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**QUALITATIVE ANALYSIS OF LEARNER RESPONSES AND EVALUATION OF QUESTION PAPERS: NSC 2021**

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| **REPORT 1: EVALUATION OF THE QUESTION PAPER AND MARKING GUIDELINE** |

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| **SUBJECT** | **LIFE SCIENCES** |
| **PAPER** | **1** |
| **DURATION OF PAPER:** | **2½ HOURS** |

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

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| In general, candidates performed better in Life Sciences Paper 1 than in the previous year. We saw an increase in the percentage of learners who passed as well as an increase in the number of learners achieving level 6 and 7. Higher marks were obtained in question 1 due to the high number of level 1 questions in this section. Question 3 was the most poorly answered question with most learners giving very short responses.  Candidates also attempted to answer more of the question paper. This may be due to the change in the format of the paper. Question 4, which was the Essay, has been removed. The paper was therefore more accessible to all candidates, and this is reflective in the results. The standard of the paper was not compromised in anyway when compared to previous years and it still contained the same high order of challenging questions. Candidates, however, have more confidence in attempting the shorter questions which resulted in better marks.  Questions that require descriptions and explanation are still poorly answered. Language usage remains a major barrier to most candidates. Although the language in this paper was simple and sentences well structured, candidates struggle both in understanding the question and in expressing the answer. This does not only apply to candidates who are writing in a second language but even first language candidates struggle to express themselves due to poor vocabulary and sentence structure. |

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**SECTION 2: Comment on candidates’ performance in individual questions**

**(It is expected that a comment will be provided for each question).**

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| **QUESTION 1** |
| 1. **General comment on the performance of learners in the specific questions. Was the questions well answered or poorly answered?** |
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| 1. **Why was some questions poorly answered? Also provide specific examples, indicate common errors committed by learners in this question, and any misconceptions.** |
| **Question 1.1**  Questions 1.1.7 and 1.1.9 were poorly answered.  1.1.7 Candidates battled to interpret the graphs correctly.  1.1.9 Candidates battled to interpret the cause of low blood volume.  **Question 1.2**  Spelling is a problem. Candidates often confuse words like “allantois” and “amnion” and lose marks as markers cannot distinguish which word the candidate is implying. |
| 1.2.3 Candidates answered pregnancy instead of gestation. Gestation is the specific time period of development of the foetus while pregnancy includes all the changes that take place during this period. In Afrikaans the term “draagtydperk” was not accepted as it refers to pregnancy rather than gestation.  1.2.4 Many candidates gave specific tropisms such as “geotropism” and “phototropism”. These were not accepted as the question asked for the general term for growth movements in response to a stimulus.  **Question 1.3**  1.3.1 Candidates could not apply the difference between an exocrine and endocrine gland  1.3.2 Candidates do not understand that peripheral nervous system is made of both cranial and spinal nerves.  **Question 1.4**  1.4.1 Candidates confused vas deferens and epididymis  1.4.2 Candidates still don’t read instructions clearly. When asked to give **BOTH LETTER and NAME** they write only letter or only name.  1.4.2 (b) Candidates confuse urethra with ureter  **Question 1.5**  1.5.1 Candidates confused ovum with amniotic egg  1.5.1 (b) Candidates wrote “jelly membrane /wall” instead of “jelly layer”  1.5.2 Candidates do not know what an organelle is. They write Mitochondrial DNA instead of  Mitochondria.  1.5.4 Candidates continue to confuse oogenesis with ovulation. Learners also wrote mitosis, meiosis, and spermatogenesis as incorrect answers. |

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| **QUESTION 2** |
| **(a) General comment on the performance of learners in the specific questions. Was the**  **questions well answered or poorly answered?** |
| |  |  |  |  |  | | --- | --- | --- | --- | --- | | **QUESTION 2: RASCH ANALYSIS – AVERAGE PERCENT PER SUB-SECTION** | | | | | | **2.1** | **2.2** | **2.3** | **2.4** | **2.5** | | 41 | 28 | 19 | 49 | 36 |   The performance in this question varied greatly across centres. The question contained a good balance of higher order and lower order questions. Candidates generally attempted most questions with top achievers scoring high marks. Weaker candidates struggled to apply the knowledge that was required by some questions.  **Question 2.1**  This question was fairly well answered as all candidates attempted to answer it.  **Question 2.2**  This question was poorly answered as candidates battled to apply their knowledge.  **Question 2.3**  This question was the worst performing question in the paper. Many candidates did not understand the concept of endometriosis, even though it was explained in the passage.  **Question 2.4**  This level 1 question on hearing was well answered and attempted by the majority of candidates.  **Question 2.5**  Most candidates were able to gain some marks in this question as it contained a variety of levels of questions. |

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| **(b) Why were some questions poorly answered? Also provide specific examples, indicate**  **common errors committed by learners in this question, and any misconceptions.** |
| **Question 2.1**  Candidates were not able to compare neurons. They did not always pick up that neuron 1 had a myelin sheath and neuron 2 did not and therefore could not explain the transmission speed of the impulse.  2.1.3 Candidates did not compare the two neurons. Many only stated the speed of transmission in the one neuron but did not explain how the speed differed in the other.  2.1.4 Although candidates understood the reason a person could not respond if a motor neuron is damaged, they did not explain the complete pathway. Most candidates knew that the stimulus would be picked up by the receptor and transmitted on the sensory neuron. However, they failed to state that the stimulus would be felt because the impulse was sent to the brain for interpretation. They therefore lost a mark. They also did not say that there was no response because the impulse was not carried on the motor neuron to the effector.  **Question 2.2**  2.2.1 Candidates still confuse “Choroid” with “Chorion”. The “chorion” should be associated with the “amnion” in the developing foetus.  2.2.3 Candidates needed to state why the yellow spot had the clearest image. It must be noted that the yellow spot consists of **ONLY** cones and therefore has the **highest** concentration of cones. There are NO rods in the yellow spot. If the learners said “rods and cones are in the highest concentration” they were not awarded a mark. Photoreceptors was also not accepted as an alternative for cones as it implies both rods and cones.  2.2.4 This question required knowledge that was not required by the examination guidelines. The marking guideline for this question was adjusted to benefit the learner. The candidate was awarded full marks for stating the difference in structure between B (sclera) and F (lens). They were not required to EXPLAIN the difference as this was beyond there scope of knowledge required.  Some candidates wrote a comparison of the functions of parts B and F, rather than a comparison of the structure.  Candidates lost marks as their comparisons did not refer to the same structural feature. If a candidate states that “B is inelastic” then they should state that “F is elastic”. Many candidates wrote “B is elastic” and “F is transparent”. These two statements are not comparing the same feature and so the candidate lost marks.  2.2.5 Candidates still confuse “circular muscles” with “ciliary muscles”  2.2.6 This was a higher order question which, as expected, was poorly answered. Candidates understood that light focussed in front of the retina but failed to explain why this was so. They needed to state that both the spectacles and the lens were refracting the light inwards/converging. No marks credited for refracting light outwards/diverging.  .  **Question 2.3**  Performance in this question was poor as candidates could not apply their knowledge. Questions 2.3.2 and 2.3.3 were higher order questions and most candidates could not apply their knowledge to answer these questions. Higher order questions require candidates to apply their knowledge, and this separates the top achievers from weaker candidates.  2.3.1 Candidates wrote “uterine wall” instead of “uterus” The questioned asked for the structure where the endometrium normally develops.  Candidates were not credited for “baarmoeder” as an alternative for uterus in Afrikaans as it is not the correct scientific term. “baarmoeder” refers to the womb which was also not accepted in English.  2.3.3 Candidatess still do not understand the negative feedback mechanism involved in the production of FSH. Progesterone inhibits the pituitary gland from producing FSH. Most candidates are not aware of this negative feedback mechanism. The lack of FSH would then prevent a follicle from developing and because there is no developing follicle it would not produce oestrogen. This would then prevent oestrogen causing endometriosis.  No marks were credited if learners wrote “progesterone inhibits FSH production” because in any negative feedback mechanism an endocrine gland has to be inhibited or stimulated. Therefore, candidates that wrote the answer without mentioning that the “pancreas was inhibited from producing FSH” were not credited.  **Question 2.4**  Some candidates do not explain the process using full statements. They use keywords and flow charts to explain. This is perhaps due to educators summarising it for them to learn. However, marks are not awarded for keywords, full statements are required to be awarded marks.  Candidates also do not differentiate between the different modes of transmission of sound.  It is important to note that there are **THREE modes of transmission**:  **SOUND WAVES 🡪 VIBRATIONS 🡪 PRESSURE WAVES**.  The pinna captures **SOUND WAVES** in the air. The **SOUND WAVES** are converted to **VIBRATIONS** when they hit the tympanic membrane. The **VIBRATIONS** are then past through the ossicles to the oval window. The oval window then sets up **PRESSURE WAVES** in the fluid of the inner ear.  This is because the sound travels through **THREE mediums** as it moves through the ear. Firstly, **SOUND WAVES** travel through **AIR** and are sent down the auditory canal. Then the **VIBRATIONS** travel through the **SOLID** structures of the tympanic membrane, ossicles and oval window. The sound then moves into the **LIQUID** perilymph of the inner ear as **PRESSURE WAVES**.  Candidates still confuse hearing and balance. They do not see these two processes as independent.  **Question 2.5**  2.5.2 This level 1 question required candidates to state the functions of the amniotic fluid. Candidates generally performed well but some are writing secondary functions which were not awarded marks. Examples of these secondary functions are “providing lubrication during birth” and “providing antibodies for the foetus” (antibodies are produced by the placenta, not the amniotic fluid).  2.5.3 Candidates wasted a lot of time writing unnecessary information and tend to leave out relevant information. They explained the whole process leading up to fertilisation and then only explained briefly what happens after fertilisation. They should only explain what happens after the zygote is formed.  Candidates also confuse “blastocyst” with “blastocyte” which are the cells that form the blastocyst and therefore incorrect.  2.5.4 Candidates wrote all the functions of the placenta when the question required them to only write those functions that are involved in the protection of the foetus. They did not read this question clearly. Protective functions prevent harm from being done to the foetus.  2.5.5 Candidates lost marks as they said that the oviparous organism received nutrition from the egg rather than the egg yolk, which is the part of the egg that supplies nutrient to the embryo. |

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| **QUESTION 3** |
| **(a) General comment on the performance of learners in the specific questions. Was the questions well answered or poorly answered?** |
| |  |  |  |  |  | | --- | --- | --- | --- | --- | | **QUESTION 3 - RASCH ANALYSIS – AVERAGE PERCENT PER SUB-SECTION** | | | | | | **3.1** | **3.2** | **3.3** | **3.4** | **3.5** | | 31 | 37 | 19 | 32 | 26 |   This question was very poorly answer. With the average mark being under 40% for all sub-sections.  **Question 3.1**  Candidates struggled to answer this question which integrated two separate chapters into one question. They confused the roles of the brain and adrenal glad in preparing the body for an emergency.  **Question 3.2**  Candidates continue to struggle with data response questions, many could not interpret the data given.  **Question 3.3**  This question was also the worst performing question in the paper. Although top achievers could answer 3.3.1, they all struggled to explain how an under-secretion of thyroxin led to weight gain in 3.3.2.  **Question 3.4**  This question on plant hormone showed a better performance than similar questions in previous years. Perhaps because it consisted of very short questions rather than explanations.  **Question 3.5**  This question was also poorly answered, and many candidates were not able to interpret the information given about the three aquatic species. |

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| **(b) Why were some questions poorly answered? Also provide specific examples, indicate**  **common errors committed by learners in this question, and any misconceptions.** |
| **Question 3.1**  3.1.1 Many candidates still get confused between the cerebrum and the cerebellum.  3.1.2 Some candidates lost mark because they wrote the corpus callosum “separates” or  “divides” the two hemispheres of the brain. Some candidates lost mark because  they did not indicate which hemispheres were connected by the corpus callosum. Candidates had to state that is connects the hemispheres of the brain or cerebrum. This is because the cerebellum also has two hemispheres.  3.1.3 Cerebral cortex was accepted as an alternate response to cerebrum.  3.1.4 (a) Epinephrine was also accepted as an alternate answer for adrenalin.  (b) Most of the candidates lost marks because they failed to write how **high breathing rate** and **heart rate** contribute to increased energy production. The candidates were expected to write how the high breathing rate (which **increased oxygen** intake) and heart rate (which caused the blood to be pumped **faster**) increased the amount of oxygen and glucose supplied to the skeletal muscle tissue, which then allowed more respiration to take place in an emergency situation.  Some candidates lost marks because they did not write both the ingredients required for the energy production, i.e., **glucose** and **oxygen**. (Candidates were expected write both ingredients not one.)  Some candidates lost mark for not mentioning the process (cellular respiration/cell metabolism) that causes the increased energy production.  (c) The question was about the homeostatic role of the medulla oblongata in activating the high breathing and heart rate. Therefore, the candidates were not credited for stating that the breathing rate and heart rate would be high as this was part of the question. To perform this function, the medulla oblongata must be stimulated. When it is stimulated (due to high blood CO2) the impulses are sent to breathing muscles and heart muscles. This causes a high heart rate (which is already mentioned in the question) to pump **more** CO2-laden blood to lungs **faster**. The high breathing rate causes the expulsion of **more CO2** from the lungs. All these processes eventually lead to the decrease in the blood CO2 levels back to its **normal levels**. This is the homeostatic function.  Some candidates lost marks because they did not state that the medulla oblongata is stimulated, but rather stated its function (being responsible for the rate of breathing rate).  The candidates did not write the cause of the increased breathing and heart rate which was the impulse being sent by the medulla oblongata to the heart and breathing muscles. Rather they repeated what was already in the question. The candidates mainly focused on the breathing faster, but not on the WHY.  Some candidates lost marks because they only wrote that CO2 level decreased instead of writing the CO2 decreased to its **normal level**.  **Question 3.2**  3.2.2 The candidates lost marks when they wrote that when the average blood flow to the skin increases the environmental temperature increases. Some candidates lost marks when they wrote that the high environmental temperature is directly proportional to the high average blood flow to the skin. The information in the table does not show such a relation between those two.  3.2.3 Majority of the candidates failed to show correct calculation.  3.2.4 The candidates lost marks because they failed to see that there is a steady increase in temperature from 20 0C to 45 0C. The increase in temperature causes dilation of blood vessels that carry blood to the surface of the skin. (vasodilation)  Many candidates lost a mark because they wrote vasoconstriction instead of vasodilation. The dilation of blood vessels that carry blood to the surface of the skin cause an increase in blood flow to the surface of the skin. Some candidates lost a mark when they failed to include this in their response.  The high blood flow to the skin causes loss of heat (due to conduction, convection and radiation) or causes the secretion of a large amount of sweat. (heat is lost due to evaporation of sweat). Some candidates lost marks because they gave a complete/ generic description of thermoregulation rather than giving an explanation of a specific question. Some candidates gave a generic description of what happens “on a hot day” or “on a cold day” as described in a textbook. Many candidates wrote what happens at 200C and then described what happens at 450C.  3.2.5 Majority of candidates scored only one mark for low blood flow to the skin but could not explain the fatal consequence of low blood flow to the tissues. (i.e. lower or no supply of oxygen and nutrients for the vital processes in the cells or accumulation of poisonous metabolic waste that would stop vital cellular functions)  **Question 3.3**  3.3.1 The majority of the candidates were able to score some marks for this question.  3.3.2 This question was poorly answered by the majority of candidates because they failed to link the lower concentration of thyroxin in the blood to the lower rate of metabolism. They also failed to explain why a lower rate of metabolism contributes to the storage of more fat in the body.  **Question 3.4**  3.4.1 Many candidates were unable to identify the dependent variable in this investigation. The dependent variable is extracted from the aim of the investigation stated in the question.  3.4.2 This question was not answered correctly by most of the candidates. Most of candidates failed to recognise the tip as the site of auxin production.  3.4.3 Most of the candidates were able to respond to this question correctly.  3.4.4 Majority of the candidates answered this question correctly.  3.4.5 Many candidates described apical dominance correctly as it was described in the textbook.  3.4.6 (a) and (b) were answered correctly by most of the candidates.  **Question 3.5**  3.5.1 The majority of candidates responded correctly.  3.5.2 This question was answered poorly by many of the candidates as they were unable to explain the two reproductive strategies adopted by the great white shark to increase their reproductive success. Although some of the candidates identified strategies correctly but, they failed to explain the reason for adopting those strategies. Therefore, the candidates were only credited for the strategies.  Some candidates lost all marks because they wrote the reason without linking to the respective strategies.  3.5.3 This question was also not well answered by many of the candidates. The candidates fail to recognise the production of large of number of gametes as a strategy to increase the chances of fertilisation despite the threat of predation and other undesirable environmental factors during external fertilisation. |

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| **(c) Provide suggestions for improvement in relation to Teaching and Learning** |
| * **Question 1.1**   If a candidate gives more than one letter for a response, they will not be awarded any marks. The principle of mark first one only does not apply, and candidate will lose all marks. Therefore, it is important to instruct candidates to only write ONE letter in multiple choice questions.   * **Question 1.2 Terminology**   Abbreviations will not be accepted in this question in future papers. The full name is required. e.g., ABA / ABS will not be accepted for abscisic acid.   * Educators are in desperate need of a complete list of acceptable Afrikaans and English terminology and definitions. There is much confusion regarding correct terminology as textbooks use various terms that are not always acceptable. e.g., “bytestes” is not acceptable for “epididymis” but “saadleier” is acceptable for “vas deferens”. * Terminology is an important part of any topic, and a list of appropriate terminology should be given at the beginning of every topic. * Mind the Gap uses Afrikaans terminology such as “saadbuis’ for “vas deferens” that is not acceptable and should be updated. In this way learners can be taught only the acceptable terminology and not lose marks unnecessarily. * Spelling is also very important for terminology as often incorrect spelling changes the meaning of the word. Educators should write the words on the board so that learners become familiar with the spelling. * Educators should emphasize the difference between pregnancy and gestation as highlighted earlier. * Candidates need to be exposed to the interpretation of graphs in all assessments to prepare them. * Questions such as 2.2.1, 2.2.2, 2.5.1, 2.5.2 (labelling of diagrams and functions of parts), 2.2.5 (the pupillary mechanism) and 2.4 (hearing) are recall questions. This type of question should be practiced regularly in class through daily testing to ensure that candidates do not lose marks from level 1 questions. * Naming and labelling structures and knowing the function of parts are important basics that should be stressed during teaching. However, it is also important for candidates to understand the consequences if a structure can no longer perform its function. e.g., What would happen if the tympanic membrane does not vibrate. Educators should build this into their teaching by not only stating the function but then explaining what happens when it stops functioning. * Educators should continue to expose candidates to higher order questions that require the application of knowledge. Use past papers for questions and focus on explaining answers in a step-by-step method so that candidates can obtain full marks. * Expose candidates to long questions. Although the essay has been removed from the paper they are still required to be able to answer 7 – 8 mark questions. * Negative feedback mechanism of hormones also requires more in-depth teaching. Candidates should not only know how to describe the negative feedback mechanism but should also be exposed to how these feedback mechanisms work in real situations. Past papers can be used to source examples of this as there have been questions of this type every year. * Candidates should be taught to only write what they are being asked for in the question. If they are required to name TWO structures they should not write more as only the FIRST TWO structures will be marked. Writing more is wasting time. * Educator must teach candidates how to compare parts both structurally and functionally. When doing a comparison candidates should choose ONE feature and describe that feature in each of the parts. e.g. If comparing the sclera and the lens they may choose the ability to allow light to pass through for each structure. They would then state that the sclera is opaque while the lens is transparent. * Although it has been stressed in previous year, it is important to teach candidates the difference between a question that asks you to DESCRIBE and one that asks you to EXPLAIN. Description question require a step-by-step account of the process. When asked to explain candidates need to answer this question in a cause-and-effect manner. e.g., In question 2.1.3 that asks candidates to explain how speed of transmission differs in neuron 1 and 2. The correct answer is: Neuron 1 has a myelin sheath which means that the impulse will be transmitted faster in neuron 1. The CAUSE is the myelin sheath, and the EFFECT is that the speed is faster in neuron 1 than neuron 2. * Candidates need more practice in questions that require describing and explaining as they lack the understanding and language ability to answer fully. It is important that when they take notes that they do not only write flow charts and keywords but write full sentences. They need to constantly practice sentence construction and explanation in the classroom to improve their use and understanding of their language of learning. |

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| **(d) Describe any other specific observations relating to responses of learners and comments that are useful to teachers, subject advisors, teacher development etc.** |
| * A need for a comprehensive terminology and definitions list for Life Sciences is required. Educators need to know the alternative terms that are accepted, as well as those found in textbooks that are not accepted. A handbook of acceptable terminology needs to be produced especially for Afrikaans where many common names are still used to describe parts. * Terminology should continue to be emphasised in teaching and should be tested frequently. Emphasis should be placed on spelling. There has been an improvement over the years in the responses in Question 1.2. * Educators should work through past question papers with learners focusing on the instructions for each question. e.g., Give both NAME and LETTER / Write A only, B only, Both A and B or none / Explain / Describe / Tabulate etc. * Educators must follow the 2021 Examination Guidelines for grade 12 when they are teaching. Textbooks do not always follow the guidelines, and many are not up to date. It is therefore important to continually refer to the guidelines. * Learners should also have copies of these guidelines for studying. * Subject advisors need to support schools in keeping up to date with changes in the guidelines and incorrect terminology in textbooks. This can be done by holding workshops at the beginning of each year. * More educators need to be exposed to setting of test and examination papers. Workshops should focus on layout of the paper, assessing various difficulty and cognitive levels and topic weighting. Having a knowledge of how the paper and marking guidelines are constructed will help educators better prepare their learners. |