Some candidates also lost marks for:

- Not labelling day 0 on the X axis;
- Using a range on the X-axis instead of specific values;
- Not using a ruler and therefore drawing irregular width bars and spaces.
- Transposing of the axes; and
- Not indicating units on the label of the Y-axis.

(h) Some candidates confused the question with the *pupillary mechanism* of the *iris* in Q2.4. This points to the issue of candidates not reading the stem of the question which clearly stated that the diagrams represented *arterioles* in the skin during

thermoregulation. Candidates who lost marks in Q2.4.3 included the description of the *sweat gland* as well, which was irrelevant in this context.

(i) Candidates lost marks in Q2.4.3 when they failed to include the essential word 'more' in their description of blood flow to the skin and heat lost. Blood normally does flow to the skin, but on a hot day*, more* blood flows to the skin. This is a crucial concept that is often overlooked.

(j) Questions based on scientific investigations are generally pitched at cognitive levels C and D. Candidates lost marks in Q2.5 because they lacked the skills of *application*, *analysis*, *evaluation* and *synthesis*. Candidates lost marks in:

- Q2.5.1 and Q2.5.2 when they could not correctly identify a variable. They wrote 'average height', instead of 'height'; '2 years old' instead of 'age';
- Q 2.5.3 where they gave generic explanations, rather than using the specific data for this investigation;
- Q2.5.4 for not including the unit of measurement, or including an incorrect unit, even though it was requested in the question. Also, some candidates expected the answer to be a percentage, as it had been in previous years, therefore, they included 'x100' in their calculations.
- Q2.5.5 they were unable to correctly write a conclusion that included both variables and that was based on the results of the investigation. They also incorrectly stated 'growth hormone' instead of 'added growth hormone'.

QUESTION 3: EYE DISORDER (ASTIGMATISM), BRAIN AND REFLEX ARC, HUMAN EYE (ACCOMMODATION), HUMAN EAR (BALANCE AND HEARING), SCIENTIFIC INVESTIGATION ON INSULIN AND BLOOD GLUCOSE LEVELS

Common errors and misconceptions

(a) Some candidates lost marks in Q3.1.1 (a) for:

- The incorrect spelling of *aqueous*, even though the phonetically correct spelling was credited;
- Writing *vitreous* instead of *aqueous*, and
- Responding with *aqueous fluid* instead of *aqueous humour*.

(b) In Q3.1.2 candidates lost marks for being unable to provide an adequate description of the appearance of the *astigmatic cornea*. Description is an important scientific skill, and candidates were meant to link their understanding of *astigmatism* to the diagram shown.

(c) Candidates lost marks in Q3.1.3 because they:

- Confused *refraction* and *reflection*;
- Confused *astigmatism* with *cataracts*; and
- Were unable to make the link between an unevenly shaped *cornea* and the effect on vision. This question was inadvertently asking the function of the *cornea* by asking what happened when it had an abnormal shape.

(d) In Q3.1.4 many candidates lost marks for indicating the treatments for *short-sightedness, long-sightedness* or *cataracts*. This reinforced the observation that sections on disorders, their causes and effects were not properly understood.

(e) Candidates who lost marks in Q3.2.1, did not write the full name of the *nervous system*, i.e*. central nervous system*. They only wrote the word 'central'.

(f) Q3.2.2 was a lower-order question based on the *reflex arc* and taken directly from the *Examination Guidelines*. Despite this, many candidates lost marks because they:
- Referred to the *dorsal* and *ventral roots* as being part of the *spinal cord* instead of the *spinal nerve*;
- Did not refer to the transmission of an *impulse* but rather mentioned that the *stimulus* was transmitted; and
- Failed to refer to the *synapses* and *effector.*

(g) Q3.3 was also pitched at a lower-order cognitive level. Candidates lost marks for this question when they:
- Confused *accommodation* with the *pupillary mechanism*;
- Stated that the suspensory ligaments *contract* instead of 'become taut' – ligaments cannot *contract*, only muscles can;
- Confused *ciliary* and *circular* muscles;
- Wrote accounts for both near and distant vision since only the first one was marked; and
- Referred to 'less light being *refracted*' (amount of light) instead of 'light is *refracted* less' (degree of refraction).

(h) Many candidates lost marks in Q3.4.2 for referring to both the *cristae* and the *maculae* as being stimulated by a change in speed and direction of head movement. Candidates also lost marks for:
- Not indicating that the *cerebellum* sends an impulse to the *skeletal muscles* to restore balance; and
- Referring to the *auditory canal* instead of the *auditory nerve.*

(i) Q3.4.4 was poorly answered by many candidates. This question had a higher cognitive demand, and candidates could not apply their knowledge of the hearing process to a new scenario where there is hearing loss. Candidates used colloquial language instead of scientific language. They mentioned the noise or sound entering the ear, but did not show an understanding of how sound waves entered the *auditory canal* and were converted into *vibrations* as they moved through the middle ear and *pressure waves* as they moved through the inner ear.

(j) In Q3.5.1 some candidates identified cells (*Islets of Langerhans*) instead of the organ (*pancreas*) that secretes insulin.

(k) Q3.5.3 was one of the worst answered questions in the paper. This question required candidates to derive two conclusions from a graph and then tabulate the differences between the two conclusions. This question was pitched at a higher cognitive level, with a high degree of difficulty. The differences or comparisons that were given, did not always correlate correctly. Furthermore, candidates lost marks because they:
- Referred to *glucose* levels rather than *insulin* levels;
- Described *insulin* levels at specific times rather than the overall effect of the treatment;
- Described that the *insulin* lasted a long time for long-acting and acted quickly for rapid-acting *insulin* – this was a description of the type of *insulin*, not differences in the effect of the treatment; and
- Did not understand the investigation and its results.

(l) In Q3.5.5 candidates failed to predict the effect of *insulin* on already low blood *glucose* levels. They wrote that *glycogen* is converted to *glucose* instead of *glucose* being converted to *glycogen*. Candidates also incorrectly wrote *glucagon* instead of *glycogen.* Candidates could not make the link between low *glucose* levels and *cellular*

respiration, which showed a poor understanding of the homeostasis of blood glucose levels.

Suggestions for improvement on teaching content and concepts for P1

(a) A basic premise in Life Sciences is the relationship between structure and function. Reference is made to *structural suitability*. Educators must emphasise the importance of structures for their functions. Every Life Sciences assessment must have at least one question based on structural suitability. These are best taught using annotated diagrams where each labelled structure has its associated function indicated. Furthermore, learners must also develop the skill of predicting the outcome if the structure is dysfunctional or absent.

(b) To improve performance in the topic on plant growth substances, teachers must understand the mechanics of the various plant 'hormones' and their effects. There are only three hormones to be covered and three growth responses. This topic also lends itself well to practical activities and relatable scientific investigations and teachers must mediate these with learners

(c) Learners must be made aware that diagrams may not always appear as they are in their textbooks. A case in point is Q1.4 where the direction of the *impulse* is shown as right to left, whereas some textbooks show it as left to right. Learners need to acquire the skill of analysing the entire source material for relevant details. Important information is also given in the stem of the question, which candidates often overlook.

(d) The Life Sciences curriculum requires that learners know some of the disorders that can occur when studying the relevant topics. This examination required learners to know the cause and/or effect of at least at least four disorders. The subtopic of disorders usually comes at the end of a topic, and educators only mention them, without going into the details of their mechanics. Examiners often use a disorder to test the candidates' understanding of how a system *normally* works, e.g. the role of the *cornea* becomes more evident when there is a disorder of the *cornea*. Teachers should apply the following format:
   (i) Identify the structure;
   (ii) Identify its function;
   (iii) How is the function affected when the structure is damaged? and
   (iv) How may the disorder be treated/corrected?

(e) Learners must be made aware that when tackling data-response questions, merely extracting data from the text may not always be sufficient. Further elaboration and explanation must be given.

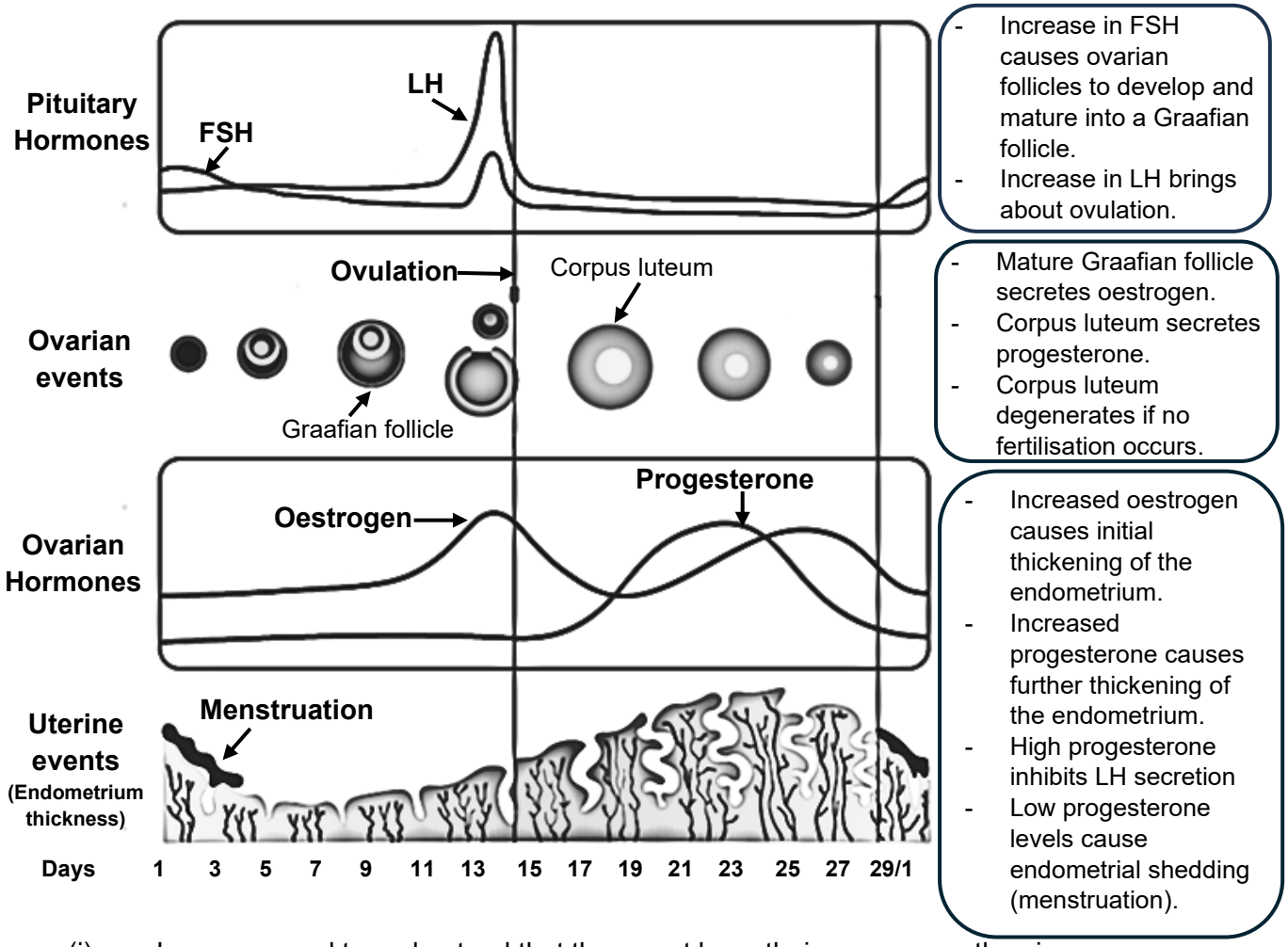
(f) When setting school-based assessments, teachers and subject specialists must include questions that:
   - Have two requirements in the response, viz. the letter and the name OR the name and the description; and
   - Require explanations rather than straightforward descriptions.

(g) Learners must be made to understand the difference in the various instructional verbs. One of the greatest challenges in Life Sciences are questions that require an explanation. Learners must be informed that *Describe* means 'how something happens' whereas *Explain* means 'how something happens AND why it happens' Learners must develop the habit of underlining the instructional verb as they read a question.

(h) Many processes are described in the *Examination Guidelines*. Learners would be less confused if these descriptions are taught, rather than the ones in some textbooks that

give too much detail. The *Examination Guidelines* and *CAPS* documents serve to elaborate on the scope of the Grade 12 Life Sciences curriculum. Going beyond its prescripts may sometimes confuse learners.

(i) When teaching the *menstrual cycle*, teachers must show that it comprises the *ovarian cycle* and the *uterine cycle* and the roles of the various hormones on both. This section cannot be taught without showing graphs of the different hormone levels, their relationship with the *ovaries*, their origin and their effect on the *endometrium.* Teachers must use these graphs to explain the changes that occur throughout a 28-day *menstrual cycle*.
The following depiction may assist with teaching this section.
NOTE: This is only a summary, and not all events of the menstrual cycle have been included.



(j) Learners need to understand that they must base their answers on the given resource as it may be based on a new scenario, e.g. *ovulation* generally occurs around day 14 of the female *menstrual* cycle, but the data provided may suggest a different day for *ovulation*.

(k) In physiological processes, it is crucial that candidates quantify a process, e.g. MORE blood flows, LESS water is excreted, HIGHER progesterone levels, etc. Teachers need to explain to learners, for example, that under normal conditions there is blood flow, but when environmental temperatures increase then there is MORE blood flow to the skin. This cannot be overlooked during marking, as it is a clear representation of the candidate's understanding.

(m) Teachers should strengthen graph-drawing skills in Grades 10 and 11 by exposing learners to all the graph types in both formal and informal assessments. Providing a caption for the data shown is categorised as a cognitive level C skill and it is understandable why many learners do not score this mark. Learners must be trained that the caption should:

- Include both variables;
- Speak directly to the data presented; and
- Identify for which country, year, etc. the data is representative.

(l) Working through past papers is a good examination preparation technique. This, however, does have its downside when candidates predict or pre-empt what they think the question is asking. As soon as candidates see the word *thermoregulation* they launch into a marking guideline answer of a previous question paper. Learners must be trained to always check the context and resource provided for the question.

(m) Learners need to practise questions based on scientific investigations, but most importantly must understand the investigation design of each new investigation that they encounter. They must understand *why* each step is carried out and *why* specific measurements are taken. They must also know that simply rewriting the steps of the procedure may not necessarily answer the question.

(n) Learners must be shown that the format for listing a variable is to identify what is being measured or enumerated. In Q2.5.1 it is the *height* that is measured and NOT the *average height*. In of Q2.5.2 the *age* is the variable and NOT *two-year-old boys*. Although concessions were made in the past, the way forward is for the candidate to identify the variable and not describe a step in the procedure.

(o) When doing calculations, learners must be cautioned to always include all the steps necessary and to include the relevant units in each step as well as in the final answer.

(p) Teachers must show candidates, using everyday examples, that the conclusion must link to the aim of the investigation and be deduced from the results provided. The very same variables that are stated in the aim, must appear in the conclusion.

(q) Learners must be trained to provide full names when asked, e.g. if the question asked for the name of a branch of the nervous system, candidates cannot merely respond with the word *central* and expect to be credited. Even though 'nervous system' is included in the question, the complete name must be given, i.e. *central nervous system*.

(r) Questions that require descriptions, e.g. *the reflex arc* and *accommodation*, may appear simplistic. Learner performance, however, is not as expected because there is not enough attention being paid to the specifics of the subject. The following concepts must be reinforced:

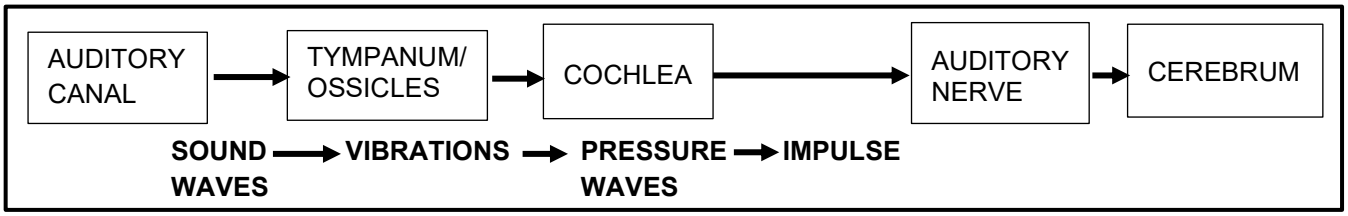
- The *dorsal* and *ventral roots* are branches of the *spinal nerve*;
- An *impulse* is transmitted along the structures of the *reflex arc*;
- A clear image is formed when light is *focused* on the *retina* and not when light *falls* on the retina;
- The difference between a *ciliary body* and a *ciliary muscle*;
- The difference between a *ciliary muscle* and a *circular muscle*; and
- The differences between *accommodation* and the *pupillary mechanism.* This may be done using a table of comparison like the one below:

	ACCOMMODATION	PUPILLARY MECHANISM
RESPONSE TO:	Distance of object	Light intensity
RESPONSE BY:	Ciliary muscles	Circular and radial muscles
CAUSES:	Lens shape to change	Pupil diameter to change
AFFECTS:	Light refraction	Amount of light entering the eye
RESULTS IN:	Clear image on the retina	Prevention of damage to retina/ clear vision in the dark

(s) The section on the role of the ear in balance is not well understood by some teachers and many learners. This content must be clarified during teacher development and resource sharing. Once again, separating the different mechanisms in a tabular form helps with consolidation. The following table may be used:

STIMULUS	RECEPTOR	TRANSMITS IMPULSE	PART OF THE BRAIN	EFFECTOR
Change in Head Position	Maculae	Auditory nerve	Cerebellum	Skeletal muscles
Movement (change in speed & direction)	Cristae			

(t) Teachers need to clarify the different forms of sound transmission in the ear. The following flow diagram shows the mode of transmission across some of the structures involved in hearing:



(u) Learners should be reminded to refer to the *cochlea* when describing the hearing process and not the *inner ear* as not all parts of the inner ear are involved in hearing.

(v) Teachers must provide learners with opportunities to tabulate differences and reiterate that the items in each row must correspond. If a feature is mentioned in the first column, there must be a corresponding corollary in the same row of the second column.

(w) Learners must be exposed to sufficient activities that require *analysis*, *interpretation* and *evaluation* of *complex* graphs. Graphs are usually a visual presentation of investigation results, and it is imperative that learners can make deductions and draw conclusions from them.

(x) Topics like the *homeostasis* of blood glucose levels that are taught in Grade 11 must be revised and reinforced in Grade 12. The relationship between *glucose* and *glycogen* and the role of the two hormones *insulin* and *glucagon* must be explained. Application-type questions on the aforementioned relationship should be included in activities.

(y) Ensure conceptual understanding of the scientific process. Learners can only master the answering of questions based on scientific investigations by understanding the scientific process and not through the memorisation of so-called shortcuts. Learners must know that each investigation design is unique. They must be able to inter alia:

- Identify *planning* steps;
- Identify *independent, dependent* and *controlled variables*;

- Provide reasons for *investigative design methodology*;
- Understand *the role and design of the control*;
- Draw *conclusions* from results; and
- Understand the differences between *reliability* and *validity* and their related improvement strategies.

8.5 OVERVIEW OF CANDIDATES' PERFORMANCE IN PAPER 2

General comments

(a) Many of the errors and misconceptions that presented themselves in candidates' responses in the November 2025 examinations have been highlighted in previous diagnostic reports. This indicates that this document is not being used as a remedial tool.

(b) Precision (accurate) teaching is essential in Life Sciences especially when terminology, processes and scientific investigations are involved.

(c) Candidates must be taught to give full answers when terminology requires them to do so, e.g. they only write *stem* for *stem cells*; *variation* for *genetic/continuous variation*, etc. No marks are allocated for incomplete answers.

(d) In many cases, teaching in Grade 12 only focuses on *meiosis I* and *meiosis II*, which results in gaps in learners' understanding of *mitosis*. Teachers should follow the *Examination Guidelines* and attend to topics highlighted for revision from previous grades such as *mitosis* in Grade 10. Proper revision of the *phases of mitosis* is essential and clear differentiation between *meiosis II* and *mitosis* must be emphasised.

(e) Learners need to be informed not to use the terms *homozygous* and *heterozygous* when describing the phenotypes in a genetic cross. Also, that only the smallest ratio will be marked correctly, if requested in the question.

(f) Poor performance is still evident in questions based on scientific investigations despite the support provided in the diagnostic reports of previous years. Scientific method practice should be embedded throughout the curriculum in Grades 10 to 12.

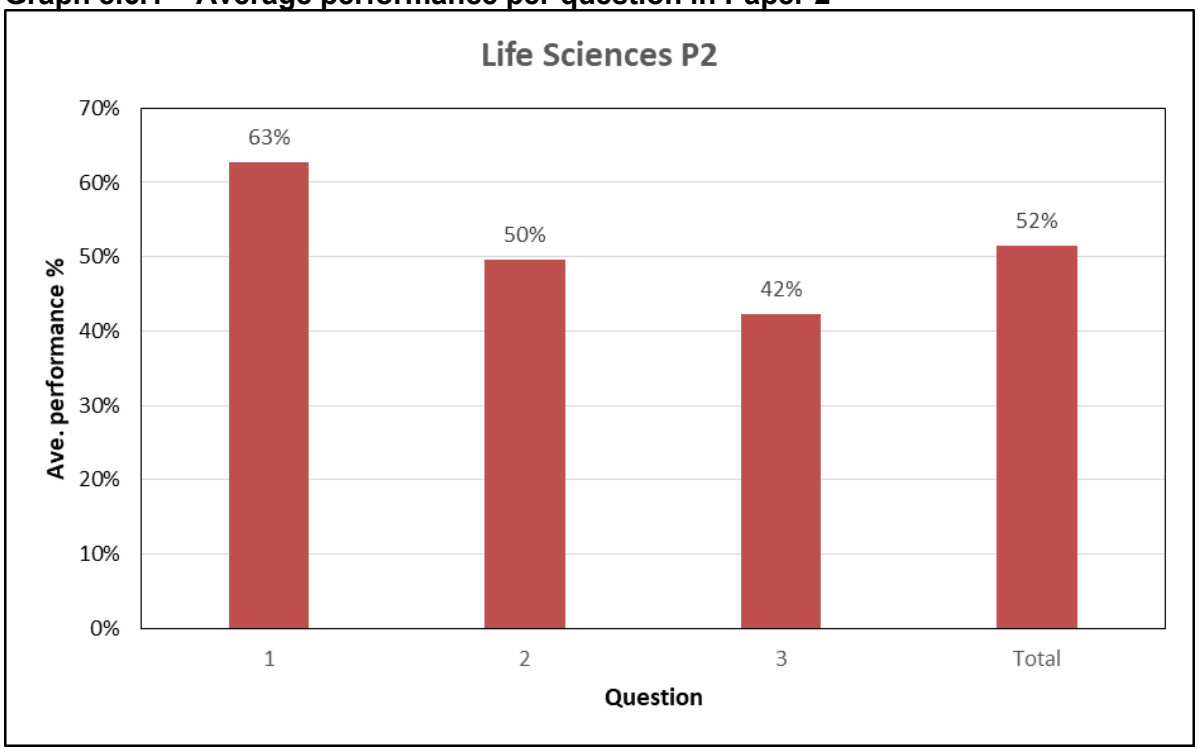
(g) The following topics in Paper 2 also appeared not to have been taught well, either due to lack of teacher development or due to infrequency of testing in previous examinations:

i. Meiosis;
ii. DNA Profiling;
iii. Human Evolution;
iv. Speciation and Biogeography; and
v. Scientific investigations.

8.6 DIAGNOSTIC QUESTION ANALYSIS FOR PAPER 2

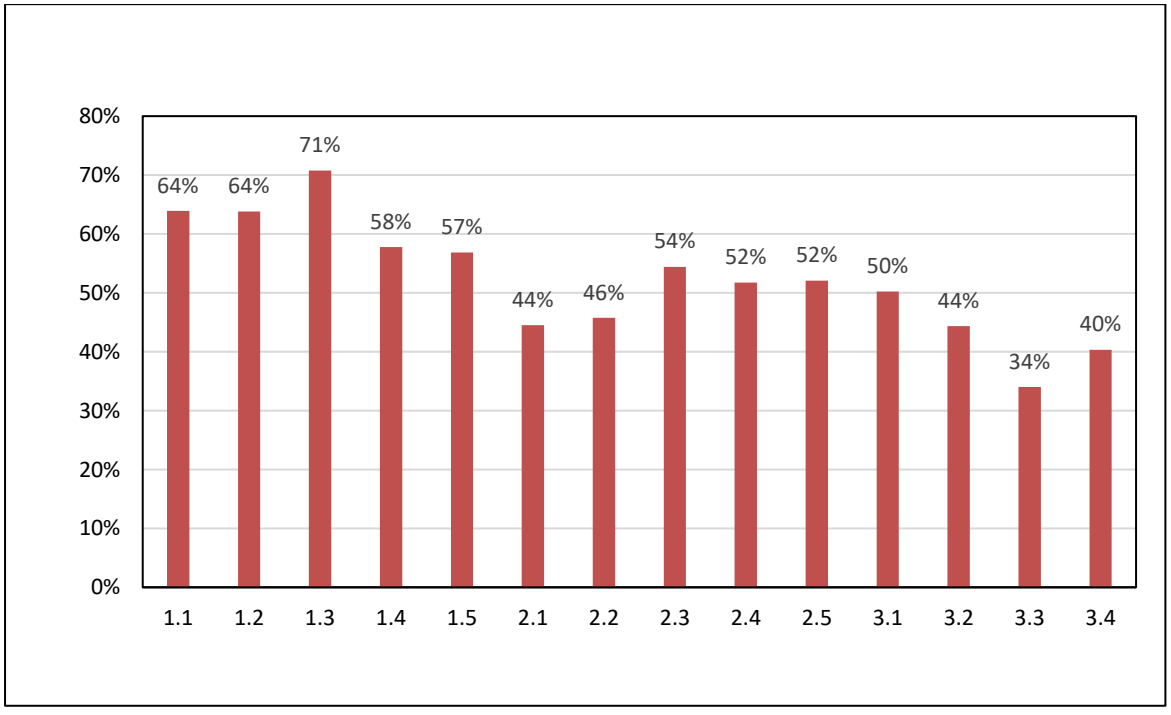
Based on the item analysis, the weakest performance by candidates was recorded in the subquestions on *Meiosis*, *Human Evolution, Speciation and Biogeography* and *Scientific investigations.*
The following graph is based on data from a random sample of candidates' scripts. While this graph might not accurately reflect national averages, it is useful in assessing the relative degrees of challenge of each question as experienced by candidates.

Graph 8.6.1 Average performance per question in Paper 2



Question	Topic	Ave. performance %
1	MCQs, Terminology, Matching, Meiosis, Protein synthesis	63%
2	DNA Code of Life, Meiosis, Genetics	50%
3	Evolution	42%
Total		**52%**

Graph 8.6.2 Average performance per subquestion in Paper 2



Subquestion	Topic	Ave. performance %
1.1	Multiple Choice	64%
1.2	Biological Terms	64%
1.3	Matching	71%
1.4	Meiosis and Mitosis	58%
1.5	Translation	57%
2.1	Meiosis	44%
2.2	DNA Profiling	46%
2.3	Pedigree Diagram	54%
2.4	Blood Groups	52%
2.5	Incomplete Dominance	52%
3.1	Human Evolution – Anatomical Features of Humans and Apes	50%
3.2	Human Evolution – Hominid Fossils	44%
3.3	Biogeography – Speciation	34%
3.4	Investigation – Natural Selection	40%

8.7 ANALYSIS OF CANDIDATES' PERFORMANCE IN EACH QUESTION IN PAPER 2

QUESTION 1: MULTIPLE-CHOICE, TERMINOLOGY, MATCHING ITEMS, MITOSIS AND MEIOSIS, TRANSLATION (PROTEIN SYNTHESIS)

Common errors and misconceptions

(a) Most candidates performed well in Q1.1, except in Q1.1.7, Q1.1.9 and Q1.1.10.

- In Q1.1.7 many candidates had difficulty in providing the correct combination of nitrogenous bases during *DNA replication*. They could not use the complementary strand on the left to determine the strand on the right and the new template.
- In Q1.1.9 a number of candidates were unable to determine the possible genotypes in the given *dihybrid cross*.
- In Q1.1.10 many candidates could not apply their knowledge of *sex-linked inheritance* to a disorder caused by a *dominant allele*.

(b) In Q1.2 some candidates lost marks because they:

- Confused *mitochondria* with *mitochondrial DNA* in Q1.2.2;
- Wrote *stem cell research* or only *stem* instead of *stem cell* in Q1.2.3;
- Used incorrect terms such as *helix* or *double stranded* instead of *double helix* when describing the shape of the DNA molecule in Q1.2.5;
- Wrote *uitwisseling* instead of *uitsterwing* in Q1.2.6 (Afrikaans-medium candidates);
- Could not distinguish between *discontinuous* and *continuous variation* in Q1.2.7 – they only wrote the words *discontinuous* or *continuous* without *variation* which is not a biological term; and
- Incorrectly answered *locust* instead of *locus* for the position of an allele on a chromosome in Q1.2.10.

(c) Most candidates performed well in Q1.3.

(d) In the *2024 Diagnostic Report*, it was indicated that a significant number of marks in Paper 2 are allocated to the topic *meiosis*. Although teaching tips were provided, some candidates had difficulty in answering the questions on this topic in Q1.4. Candidates lost marks in:

- Differentiating between a *cell membrane* and *nuclear membrane* in Q1.4.1(a);
- Identifying the different *phases of mitosis* and *meiosis* in Q1.4.2;
- Assuming the cell referred to was human instead of looking at the diagram provided and counting the number of chromosomes in the given diagrams in Q1.4.3(a) and (b). They therefore gave incorrect answers of 46 and 23 chromosomes respectively.

(e) Some candidates still confused *translation* with *transcription* in Q1.5.1(a). In Q1.5.2(b) many candidates could not work backwards by first determining the *tRNA anticodon* complementary to *codon* number 4 and then deduce the *DNA triplet* complementary to *codon* 4.

QUESTION 2: MEIOSIS, DNA PROFILING, PEDIGREE DIAGRAM, BLOOD GROUPS, INCOMPLETE DOMINANCE

Common errors and misconceptions

(a) Q2.1 ranked as the second lowest scoring question in the paper and proved to be challenging for candidates because:

- Some candidates described the process of *crossing over* rather than stating its importance. They often referred to *variation* instead of *genetic variation* in Q2.1.4(c). Also, they explained the exchange of genetic material, which describes the process rather than its importance in increasing genetic variation;
- In Q2.1.5 many confused a *single chromosome* with a *single-stranded chromosome*; and
- Many failed to read Q2.1.6 with comprehension and as a result confused non-disjunction of *gonosomes* with non-disjunction of *autosomes*. They were unable to apply their understanding of *abnormal meiosis* to a new scenario. Although the question focused on *sex chromosomes*, they gave an account of the inheritance of *Down's syndrome/Trisomy 21.*

(b) A few subquestions in Q2.1 proved to be challenging for candidates because:

- They referred to *DNA* and *DNA sample* instead of *DNA bands* or *DNA profile* in Q2.2.3; and
- In Q2.2.5, most learners could not explain the process used to determine *paternity* and how *DNA profiling* was applied. They only explained matching DNA profiles of the father and the child. They failed to explain that the DNA profiles/bands of both parents must be compared with that of the child.

(c) In Q2.3.3(a) some candidates did not use the key provided in the *pedigree diagram*. The key clearly stated *female with CADASIL*, yet some candidates wrote *female with defect* instead of naming the specific condition as shown in the key.
In Q2.3.3(b) some candidates used *sex-linked alleles* while this question was clearly about an *autosomal genetic disorder* as indicated in the stem of the question.
In Q2.3.4 many candidates failed to use the *phenotypes* and *genotypes* of individuals 1 and 2 and their children to explain why they were *heterozygous*. They described the phenotypes of the individuals in the pedigree diagram again using the words *affected* and *unaffected*, thus earning no marks. Some candidates also used individual 7 in their explanation, which was incorrect.

In Q2.3.5 candidates gave incorrect percentages (98%, 100%, 75%) instead of the expected probability.

(d) Q2.3.4 was poorly answered by many candidates who referred to the inheritance of a *blood group* rather than to the inheritance of an *allele* and described a *dominant blood group*, rather than a *dominant allele*. Candidates failed to describe the inheritance of *alleles* from both parents and also used the incorrect notation for the *alleles* and lost marks for this.

(e) Q2.4 showed varied candidate performance across the subquestions. Some candidates lost marks in:

- Q2.4.2 – incorrect notations given for the genotype of blood group B such as i^Bi, iBi^0, i^Bi^B, despite this being explained in the *2024 Diagnostic Report*;
- Q2.4.4 – many candidates could not explain the inheritance of blood group AB. They incorrectly stated that a child 'receives blood group A from one parent and B from the other' instead of explaining that the child inherits the I^A *allele* from one parent with *blood group* A and the I^B *allele* from the other parent with *blood group B.*

(f) Q2.5 assessed learners' understanding of *incomplete dominance* where neither allele is completely dominant, resulting in an intermediate phenotype. Candidates lost marks because they:

- Confused *incomplete dominance* with *co-dominance* in Q2.5.1 and Q2.5.2. Although some gave the definition for incomplete dominance, they did not apply it to the example in the question. Furthermore, they explained the inheritance too generally, stating only that 'neither allele is dominant' without referring specifically to the *cream-colour allele*, the *chestnut-colour allele*, and the resulting intermediate *golden phenotype*;
- Candidates wrote *genetic engineering* in Q2.5.3(a) instead of *artificial selection* or *selective breeding*. Some candidates incorrectly wrote *artificial breeding* instead of *artificial selection*;
- Many candidates did not include *coat* in their answer to Q2.5.3(b) and therefore lost both marks, e.g. they wrote *cream-coloured horse* instead of *cream-coloured coat*. Some candidates included *homozygous* or *heterozygous* in their answer which is incorrect since it refers to the *genotype* and not the *phenotype*; and
- A number of candidates did not give the smallest ratio in Q2.5.4. Errors included ratios which were not simplified (2:2), incorrect ratios (1 **:** 1 **:** 1 **:** 1 or 4 **:** 4), or the omission of the ratio. Some mislabelled P_1 and F_1/F_2 generations or wrote *fusion* instead of *fertilisation*. Again, some candidates included *homozygous* or *heterozygous* when stating the P_1 and/or F_1 phenotypes in the genetic cross. Some candidates used the incorrect letters instead of using what was given in the question or using the incorrect notation e.g. C^AC^G.

QUESTION 3: HUMAN EVOLUTION, BIOGEOGRAPHY, SCIENTIFIC INVESTIGATION

Common errors and misconceptions

(a) In Q3.1.3 most candidates could state the characteristic, e.g. *S-shaped spine* but failed to explain the significance of the characteristic for *bipedalism.* If a reason was provided, it was incorrectly stated, e.g. 'the S-shaped spine allows an upright posture' instead of 'better distribution of body weight/to absorb shock/allow flexibility'. Incomplete descriptions were given, e.g. the *foramen magnum* in 'a forward position' instead of 'a more forward position', 'a short and narrow pelvis' instead of 'short and wide' were given.

(b) A few subquestions in Q3.2 proved to be challenging for some candidates because:
- They incorrectly wrote *Miss Ples* instead of *Mrs Ples* and *Taung* instead of *Taung child* in Q3.2.2;
- In Q3.2.4 some candidates were unable to calculate the percentage increase and could only get the 1 mark for x 100. Some incorrectly stated x 100% instead of x 100 and did not round the answer off to two decimal places, as instructed in the question;
- Many referred to the *skull* instead of the *cranium*, failing to link cranial capacity to brain volume in Q3.2.5. Many responses simply stated 'measure the cranium' without explaining how this relates to determine brain volume. They also failed to mention that the cranium houses the brain in their explanation; and
- In Q3.2.6 many candidates simply referred to 'intelligence' without explaining that 'increased brain volume' results in 'greater intelligence'; and, instead, linked it to advanced tool usage, language development or complex social behaviour.

(c) Q3.3 showed the worst performance in the question paper. It required the interpretation of reproductive isolation mechanisms in flightless birds, biogeography and the theory of evolution. The challenges faced in each subquestion are listed below.
- In Q3.3.1(a) many candidates confused the term *biological species* with the definition for *population*. Many wrote *a group of species that can interbreed and produce fertile offspring*. Some candidates referred to *viable offspring* instead of *fertile offspring*.
- In Q3.3.1(b) most candidates gave the first part of the answer but omitted the second, i.e. organisms cannot interbreed.
- In Q3.3.3 many candidates did not link *biogeography* to *speciation*, even though the two concepts must be explained together. Many responses failed to mention that continental drift separates original populations. Most candidates gave a general description of *speciation* as they were unable to apply their knowledge to the example provided in the question.

(d) The scientific investigation questions in Q3.4 was pitched at a high cognitive demand level. Most candidates found the analysis and evaluation of the procedure and the subsequent results to be difficult. The challenges faced in each subquestion are listed below:
- Many candidates lost a mark in Q3.4.1 for writing the *independent variable* as the *effect of food availability* instead of *the availability of food*. The *effect* referred to the *dependent variable* (starvation resistance).
- Q3.4.2 was poorly answered. Many candidates only wrote *time taken for flies to die* and omitted *80% of the flies* and *die from starvation*.
- Many candidates lost marks in Q3.4.4 as they mentioned both *validity* and *reliability* in their answer. This indicates their inability to differentiate between the two concepts. Many candidates could not explain why the investigation was valid, instead they wrote the aim of the investigation.
- In Q3.4.5 many candidates answered the question in terms of starvation resistance rather than the time until death, thus stating a conclusion rather than describing the results. They also used the incorrect range to indicate hours until death for each generation, thereby losing marks.
- In Q3.4.6 many candidates provided generic responses for Darwin's theory of *natural selection* rather than applying it to the given scenario.
- Marks were lost when candidates:
  - Failed to mention that the variation occurred in a population of fruit flies, or in the offspring of fruit flies;
  - Failed to describe the variation in the fruit flies and gave incorrect descriptions of starvation resistance, some using the term *hunger resistance*;

- Stated that the characteristic of starvation resistance was passed onto offspring rather than the *allele* for starvation resistance; and
- Stated that fruit flies with starvation resistance increased in the next generation instead of the next generation had a higher proportion of fruit flies with starvation resistance.

Suggestions for improvement on teaching content and concepts for P2

(a) Teachers can use hands-on models (DNA base-pairing cards or beads) to reinforce the formation of the complementary strand when teaching *DNA Replication*.

(b) Dihybrid crosses should be taught by using *Punnett squares*. The difference between *genotype* and *phenotype* should also be emphasised.

(c) There is a misconception that disorders are only caused by *recessive alleles*. Teachers need to incorporate disorders caused by both *recessive* and *dominant alleles* during teaching. Furthermore, teachers must include case studies or real-life examples (genetic conditions) to contextualise learning in daily activities. They must also encourage learners to draw family pedigree diagrams to visualise inheritance patterns.

(d) At school level, teachers should mark spelling very strictly to ensure that learners become accustomed to spelling correctly.

(e) Teaching and learning of *mitosis* and *meiosis* must include diagrams with different chromosome numbers so that learners can apply their knowledge of the effect of the two types of cell division on the chromosome number of cells.

(f) Teachers should follow the *Examination Guidelines* and attend to topics highlighted for revision from previous grades such as *mitosis* in Grade 10. Proper revision of the phases of *mitosi*s is essential and clear differentiation between *meiosis II* and *mitosis* must be emphasised. Although these processes share similarities, the differences are important and should be explicitly highlighted for learners. In many cases, teaching in Grade 12 focuses only on *meiosis I* and *meiosis II*, leaving gaps in learners' understanding of *mitosis*. Teachers must also use the list of teaching tips on this topic as stated in the *2024 Diagnostic Report*.

(g) Teachers can use flow diagrams to show the sequence: *DNA → mRNA (transcription) → protein (translation)*. Scaffold problem-solving by teaching learners to move step-by-step backwards from *codon → anticodon → DNA triplet*.

(h) Reinforcing the use of correct terminology (*chromosome viz. chromatid*; *single viz. double-stranded*) must be prioritised. Furthermore, the term *variation* is a general answer while the result of crossing over is specifically *genetic variation*. It is important that learners know the difference.

(i) Learners should be exposed to different examples of non-disjunction (sex chromosome abnormalities like Turner or Klinefelter's) to broaden understanding. The genetic combination of the zygotes, e.g. XX + X/Y = XXX/XXY, must be emphasised.

(j) Teachers must refrain from using the term *DNA fingerprinting* and rather use *DNA profiling* as prescribed in the current *Examination Guidelines*.

(k) Teachers must emphasise the correct terminology when explaining *DNA profiling* and the difference between the use of DNA profiles in forensics and paternity testing.

The different applications of DNA profiles can be clarified for learners as follows:

USE OF DNA PROFILE	WHAT TO LOOK FOR
Forensics (Identification of a criminal, family member or a deceased person)	All the DNA bands of the suspect/family member must be identical to the DNA profile of the sample from the crime scene/missing person
Paternity testing	Each band of the child must match either that of the mother or of the potential father. If the child has a band that does not match that of either parent, then that excludes that male as the father

(l) Case studies (crime scene investigations, paternity tests) can be used to show how DNA profiles are interpreted.

(m) Teachers can use pedigree chart exercises with varied disorders (dominant, recessive, sex-linked) to highlight differences. The use of past DBE papers as class and daily activities are recommended to practise the subtopic.

(n) When a key is given in a pedigree diagram, candidates must use the wording given in answering questions based on it.

(o) As stated above, teachers must also encourage learners to draw family pedigree diagrams which will improve their understanding of it.

(p) To explain why the parents are heterozygous in the pedigree diagram, learners need to refer to the genotypes and phenotypes of the parents and offspring. An important part is that the children without CADACIL inherit a recessive allele from each parent to have two recessive alleles.

(q) Teachers and subject advisors must refer to the *2021 Diagnostic Report*, which provides steps on how to interpret a pedigree diagram.

(r) As indicated in the *2024 Diagnostic Report*, learners should be given the *phenotypes* and *genotypes* of the different blood groups as in the table below:

(s)

PHENOTYPE (BLOOD GROUP)	GENOTYPE
A	Homozygous - (I^AI^A) Heterozygous - (I^Ai)
B	Homozygous - (I^BI^B) Heterozygous - (I^Bi)
AB	Heterozygous - (I^AI^B)
O	Homozygous - (ii)

(t) Teachers can use visual examples (snapdragon flower colours, coat colour in animals) to distinguish between incomplete and co-dominance.

(u) Learners need to be informed not to use the terms *homozygous* and *heterozygous* when describing the *phenotype* in a genetic cross. It is also important to note that only the smallest ratio will be marked correctly, if requested in the question.

(v) The section on evolution comprises 36% (54 marks) in Paper 2. Teachers must refer to the *2024 Diagnostic Report* for more information on this topic.

(w) Teachers must use comparative diagrams of primate viz; human skulls and spines, to show structural differences. Scaffolding the explanations, i.e. teach learners to link feature → function → significance, which will enhance the understanding of these differences.

(x) Teachers should focus on the anatomical differences between the African apes and humans with the aid of diagrams.

(y) Teachers must expose learners to numerous case studies and real-world examples when teaching theories like *speciation* and *natural selection*. They need to design classroom activities and assessments that require learners to apply generic knowledge to specific, novel scenarios.

(z) Teachers need to clarify the following in *biogeography*: A common ancestor population becomes separated generally due to *continental drift* and this further leads to speciation.

(aa) A similar question on *biogeography* and *speciation* was assessed in November 2021 (Q3.2) but a different example was used. Therefore, as stated before, the use of previous examination papers as daily activities/assessment tasks can expose learners to questions based on difficult content. This will give them the opportunity to apply their knowledge and, in so doing, prepare them for the final examination. Also, teachers should revisit the *2021 Diagnostic Report*.

(bb) Teachers need to integrate and strengthen investigative skills: scientific method practice should be embedded throughout the curriculum in Grades 10 to 12.

- They should conduct simple practical investigations to teach *variables*, *hypothesis testing* and data analysis.
- Learners should practise graph interpretation and trend description regularly.
- A structured approach to answering investigative questions must be taught.
- Learners must be able to differentiate between the *independent variable* and the *dependent variable.* They should also be au fait with how the dependent variable was measured.