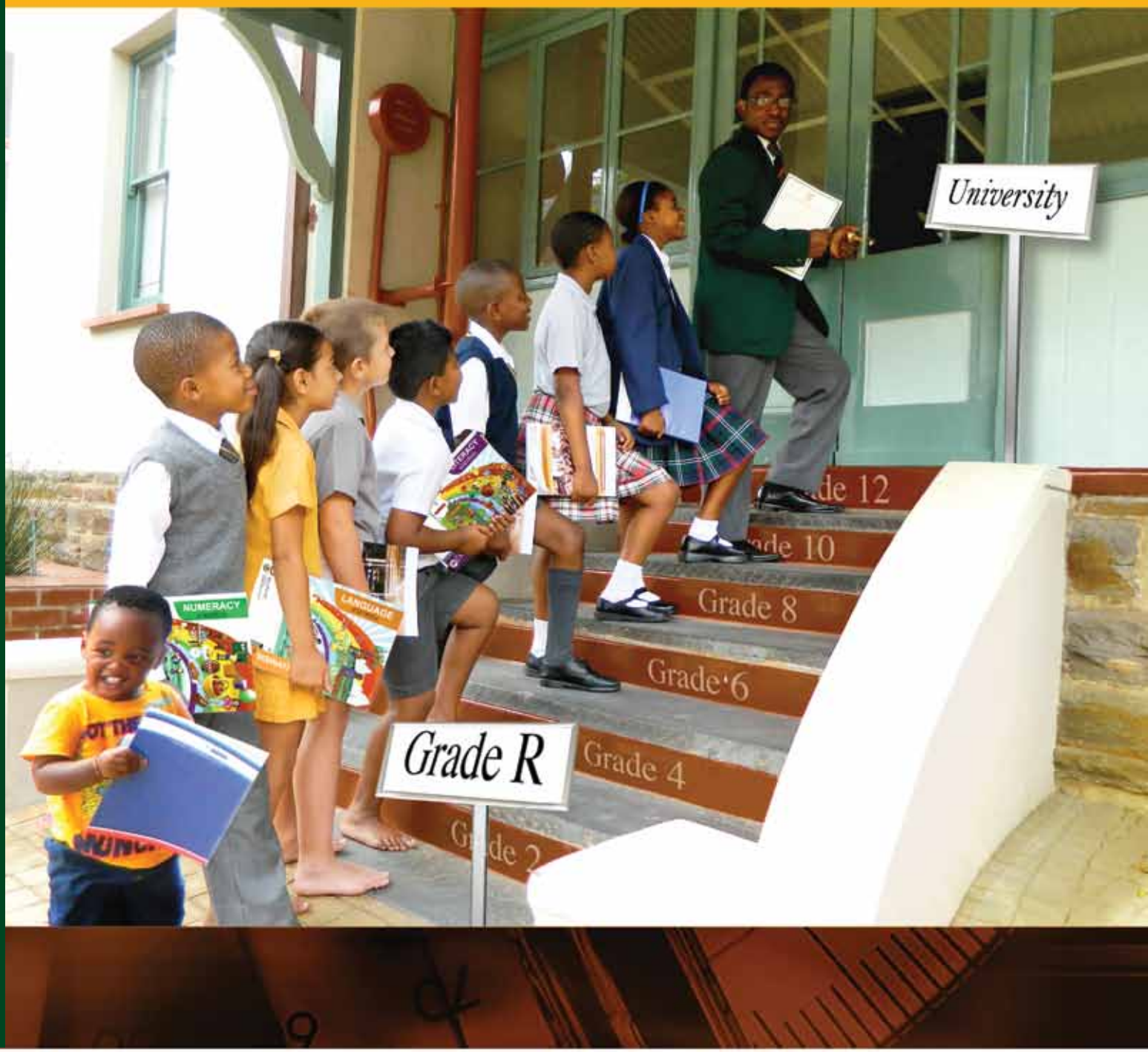
REPORT ON THE NATIONAL SENIOR CERTIFICATE EXAMINATION 2011

NATIONAL DIAGNOSTIC REPORT ON LEARNER PERFORMANCE



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KEYWORDS/LIST OF ABBREVIATIONS

LOs	-	Learning Outcomes
ASs	-	Assessment Standards
DBE	-	Department of Basic Education
NCS	-	National Curriculum Statement
NSC	-	National Senior Certificate
SAG	-	Subject Assessment Guidelines
PEDs	-	Provincial Education Departments
MCQs	-	Multiple Choice Questions
LOLT	-	Language Of Learning and Teaching
FET	-	Further Education and Training
LTSM	-	Learning and Teaching Support Material

Foreword

It is my pleasure to release to all schools in the country this comprehensive report on the performance of candidates in selected subjects in the 2011 National Senior Certificate (NSC) examination. This report is in keeping with the commitment of the Department of Basic Education to provide relevant feedback from the 2011 NSC examination to inform teaching and learning.

An examination does not serve only to assess and certificate learners who have satisfied the qualification requirements in that academic year, but it also provides a wealth of information on learner performance that would be of immense value to learners who would be examined in subsequent years.

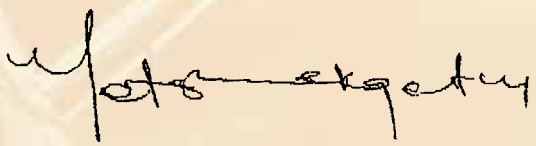
During the marking of the individual learner scripts that was executed across the 123 marking centres in the country, markers were alerted to how learners had experienced the examination in the subject. The marking process revealed information on questions that were poorly answered and the possible reasons for the poor responses, concepts that were incorrectly taught and hence wrongly responded to in the examination; or aspects of the curriculum that were not effectively presented to candidates and, therefore, left them inadequately prepared.

This report captures these useful elements and is presented for use by teachers in the classroom, subject advisors who support teachers, and curriculum specialists who develop support material for schools. This report will therefore guide the work of these officials in their preparation of learners for the 2012 NSC examination. Officials are expected to address each of the areas of concern raised in these reports and harness the aspects that have been signalled as strengths.

It will be expected of Provincial Education Departments to report on how teaching and learning in the classroom reflects the contents of these reports. The Department of Basic Education will continue to undertake similar analyses of performance in subsequent NSC examinations and it is hoped that the areas of concern will decrease considerably in the 2012 examination.

I wish all learners that embark on this final lap of their academic journey, en route to the National Senior Certificate examination, fortitude and strength as they strive to attain success. I also acknowledge the noble efforts of educators who will nurture and support learners during the course of the 2012 academic year. Let us together ensure that no learner that enters the Grade 12 academic year is left behind.

This report is available on the DBE website for use by all teachers, subject advisors, circuit managers and district managers.



MRS AM MOTSHEKGA, MP
MINISTER OF BASIC EDUCATION
4 JANUARY 2012

1. INTRODUCTION

An examination is not an event that only serves to measure learner achievements. It also provides the education system with valuable diagnostic information that should provide feedback on teaching and learning. If appropriately utilised, information from an examination, which could be both quantitative and qualitative, serves to improve teaching and learning.

These subject reports, in eleven of the subjects with high enrolments, are the first steps in providing teachers, as well as subject advisors and other support officials, with information that could assist in planning the teaching and learning practices for 2012. These reports have been compiled from the reports presented by the chief markers, internal moderators and subject specialists during the marking of the scripts of candidates who wrote the 2011 NSC examination. The reports highlight areas that, based on the responses of candidates, have been identified as problematic in each of the eleven subjects. Together with the aspects of the curriculum that have been identified as challenging, suggestions are made for improvement in teaching and learning, support to be provided for teachers, and the development of support material.

It is therefore expected that all teachers of these subjects, together with the subject advisors, will read through these reports and identify aspects that need to be given special attention in 2012. If teachers require support with the teaching and learning of these areas, they should not hesitate to contact the subject specialists in their district offices, who will be eager to assist.

2. SCOPE AND PURPOSE

The reports cover eleven of the subjects with high enrolments, namely Accounting, Agricultural Science, Business Studies, Economics, English First Additional Language, Geography, History, Life Sciences, Mathematics, Mathematical Literacy and Physical Science. For each subject, a general overview of learner performance is provided. The reports highlight those aspects of the curriculum that, based on a detailed per-question analysis of the responses of candidates in each of the eleven subjects, have been identified as problematic, and provide suggestions for improvement. The suggestions that are made for improvement are not exhaustive and therefore teachers and subject advisors are encouraged to apply other remedial measures that they consider appropriate.

The purpose of these reports is to communicate to teachers and subject advisors the common areas of weakness in the subject and to ensure that these areas are constructively addressed in the teaching programme planned for 2012. During the monitoring of schools, the DBE will evaluate the use of these reports in the teaching and learning programme, and it is expected that the problems experienced in the 2011 examinations will be considerably reduced in the 2012 examinations.

Teachers and subject advisors are requested to provide input on the usefulness of these reports and how they could be improved in future years.

3. METHODOLOGY

During the marking of the 2011 NSC examination, 100 scripts per paper for each subject, were randomly selected at each province across all 123 marking centres country wide. The scripts were randomly selected from a number of districts, to cover low, medium and high scores. Throughout the marking process, markers, senior markers and chief markers noted learners' responses to questions, paying particular attention to common errors and misconceptions. The individual scripts were scrutinised to provide a detailed understanding of the variance in responses and in the areas of common concern around the responses given.

The analysis was done per question on the random sample of 100 scripts. This entailed recording the marks obtained by learners from the 100 scripts on a per question basis. From the analysis, a detailed explanation was provided **per question/sub question** in the following two main parts:

Section 1: General overview of Learner performance in the question paper as a whole.

Section 2: Comments on candidates' performance on individual questions. This included the following:

- General comments on the performance of learners in the specific question, stating whether the question was well answered or poorly answered;
- Why the question was poorly answered, including common errors and misconceptions; and
- Suggestions for improvement in relation to teaching and learning, subject advisory support and provision of LTSM.

The reports from all 9 provinces for each paper per subject were consolidated and the information summarised in this report.

4. SUMMARY OF FINDINGS

Details of the findings are presented per subject under Section 5 of this report.

While improvements have been observed in the quality of responses of candidates in most subjects, there are still areas of concern, some of which are highlighted below:

- Inadequate preparedness of candidates for the examination and especially learners' inability to answer questions assessing higher order thinking skills such as problem solving, critical thinking, analysis and evaluation;
- Inadequacies relating to foundational competencies and basic concepts, which negatively impact on advanced learning and understanding; and
- Inadequate literacy and numeracy skills required to write proper paragraphs and do simple calculations respectively, across all subjects.

A key issue regarding subject combination choices needs to be given special attention by schools and district managers. It is important to note that certain subject combinations work to strengthen learners' performances as a whole. Acquired competencies in Mathematics for example can strengthen a candidate's understanding and improve performance in Physical science. Teachers and principals of schools need to assist learners to make the right subject combination choices as this has a huge impact on their competence in other subjects as well as their overall performance.

It is recommended that teachers and subject advisors convene special workshops at which these reports will be thoroughly discussed and problem areas addressed with teachers.

5. INDIVIDUAL SUBJECT REPORTS

Forty one thousand four hundred fifty three (41 453) fewer full time candidates wrote for the NSC examinations than in 2010. Comparative figures are: 537 543 (in 2010) and 496 090 (in 2011). The main reason for this is the increase in the admission age for learners entering Grade 1 implemented in 2000. This has significantly affected the number of candidates who were registered in all major subjects.

5.1 ACCOUNTING

The following report should be read in conjunction with the Accounting question paper of the November 2011 Examination.

SECTION 1 - QUANTITATIVE ANALYSIS (2008 – 2011)

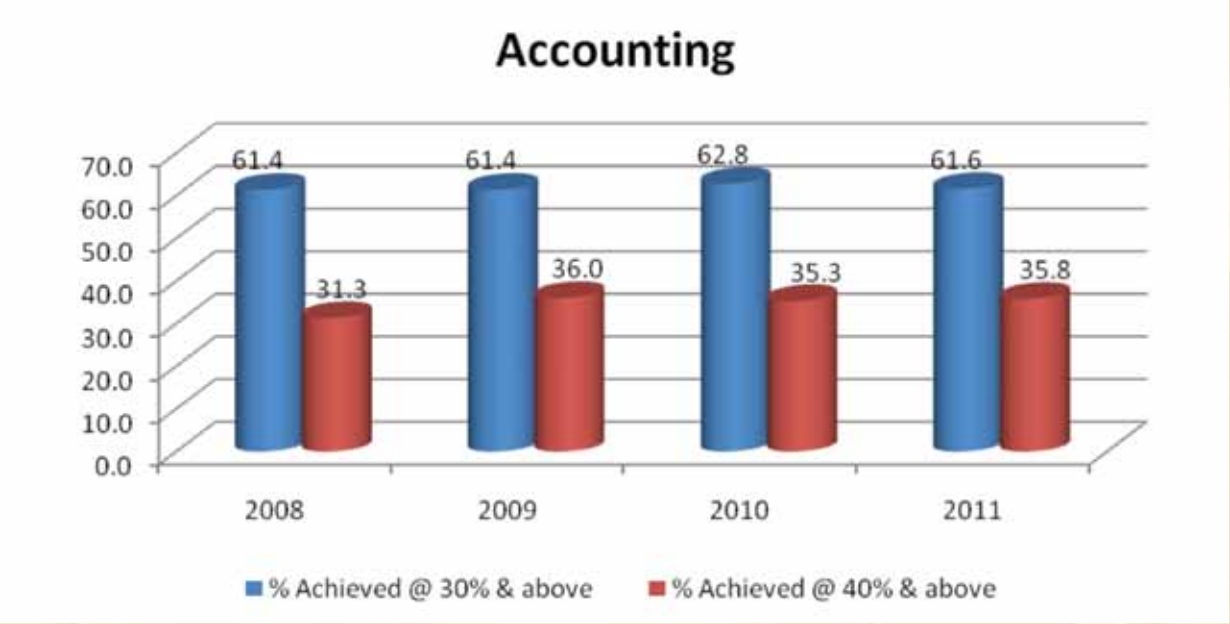
OVERALL ACHIEVEMENT RATES (2008 – 2011)

There was an improvement in the nature and quality of responses of Accounting candidates across all provinces. Reasons for this include learners being better prepared for the examination, and teachers being more familiar with the subject content. However, this improved performance did not translate into the expected improvement in the pass rate at the 30% level, as it is clear that a considerable number of centres are still producing candidates who do not understand basic subject content. Nevertheless, the improved general quality of work produced by candidates augers well for future NSC examinations, provided that basic applications and conceptual knowledge are embraced in all centres.

TABLE 1: OVERALL ACHIEVEMENT RATES IN ACCOUNTING, 2008 - 2011

Year	No. Wrote	No. Achieved @ 30% and above	% Achieved @ 30% and above	No. Achieved @ 40% and above	% Achieved @ 40% and above
2008	176 366	108 106	61.3	55 164	31.3
2009	174 347	107 156	61.5	62 743	36.0
2010	160 991	101 093	62.8	56 752	35.3
2011	137 903	84 972	61.6	49 368	35.8

FIGURE 1: OVERALL ACHIEVEMENT RATES IN ACCOUNTING, 2008 - 2011



SECTION 2 - QUALITATIVE ANALYSIS OF LEARNER PERFORMANCE

A. GENERAL OVERVIEW OF LEARNER PERFORMANCE

This is the fourth year of the implementation of the NCS and all topics in the Accounting NCS have been covered in at least one of the three year-end or three supplementary examinations, which means that teachers and learners had extensive resource material to assist them in preparing for the November 2011 paper. Together with the interventions that were put in place in the provinces to assist teachers and learners, this appears to have had a positive effect in some centres. However, it was clear that many centres did not make use of the six available past papers to prepare their learners. The reasons for this could be a lack of finances to cover costs of reproducing the past papers, or a lack of willingness on the part of teachers and/or learners to engage with these resources.

In past years, it was noticeable that certain significant NCS topics that were also included in the old report 550 Higher Grade curriculum presented major problems for candidates in many centres. These candidates either neglected to answer these sections or performed poorly in them. Such topics included analysis and interpretation of financial information and Cash Flow Statements. The performance of candidates in the 2011 paper indicated that a smaller number of centres than in previous years appeared to be unfamiliar with these important sections of work. Nonetheless, the poor quality of answers in many centres indicates that problems still exist in the teaching and learning process.

It was disappointing to note that candidates did not perform better, since the opportunities existed for them to do so. The questions in every Accounting paper are structured to reflect an appropriate balance between lower-order, middle-order and higher-order cognitive levels. The lower-order levels cover the Remembering, Understanding and Basic Application levels, as adapted from Bloom's Revised Taxonomy. According to the Subject Assessment Guidelines, Basic Application is taken to mean remembering basic formats of financial statements or ledger accounts. It is also noted that certain questions covering the lower-order cognitive range may be considered challenging for learners, while some questions covering the middle- or higher-order cognitive range might be less challenging for them. Papers are therefore also structured to reflect an appropriate balance between easy, moderate and challenging questions.

In the November 2011 paper, marks for easy sub-questions were spread across all questions to enable weaker candidates to engage with every question. Many of the easy sub-questions covered basic theoretical knowledge which is essential for enabling learners to engage with the more complex applications pertaining to each topic. It was expected that all learners would have been able to answer these questions correctly. The failure of weaker candidates in many centres to do so, has indicated deficiencies in the teaching and learning process, where basic theory is not covered and the basic formats of financial statements are not properly taught. Specific examples of this are provided in the analysis of each question below. Teachers are earnestly encouraged to focus on this aspect of the teaching and learning process.

Judging from the general performance of candidates in the 2011 paper, the following practices appear to have been neglected in many centres. These (suggested) practices are expected to lead to improvement in the performance of learners in future NSC Accounting papers and should be built into the work plan for the year:

- **Use of past NSC papers:** In preparation for the 2012 year-end paper, every learner should have access to four NSC November papers and four NSC supplementary papers. Teachers should also answer these papers themselves to improve their own confidence in their ability to deal with each topic and to assist them in their teaching.
- **Basic concepts:** Teachers should ensure that learners understand and can explain the essential basic concepts and terminology before engaging in Accounting applications in each topic. For example, in preparing a Balance

Sheet, learners should know what is meant by non-current assets or current liabilities; they need to know what is meant by liquidity, solvency and return when interpreting financial information.

- **Revision of relevant Grades 10 and 11 content:** The Subject Assessment Guidelines state that up to 20% of an examination paper may contain content from previous grades that is pertinent to Grade 12 content. Teachers must ensure that revision of relevant Grade 11 work is done before engaging with Grade 12 content. Meaningful liaison with teachers of Grade 11 classes should also serve to reduce the time spent in Grade 12 on revision of these aspects.

- **Memorising and understanding basic formats:** Teachers should ensure that the basic formats of financial statements and ledger accounts are fully understood by learners. These formats must cover Income Statements, Balance Sheets, Cash Flow Statements, Cash Budgets, Production Cost Statements and relevant notes to the financial statements, as well as ledger accounts for items such as asset disposal, share capital, dividends, taxation, and appropriation of profit.

- **Internal control and ethical issues:** Teachers should teach not only the logic and the process of each Accounting application in the curriculum, but also the internal control measures and ethical considerations that are relevant to each application. This will not take up a significant amount of time if these aspects are integrated into the teaching of the relevant application. (Refer in particular to Questions 1 and 2 below for examples.)

- **Requirements of questions:** Teachers must ensure that learners understand the requirements of typical questions in NSC papers. For example, if a question requires a figure to be provided in an explanation, this must be done to earn the relevant mark. Teachers should ensure that learners understand the basic layout of examination questions and where to look for the relevant information.

- **Time allocations:** Teachers should train learners in the art of managing their time and to adhere to the suggested time allocations provided in the paper.

- **Comments and explanations:** Teachers need to train learners to express themselves clearly and simply where comments or explanations are required. In Accounting, the use of bullet points and short, concise sentences is acceptable.

- **The importance of formative testing:** Teachers should ensure that they build up the confidence of learners in all topics through the use of short, informal formative tests. It is a most effective practice if learners mark these formative tests themselves for immediate feedback and for an appreciation of how marks for easy parts of an examination question can easily be obtained. This will also force learners to take ownership of the learning process.

B. ANALYSIS OF LEARNER PERFORMANCE IN INDIVIDUAL QUESTIONS

QUESTION 1: MANUFACTURING

This question was generally well answered. It appears that most candidates are approaching with confidence this relatively new topic in the Accounting NCS.

(i) COMMON ERRORS AND MISCONCEPTIONS

Most candidates were able to prepare the Production Cost Statement (Question 1.2) and to respond to the ethical scenario regarding the reduction in raw materials (Question 1.3.4).

It was disappointing to note that weaker candidates did not earn full marks for the identification of basic cost categories (Question 1.1), since knowledge and understanding of these categories is essential to enable them to prepare or interpret a Production Cost Statement. It was therefore not surprising that these candidates tended not to remember the basic set format of the Production Cost Statement (Question 1.2).

Weaker candidates could not calculate the direct material cost per unit (Question 1.3.1), which involved a simple division of the given cost by the given number of units. The calculation and interpretation of the break-even point (Questions 1.3.2 and 1.3.3) were done well by above-average candidates. As this aspect has been examined in several past NSC papers, candidates in general were expected to perform better in it.

Regarding the ethical scenario (Question 1.3.4), many candidates erroneously considered it a viable option to reduce the raw materials or ingredients and yet keep the selling price unchanged in order to improve profit. It seems that ethical considerations of manufacturing have been neglected in certain classrooms.

(ii) SUGGESTIONS FOR IMPROVEMENT

Teachers who follow a conceptual approach from the outset of each section tend to develop candidates who achieve the best results, since they will have a better understanding of the manufacturing process and the relevant information. Teachers need to ensure that learners understand the nature of the five cost components (direct materials, direct labour, factory overheads, administration, and selling and distribution), together with examples of each. This should be done simultaneously with the teaching of the Production Cost Statement.

Formative tests covering explanations of each category, or identifying examples for each category, will serve as a most effective basis for the development of understanding the manufacturing process. Similarly, formative tests should be conducted for testing learners' knowledge of the format of the Production Cost Statement without figures, the calculation of unit costs, and the calculation of the break-even point, before moving on to interpretation of the unit costs and break-even point.

QUESTION 2: BANK RECONCILIATION AND CREDITORS' RECONCILIATION

Although many centres performed well on this question, better results had been expected. Weaker candidates were not able to earn the marks available for easy components.

(i) COMMON ERRORS AND MISCONCEPTIONS

A bank reconciliation question is very predictable, and below-average candidates should have been able to achieve at

least 16 of the 'easy' marks covering the basic theory questions, calculation of the bank balance and preparing of the bank reconciliation statement (i.e. at least 50% of this question).

Many weaker candidates were not able to earn the full 8 marks on the 'easy' true/false questions on basic concepts (Question 2.1.1). In calculating the bank balance (Question 2.1.2) and preparing the bank reconciliation statement (Question 2.1.3), many weaker candidates appeared to be guessing where the figures should be reflected, and therefore attracted penalties for foreign or superfluous entries by placing certain figures in both sections. This indicates poor basic understanding of the reconciliation process, i.e. that errors or omissions in the books of a business should be corrected in the books only or that items outstanding from the bank statement will affect the reconciliation only.

The comments by candidates on the large outstanding deposit (Question 2.1.4) were generally acceptable, with the more capable candidates displaying insight into the potential for fraud. The marking guideline allowed for the overdue and large outstanding deposit (Information 2) to be reflected as outstanding in the reconciliation statement, or to be reversed in the books of the business in line with the GAAP concept of prudence. It can be argued that the latter option is more appropriate in this regard as fraud or the 'rolling' of cash could be occurring.

The creditors' reconciliation (Question 2.2) was very poorly done, with many candidates apparently guessing answers by placing figures in the creditors' ledger and reconciliation statement. A similar question was asked in the November 2009 paper and performance was also poor. This topic appears to be ignored in many centres.

(ii) SUGGESTIONS FOR IMPROVEMENT

Teachers who follow a conceptual approach from the outset of each section tend to develop candidates who achieve the best results; in other words, if learners understand what is meant by 'internal control', 'documentation', 'outstanding deposit or cheque', 'dishonoured cheque', 'bank charges', 'overdraft', 'outstanding invoice or credit note', etc, they will have a better understanding of the reconciliation processes. Formative tests similar to the true/false questions (refer to Question 2.1.1) are advisable in the teaching of all forms of reconciliation i.e. bank, creditors, debtors, and age analyses.

It is clear that teachers at certain centres are covering the basic concepts and theory competently. Reconciliations are an important part of the internal control process in any business. This aspect, together with the role of the internal auditor, should be stressed at every available opportunity so as to enable learners to appreciate the validity and importance of the reconciliation process (refer to Question 2.1.4).

The preparation of reconciliation statements is a topic in the Grade 11 curriculum, with progression to interpretation thereof in Grade 12. The learning programme for this section of work should be to cover basic concepts (including the need for reconciliation) and revision of Grade 11 entries (after identifying differences between the books and the external statements) and listing outstanding items in the reconciliation statement. This provides an appropriate basis before moving on to the interpretation of reconciliation statements, and consideration of internal control and ethics in the context of reconciliations.

QUESTION 3: GAAP CONCEPTS, ASSET DISPOSAL, INCOME STATEMENT AND AUDIT REPORT

This question was generally well answered, although weaker candidates did not earn the expected marks on certain easy aspects of it, particularly on GAAP concepts and the Asset Disposal account. The theory questions on the audit report were satisfactorily answered by many candidates, although these aspects also appear to have been neglected in many centres.

(i) COMMON ERRORS AND MISCONCEPTIONS

The question on GAAP concepts (Question 3.1) was generally poorly answered. This is a topic which is covered in Grades 10 and 11. This matching sub-question offered an opportunity to earn 10 marks easily, yet candidates in certain centres earned very low marks.

It was also surprising that weaker candidates did poorly in the Asset Disposal account (Question 3.2.1), which always follows a set, predictable format. Many candidates could not fill in the correct contra details, could not calculate the depreciation correctly, and did not appear to know that accumulated depreciation should be updated before being entered in the Asset Disposal account, erroneously entering this as a figure separate from the accumulated depreciation figure.

The company's Income Statement (Question 3.2.2) was generally an area in the paper where many weaker candidates earned a sizable bulk of their marks through the entering of the pre-adjustment figures and the easier adjustments. However, disappointing errors of principle were evident and prevented a better general performance. It is still very disappointing that candidates are placing interest income and interest expense in the main body of the Income Statement (instead of below operating profit) and that they are placing Balance Sheet items and dividends in the Income Statement. These errors of basic principle attracted negative marks for poor presentation or for superfluous (foreign) entries. Weaker candidates also did not appear to understand whether an adjustment should be a plus or a minus to a pre-adjustment figure, e.g. erroneously adding packing material on hand at the year-end or deducting directors' fees owed at the year-end. The above-average candidates dealt successfully with the more challenging adjustments, like rent income. Teachers should ensure that their learners understand that, in practice, capitalised interest is levied on mortgage loans by all financial institutions. The calculation of capitalised interest from the loan statement is in fact easier than calculating the interest using a percentage rate and a number of months. All Grade 12 candidates can be expected to perform this calculation. Most learners earned method marks on completing the sub-totals in the Income Statement, but on occasion erroneously added interest expense and income tax, which indicates serious conceptual flaws.

Most candidates were able to offer comments on the ethical scenario of the CEO's holiday expenses (Question 3.2.3), although it was a concern that some were of the invalid opinion that it was appropriate for him to use company funds for this purpose or to reduce tax owed to SARS through this method.

Most candidates attempted the questions on the audit report (Question 3.3), even through many did not appreciate that this was a qualified audit report, given that the marketing expenses could not be verified by the auditor. Many candidates incorrectly thought that the word 'qualified' in this context related to the auditor's CA (SA) qualifications.

(ii) SUGGESTIONS FOR IMPROVEMENT

It appears that most learners are confident in preparing an Income Statement. This is in stark contrast to the poor performance on the Balance Sheet, which was examined in the November 2010 paper and when many learners appeared to be guessing where to place items under the appropriate sub-headings. It is not possible for all major financial statements to be asked within any one examination paper; hence teachers should not be complacent about their learners' grasp of the topic of preparing financial statements.

If learners understood what is meant by 'asset', 'liability', 'expense', 'income' or 'equity' as well as the GAAP concepts covered in Question 3.1 and the difference between gross profit, operating profit and net profit, they would have a better understanding of the preparation of financial statements.

Basic GAAP concepts or rules form part of the Grade 10 curriculum. Asset disposal is also a topic which arises in both the Grade 11 and the Grade 12 curriculum. It appears that revision of these aspects is not being effectively covered in many centres in Grade 12.

Asset disposal entries always follow the same set process: enter the cost price; update the accumulated depreciation; transfer the final figure for accumulated depreciation; enter the selling price; and enter the difference which is the profit/loss. All candidates must be encouraged to follow the 5-step logical process.

Formative tests should be conducted on depreciation calculations, the asset disposal account and the basic format of the major financial statements (without figures), i.e. the Income Statement, Balance Sheet and Cash Flow Statement.

Learners should also be required to do several practical application tasks on these aspects. Most textbooks can be relied on in this regard. Teachers should require learners to follow five fundamental steps in drawing up an Income Statement or a Balance Sheet: enter the pre-adjustment figures; enter the adjustments; fill in the final figures for each item; provide sub-totals and totals, and carry the appropriate figures through to the next part of the statement.

QUESTION 4: CASH FLOW STATEMENT, RATIOS AND INTERPRETATION

It was encouraging that there appears to be a reduction in the number of centres which ignore this particular section of content. However, there are still several centres where teaching of this content appears not to be taking place. Many other centres perform very well on this section of work, and their candidates take full advantage of the marks available on both easy and more challenging aspects of such questions.

(i) COMMON ERRORS AND MISCONCEPTIONS

Many candidates do not know what is meant by the categories on a Balance Sheet (Question 4.1). The Retained Income note (Question 4.2) was extremely poorly done, indicating that many candidates did not understand the basic format. The Cash Flow Statement with its note (Questions 4.3 and 4.4) offered some marks on easy aspects to candidates. The basic format can be learnt by all candidates, but many candidates did not indicate outflows of cash by way of brackets in the Cash Flow Statement and could not calculate the cash effects of changes in creditors and dividends paid. The calculations for only three basic financial indicators were asked (Question 4.5). This was a predictable requirement which has appeared in several past papers, and most candidates were able to earn marks on these sub-questions.

Most candidates were able to offer valid comments on liquidity (Question 4.6), but some did not realise that, based on the figures in this question, the stock turnover rate and the creditors' payment period were not relevant to the improvement in the liquidity situation. Some also erroneously thought that the debt/equity ratio was pertinent to liquidity. The comments on the share prices (Question 4.7) and the decisions reflected in the Cash Flow Statement (Question 4.8) were intended to extend above-average candidates, yet many candidates offered some valid comments.

(ii) SUGGESTIONS FOR IMPROVEMENT

The teaching and learning process on this topic has to start with learners understanding what is meant by the categories reflected on the Balance Sheet and Income Statement, i.e. non-current assets, current assets, non-current liabilities, current liabilities and equity (for the Balance Sheet), and income and expenses (for the Income Statement). Without this essential basic knowledge, learners will not be able to prepare the Income Statement and Balance Sheet, and understand the cash effects of each on the Cash Flow Statement.

It is important to follow a conceptual approach from the outset to develop candidates to ensure good understanding. For example, if learners understand what is meant by 'operating', 'investing' and 'financing' activities, they will have a better understanding of the preparation of a Cash Flow Statement. Formative tests should be conducted on calculations of financial indicators, the Appropriation Account and Retained Income note, and the basic format of the Cash Flow Statement (without figures).

The sub-question on allocating Balance Sheet items to their appropriate categories (Question 4.1) offered 8 easy marks to all candidates, yet a startling statistic is that in some provinces more than half the candidates were unable to earn 50% on this question. In most provinces, fewer than 15% of candidates were able to earn the full 8 marks. This is of major concern because essential knowledge of Balance Sheet categories determines whether or not a learner can in fact prepare a Balance Sheet. The disappointing performance on this sub-question arguably provides evidence of shortcomings in the teaching and learning process, and explains why the performance on the Balance Sheet question in the November 2010 paper was so poor.

It is acknowledged that the Cash Flow Statement (Questions 4.3 and 4.4) is a challenging application topic for many teachers and most learners, even though this has been examined regularly in past examinations of the NCS and REPORT curricula. Teachers should by now be at the stage where they can confidently teach this section of work. It is clear that many teachers might not understand the Cash Flow Statement properly themselves and although there is only one format of this statement, there appears to be a diversity of methods of teaching the section. In the opinion of the examining panel, each aspect of the Cash Flow Statement should be taught in isolation and then consolidated in the complete Cash Flow Statement for an overall perspective.

Regarding the calculation of financial indicators (ratios/percentages; Question 4.5), it is important for learners to understand the logic of each indicator. Learners should not be required to learn formulae, but rather to identify ways of working out the indicator from the description. For example, earnings per share indicate the amount of profit that is attributed to each share that is owned by a shareholder.

It is apparent that learners not proficient in English or Afrikaans might have problems in expressing themselves when making comments on financial indicators (Questions 4.6 and 4.7). However, in order to help such candidates in comment-type interpretation questions, candidates are asked to identify the correct indicator, to state it with the figure, and to offer a comment, which could be in point form. Teachers should advise such candidates that this approach is acceptable.

QUESTION 5: CASH BUDGET AND DEBTORS' ANALYSIS

While many candidates answered this question well, overall performance was generally disappointing, with weaker candidates unable to take advantage of the marks for easy parts of the question.

(i) COMMON ERRORS AND MISCONCEPTIONS

Basic calculations on the debtors' collection schedule (Question 5.1) and figures in the Cash Budget (Question 5.2) provided opportunities for approximately 10 marks to be earned on easy sub-questions, yet candidates did not do as well as expected. For example, some candidates did not know that the closing cash balance for November was the same as the opening cash balance for December.

The calculation of the debtors average collection period (Question 5.3) was a more challenging question, with which weaker learners battled. However, the calculation of the percentage increase in salaries and wages (Question 5.5) was a basic arithmetical calculation which should have been within the capability of every Grade 12 learner.

Generally, candidates were able to provide valid comments on the debtors' age analysis (Question 5.4) and the comparison of budget to actual figures (Question 5.6), although many learners erroneously thought that favourable variances occurred when actual expenses were greater than budget, or when actual income was less than budget. Moreover, many candidates could not offer valid solutions to rectify negative variances.

(ii) SUGGESTIONS FOR IMPROVEMENT

Teachers need to ensure that revision is done on calculations relating to specific figures in the budget or the debtors' collection schedule, as well as revision of preparing the cash budget. This constitutes essential prior knowledge from the Grade 11 curriculum.

Limitations in learners' basic arithmetic skills were noticed, particularly with regard to the calculation of basic figures in the cash budget and the percentage increase in salaries and wages. This matter should be addressed in Grades 10 and 11. Formative tests on budget calculations (refer to Questions 6.1 and 6.2) are strongly advised.

In teaching Cash Budgets, teachers should stress the format of a Cash Budget and its purposes (to anticipate cash problems and as a control measure) by comparing budgeted figures to actual figures. With regard to positive and negative variances between budgeted and actual figures, teachers should encourage learners to express opinions and offer solutions.

QUESTION 6: INVENTORY VALUATION AND PROBLEM-SOLVING

While many centres appeared to answer this question well, the general performance of candidates was disappointing, with weaker candidates unable to take advantage of the marks available on easy aspects of the question.

(i) COMMON ERRORS AND MISCONCEPTIONS

It was astounding to note that in some provinces almost half the candidates did not know what FIFO represents (Question 6.1.1), while a similar number could not work out the unit value of each bicycle on hand at the beginning of the year when the total value and the number of bicycles were provided (Question 6.1.2). This was very disappointing because this accounted for 4 easily achievable marks that all candidates should have earned.

Generally, the calculations of the closing stock according to FIFO (Question 6.1.3) and the gross profit (Question 6.1.4) were of varying quality. However, most candidates could not evaluate the merits of the two stock systems (Question 6.1.5). Many did not appreciate that consistency from one year to the next is an important consideration, and that a reduction in tax is not a valid reason to change the stock valuation method.

(ii) SUGGESTIONS FOR IMPROVEMENT

Teachers need to ensure that all learners understand basic theory and concepts relating to stock valuations to enable them to take full advantage of the marks on offer for the easy sub-questions. Short formative tests should be conducted on inventory valuation involving FIFO, weighted average and mark-up percentages (refer to Questions 6.1.1 to 6.1.3).

Basic concepts and terminology must be covered at the outset of the teaching process. The fact that a significant portion of candidates in many centres did not know that FIFO means 'First In First Out' (Question 6.1.1) is evidence that essential basic knowledge and concepts are not being covered in the teaching and learning process in many schools. This raises serious doubts as to whether these learners actually understand the logic of the calculation that they are required to do in valuing stock according to the FIFO method (Question 6.1.3).

In teaching inventory valuation, teachers should also ensure that learners understand how this affects the calculation of the gross profit earned (refer to Questions 6.1.4 and 6.1.5). The drafting of a Trading account would assist in this regard.

The problem-solving question at the end of the paper (Question 6.2) was intended as a higher-order question to challenge top candidates and many of them earned excellent marks for it. Unless a 'problem' is 'new' or 'unfamiliar', it no longer constitutes a 'problem'. Problem-solving questions are contained in all papers and may comprise up to 10% of a paper. Many candidates were able to earn at least part-marks on this aspect, which was encouraging. Teachers are advised to expose learners to such questions in class at appropriate times, even if learners work in pairs and involve themselves in short discussions on such questions.

5.2 AGRICULTURAL SCIENCES

The following report should be read in conjunction with the Agricultural Sciences question papers of the November 2011 Examination.

SECTION 1 - QUANTITATIVE ANALYSIS (2008 - 2011)

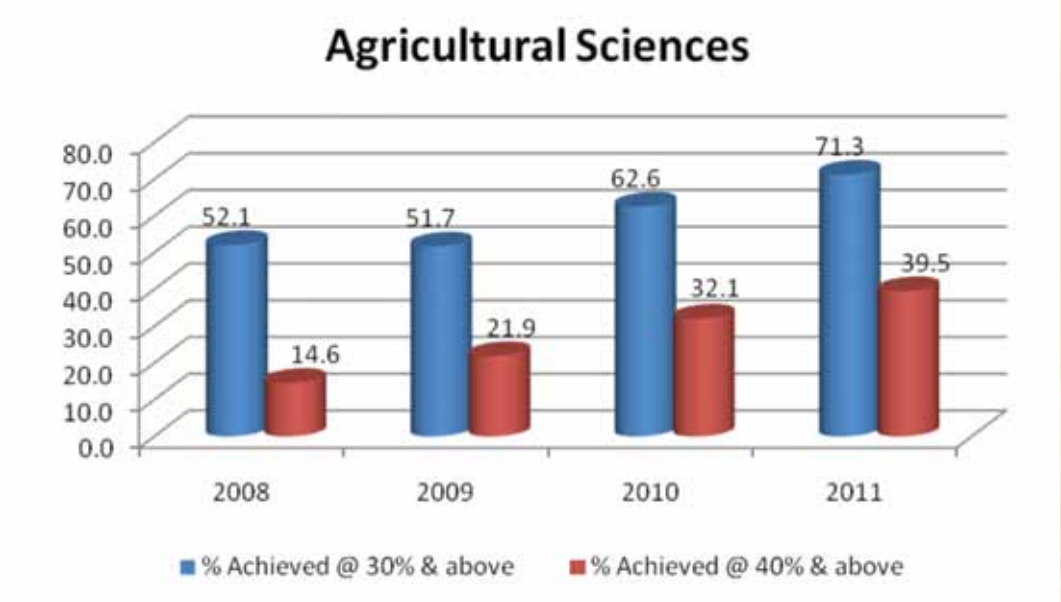
OVERALL ACHIEVEMENT RATES (2008 - 2011)

The performance of the NSC 2011 Agricultural Sciences candidates reflected a significant improvement in the quality of work produced and in the pass rates at both the 30% and 40% levels. The general upward trend in these indicators since 2008 is very pleasing and augers well for the results of future NSC examinations.

TABLE 2: OVERALL ACHIEVEMENT RATES IN AGRICULTURAL SCIENCE, 2008 - 2011

Year	No. Wrote	No. Achieved @ 30% and above	% Achieved @ 30% and above	No. Achieved @ 40% and above	% Achieved @ 40% and above
2008	86 251	45 247	52.5	12 472	14.5
2009	90 136	46 597	51.7	19 723	21.9
2010	85 523	53 573	62.6	27 427	32.1
2011	77 719	55 404	71.3	30 678	39.5

FIGURE 2: OVERALL ACHIEVEMENT RATES IN AGRICULTURAL SCIENCE, 2008 - 2011



SECTION 2- QUALITATIVE ANALYSIS OF LEARNER PERFOMANCE

PAPER 1

A. GENERAL OVERVIEW OF LEARNER PERFORMANCE

The general performance of learners was an improvement on that of previous years, with most of the questions being answered satisfactorily by learners. However, it is a matter of concern that some examination centres performed extremely well, with averages of approximately 70%, while others did extremely poorly with averages of approximately 30%.

Some school-based factors that might have contributed to poor performances in some centres include the following:

- **Lack of competent subject specialists**: Teachers not confident about subject content might rely almost exclusively on the subject assessment guidelines and examination guidelines to develop their teaching and learning programmes.
- **Subject combinations or subject packages offered to learners**: Because of the demands of Agricultural Science, learners who take it should also take Mathematics, Life Sciences and/or Physical Science. Accounting would also assist in understanding financial and budgetary applications.
- **Learners exposed only to the minimum number of formal school-based Assessment tasks**: Learners will find that regular formative assessment tasks will serve to improve their confidence in dealing with the subject content.
- **Varying quality of assessment tasks**: The setting of quality-assured common tasks on more challenging sections of the curriculum such as graphs and data response questions is advisable.

Judging from the general performance of candidates in the 2011 paper, greater focus on the following practices should assist in promoting improvement in the performance of learners in future NSC Agricultural Sciences papers:

- **Knowledge of practical situations**: Teachers need to broaden their knowledge and practical experience in certain areas of the curriculum so as to be able to expose learners to practical and topical situations. For example, Animal Nutrition (in Paper 1, Question 2) and Genetics (in Paper 2, Question 4) provided serious challenges for many learners.
- **Alignment of school-based assessment tasks to NSC standards and exposure to different types of questions**: Teachers need to follow the work schedule and learn to interpret it correctly in order to spread the content evenly throughout the year. Teachers need to utilise the available guidelines documents, previous NSC examination papers and other support structures, to prepare their learners more effectively, and to inform the development of teaching and assessment programmes. More intensive moderation of internally generated SBA tasks should be carried out to ensure that they are of the required standard, in line with the SAG and the Examination Guidelines. A similar format, style, standard and level of difficulty of questions to that applied in NSC papers should be used in class tests and internal examinations. For example, assessment tasks, particularly formal examinations and class tests, should always integrate the four sub-questions used in Paper 1 Section A, so that learners can become familiar with the style of setting in order to develop competence in answering these questions.

It was also apparent that most candidates struggled with data response questions and that they were unable to interpret graphs, tables, illustrations, pictures and diagrams. It was evident from answer scripts that some teachers had not adequately prepared learners to deal with the demands of certain types of questions. Case studies, scenarios and short essays are used for application-type and interpretation-type questions. Questions that require higher order thinking like problem-solving, critical thinking and analysis are posing a great challenge, and activities in class should expose learners more to these types of question. Learners ought to be able to link a case study to the subject content. Learners also need to be exposed to questions which require that they interpret information and arrive at conclusions, rather than be restricted to straightforward knowledge questions.

- **Language and terminology**: Candidates' responses also indicated that language and terminology deficiencies are barriers to many candidates and there were instances of misinterpretation of questions. Greater exposure to past NSC papers should facilitate improvement in these areas.

- **Variations in textbooks and LTSM resources relating to terminology and coverage of essential basic concepts**: Teachers need to ensure that several LTSM resources are used to compensate for shortcomings that might exist in textbooks regarding terminology and topics, such as proclaimed diseases. Teachers should use several available textbooks, although the learners might use only one. The different titles provide a good opportunity to expose teachers and learners to a wide range of activities. Many learners still lack basic conceptual knowledge. This suggests that teachers are either not completing the curriculum content, or that ineffective teaching and learning are occurring. Terminology and concepts should be explained with examples so as to enhance learners' understanding. Resources other than textbooks should be used, e.g. agricultural magazines. Learners should also be encouraged to follow television programmes such as *AgriTV* on SABC 2 and to develop a comprehensive understanding of concepts in the subject.

- **Calculations and mathematical formulae:** Learners should be exposed to simple mathematical calculations involving percentages, ratios, conversions of decimals, mass, weight, length and their respective units. Calculations are an integral part of the subject. It is important that there be integration with Mathematics and Mathematical Literacy, so that learners can be assisted to understand the importance of formulae in calculations. Learners lost marks in the initial steps of the calculations. It is recommended that a calculation be started with the formula/ formulae given, then the correct substitution followed by the calculation and then the correct answer. The final answer should also be re-checked, if time allows.

In Paper 1, Question 1 was the best-answered question. In contrast, Question 2 (Animal Nutrition) was the most poorly answered part of this paper. This is generally the section that is done in the first term, according to the work schedule. There were also cases of candidates not following instructions, as in Question 3.1.2 where candidates were expected to refer to the data but provided general reasons for lower temperature in dairy cows as compared to pigs.

B. ANALYSIS OF LEARNER PERFORMANCE IN INDIVIDUAL QUESTIONS

QUESTION 1: ANIMAL NUTRITION, ANIMAL REPRODUCTION

The question was the best answered in the paper. Candidates followed instructions by writing on the attached answer sheet.

(i) COMMON ERRORS AND MISCONCEPTIONS

Most learners responded quite well to the multiple choice items in Question 1.1, although in Question 1.1.8 the learners chose A instead of D, and in Question 1.1.9, learners missed the key word 'common', which made C the correct answer. This type of question seemed well known to the candidates and it appears that learners are becoming more confident in this regard.

Question 1.2 was challenging for some candidates, who experienced difficulty in matching the items in Column A with those in Column B. Responses indicated that most candidates struggled with the interpretation of option D (i.e. none is correct). In almost all cases where option D was the correct answer, candidates opted for other options.

Most learners performed reasonably well in Question 1.3, which referred to terminology, and Question 1.4, where the underlined word had to be replaced. The poor performance in some parts of the question appeared to be due to a lack of knowledge of certain agricultural terms.

(ii) SUGGESTIONS FOR IMPROVEMENT

It would be advisable to grasp opportunities for networking and mentorship programmes between centres. Short courses focusing on critical content gaps could assist in improving results at certain centres.

Refer to the general overview of learner performance on this paper for suggestions concerning alignment of school-based assessment tasks to NSC standards, coverage of terminology and basic concepts, exposure to calculations, and knowledge of practical situations.

QUESTION 2: ANIMAL NUTRITION

This question was the most poorly answered in this paper. However, there were a few instances of exceptionally good performance.

(i) COMMON ERRORS AND MISCONCEPTIONS

The following were some of the questions that learners found difficult.

Question 2.1.3 was poorly answered. Learners knew that the indicated parts of the stomach were underdeveloped in young suckling animals but could not provide the appropriate reasons.

Question 2.1.4 was a higher-order question and learners did not perform well in it. This suggests that learners were unable to associate micro-organisms in the rumen with the type of animal in question.

In Question 2.2.3, learners performed poorly because they were unable to do the calculation properly. Some candidates could not calculate the nutritive ratio, as their responses indicated that they did not know the formula for a nutritive ratio.

In Question 2.2.4, responses implied that candidates were not aware of the chemical substances necessary for increasing growth rate.

In Question 2.2.5, learners performed very poorly since they did not think of using the Pearson Square calculation method. They also failed to realise that the data supplied in the scenario had to be used in the calculation.

In Question 2.3.4, candidates' responses indicated that they confused functions of carbohydrates with those of proteins, since the majority responded that carbohydrates were needed for growth.

Most learners could not answer Question 2.3.5 correctly. This is an example of a higher order question, which shows that learners are not yet familiar with key action verbs such as 'Justify'.

Most learners simply did not provide correct answers for Question 2.4 on the chemical substances used to improve growth.

Question 2.5.3 posed a challenge to most learners. They could not evaluate the suitability of fishmeal since they struggled with the definition of biological value. This implies that candidates still lack knowledge of subject terminology. Biological value is an index of the quality of the protein in a feed and is linked to the amino-acid composition of the proteins, and many learners could not explain this definition of biological value.

(ii) SUGGESTIONS FOR IMPROVEMENT

Refer to the general overview of learner performance on this paper for suggestions concerning exposure to calculations and alignment of school-based assessment tasks to NSC standards, and exposure of learners to different types of questions.

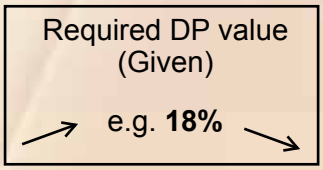
Basic calculations that involve a nutritive ratio and a Pearson Square are serious challenges to the majority of candidates. Comprehensive teaching and continual assessment of these aspects is essential.

The following list provides the examples of calculations used in the question paper and which learners need to be taught. Formative assessment tasks should be effectively used to provide the required practice for learners.

- Nutritive Ratio;
- Biological Value;
- Average Daily Gain;
- Coefficient of Digestibility; and
- Pearson Square Method to balance a ration (using only two feeds).

It is recommended that the Pearson Square Method of balancing rations be used in the following way:

Feed A: Given the Digestible Protein (DP) value, e.g. **10% 22 parts** of feed A



Feed B: Given the Digestible Protein (DP) value, e.g. **40% 8 parts** of feed B

Write the final ratio: **22:8**

or

22 parts of feed A must be mixed with 8 parts of feed B

The given values will appear in the question (or in the table related to the question). The differences in values between these given feeds and the required value (also given) will then determine the parts that need to be used in the feed mixture.

All types of graphs should be taught, with emphasis also on the interpretation thereof. Important aspects assessed when drawing a graph include the following:

- Correct heading;
- Correct labelling of both axes and inclusion of units;
- Correct type of graph and scale;
- Values correctly plotted/indicated; and
- Relevant keys.

The following opportunities would assist learners to cope with the content which is linked to this question.

Learners should be taken to a local feedlot to observe balancing of rations and chemical substances used to increase growth rate in farm animals.

Functions of all nutrients should be equally emphasised and practical examples should be given to learners. Learners will respond to questions on biological value only if they know what biological value represents. Biological value should be defined using practical examples by bringing protein sources to the classroom/learning site. This could also be part of the visit to a local feedlot or feed supply depot.

Intervention workshops for teachers and study groups for learners should be held to cover balancing ratios and calculations in general. Team-teaching, lesson studies in cluster groups and classroom support visits would assist in the development of teachers.

QUESTION 3: ANIMAL PRODUCTION

Generally, the performance in this question ranged from average to above-average.

(i) COMMON ERRORS AND MISCONCEPTIONS

The following questions posed a degree of challenge to the learners:

They did not understand the concept of ‘optimum’ in Question 3.1.2. The expected answer referred to the activities of microbial bacteria that are covered in animal feeding, and very few learners could make this correlation.

In Question 3.1.1, most learners failed to interpret the production curve, and could not describe the relationship between production output and temperature.

Question 3.2.1 posed a challenge to some candidates since they thought that responses should be generated from Diagram B. They failed to analyse the diagram and provide basic aspects to be considered when transporting beef cattle.

In Question 3.2.2, reference is made to Diagram A and the tools used in the movement of animals. Many learners have no practical experience of the handling of animals and are not exposed to any of these activities. To compensate for this, teachers should expose learners to the handling and behaviour of animals by using excursions or electronic material such as DVDs.

In Question 3.3.2, most candidates could not identify factors influencing growth rate in the case study. Most responses from the learners were very general and did not relate to the case study.

Question 3.3.4 was poorly answered and learners only managed to provide the given formula, but could not calculate the daily gain.

In Question 3.4.1, some candidates failed to interpret the data and could not plot the graph correctly. This indicates that many learners find data response challenging.

Learners struggled slightly with Question 3.4.2, because they could not interpret the graph.

In attempting to answer Question 3.4.3, many learners were not able to analyse the data properly.

(ii) SUGGESTIONS FOR IMPROVEMENT

Refer to the general overview of learner performance on this paper for suggestions concerning alignment of school-based assessment tasks to NSC standards, exposure of learners to different types of questions, particularly the plotting of graphs, and exposure to various LTSM resources, to enhance exposure to practical situations.

Performance in this topic focused more on skills than on knowledge and content. In particular, learners should be encouraged to read agricultural magazines, particularly the *Farmers' Weekly* (and other agricultural magazines) to enhance their grasp of the terminology used in this topic. This would also give them more knowledge of a feeding programme. Starting in Grade 10, learners also require more practice in plotting graphs, since it appears that some come across these for the first time in the Grade 12 examinations. Teachers should provide enrichment activities, particularly in the form of worksheets that would enhance reading and interpretation of data/information.

QUESTION 4: ANIMAL PRODUCTION, PROTECTION AND CONTROL

The overall performance of candidates in responding to this question can be described as average. There were, however, instances of poor performance in some sub-questions.

(i) COMMON ERRORS AND MISCONCEPTIONS

The following questions were mostly poorly answered by the learners:

In Question 4.1.1, most learners were able to identify only one secondary sex organ (i.e. the vagina).

In Question 4.1.4, two key verbs were used which contributed to learners not responding to the second part of the question. Some learners could not provide adaptations but rather provided functions, indicating a language problem. Learners had to refer to adaptations of this structure (i.e. fallopian tube – infundibulum), which meant that they had to indicate what this structure looks like and how it is formed to enable it to catch the released ova (i.e. adaptations).

Question 4.2 was on hormonal graphs. Most candidates could not interpret the graphs or provide relevant responses to Question 4.2.1 and Question 4.2.4. Question 4.2.1 in particular showed that learners still have problems in interpreting graphs correctly.

In Question 4.2.3, two functions were required, but learners were able to provide only one function for each and consequently lost two marks. This indicates that learners need to learn in more detail and not merely learn one function.

There were a few instances where candidates responded in their home language, for instance, '*xithuvi'* for colostrum (Question 4.3.1). Some candidates are unable to draw a bar graph and plot data. There were some cases of spelling mistakes; for instance, 'filapia tube' for fallopian tube, 'vacinition' for vaccination. This might be due to language barriers or reading deficiencies. Some candidates did not know the hormones responsible for the oestrus cycle.

In Question 4.4.1, many of the learners did not know the micro-organism that causes Rift Valley Fever.

In Question 4.5.3, the learners' responses indicated that they did not understand what was meant by a 'proclaimed disease'. Answers provided indicated measures to control diseases.

(ii) SUGGESTIONS FOR IMPROVEMENT

In teaching the section on reproductive organs, it is always advisable that charts, pictures and diagrams from a variety of resources be used to reinforce and enhance understanding. Learners should be encouraged to distinguish between, and describe functions and adaptations of, these organs. Teachers should expose learners to different examples of diagrams and pictures, and not only those in their text books. It is always expected and recommended that graphs form an integral part of learner assessment in this topic. Learners need to be able to interpret and draw graphs, and should be exposed to activities that develop their ability to differentiate between key verbs and concepts.

PAPER 2

A. GENERAL OVERVIEW OF LEARNER PERFORMANCE

Generally, the performance of the learners in this paper was better than that of previous years. Question 4 on Basic Agricultural Genetics posed a serious challenge and problems with basic concepts such as have been evident in all the previous NSC question papers, still persist.

Question 1 (Section A) was the best-answered question in Paper 2. Most candidates performed well, with a few cases of exceptionally good work. Question 4 on Basic Agricultural Genetics reflected the worst performance by candidates in this paper. This might have been due to lack of understanding of content terminology in basic genetics.

In most cases, learners performed poorly in data response questions. They struggled with interpretation of case studies, tables, illustrations and diagrams. Deficiencies in calculations may be attributed to candidates' unfamiliarity with formulae. Furthermore, candidates' responses indicated that command of language is still a serious problem for the majority of learners. This was especially evident in areas where they were unable to interpret questions correctly.

Generally, if not in all cases, candidates followed instructions.

Because of the nature of the paper, a significant amount of reading was required. This might have caused difficulties for some.

Teachers are advised to do more than the minimum number of School-Based Assessment tasks that comprise the formal requirement, because learners require additional practice in answering more lengthy questions. Teachers should make use of previous NSC question papers as a guide to the required standard for SBA tasks. Many of these questions could be adapted for assignments, which would also support the preparation of learners for their final examination.

The suggestions for improvement reflected in the overview of Paper 1 apply equally to Paper 2. Refer specifically to the points relating to visual LTSM resources, exposure to practical situations, mathematical calculations and terminology.

Suggestions, specifically in the context of Paper 2, are as follows:

- **Effective use of formative assessment tasks**: Learners must be taught how to answer the different types of short questions, and should practice the answering of different types of questions in formative class tests and examinations.
- **Coverage of curriculum content**: Teachers need to pace the coverage of content so that this can be completed prior to the start of the preparatory examination, and leave sufficient time for revision thereafter.
- **Coping with demands of reading**: Teachers should expose learners to different types of longer questions that involve more reading. It is clear that learners battle with case studies, scenarios and data response questions. It is imperative that learners engage with previous NSC question papers right from the beginning of the Grade 12 year so that they are familiar with the applicable format and style. This will relieve pressure towards the end of the year when time is limited.

B. ANALYSIS OF LEARNER PERFORMANCE IN INDIVIDUAL QUESTIONS

QUESTION 1: AGRICULTURAL MANAGEMENT, GENETICS, ANIMAL PRODUCTION

In most centres, the performance of learners was average. Fewer poorly performing centres were apparent than in previous years.

(i) COMMON ERRORS AND MISCONCEPTIONS

Question 1.1 was generally well answered. Some learners made corrections on the mark sheet, which was confusing, and at times two answers were provided.

In Question 1.2, learners did not perform very well. Some learners still battle with the task of matching items in Column A with those in Column B.

Question 1.3 was well answered. However, some learners do not understand certain terms and concepts. In Question 1.3.2, there were cases where candidates would offer ‘free marketing’ as an answer. This suggests that candidates had not read questions with much understanding.

Question 1.4 was poorly answered, as some candidates looked for the direct opposites of the underlined terms. Candidates’ responses suggested that most of them struggled to read and understand the sentences and descriptions. Some candidates’ responses indicated that there are deficiencies in their understanding of terminology.

Sub-question 1.1 (multiple choice) was a knowledge-based question within which learners sometimes experienced difficulty as they could not identify the correct term.

In Question 1.3.5, most learners gave the answer 'heredity' instead of 'genetics'. It appears that, when they did not know the correct answer, it was because they had either misinterpreted the instruction or resorted to guesswork.

(ii) SUGGESTIONS FOR IMPROVEMENT

Teachers should refer to the overviews of Paper 1 and Paper 2 for general suggestions, particularly with regard to terminology, language, concepts and exposure to different types of questions. The following suggestions are made in the context of this question:

- It is important to remember that only the most correct answer is accepted in a multiple choice question. Learners need to take note of this and not choose the answer that appears to be correct at first glance.
- Comprehensive knowledge was necessary to answer these questions, especially Questions 1.3 and 1.4.
- Learners need to be exposed to the same answer sheet format as used in the NSC examination, in order to get used to marking the correct answer with an X.
- Since learners still battle with the matching of items in the two-column question format, teachers should expose learners to this type of format in their informal class tests.

QUESTION 2: AGRICULTURAL MANAGEMENT

Generally, the question was answered well and there were a few cases of exceptionally good performance.

(i) COMMON ERRORS AND MISCONCEPTIONS

The following sub-questions were poorly answered by many candidates: 2.1.1, 2.1.3, 2.1.4, 2.1.5, 2.2.2 and 2.4. Many of these questions required a significant degree of reading and application of knowledge. Learners need to be continually exposed to similar types of question. Responses from candidates indicated that graph interpretation is still a serious challenge to the majority of them. This might be attributed to a lack of exposure to these types of question. Moreover, the majority of candidates might not be proficient in English or Afrikaans.

In Question 2.1.1, some candidates' responses did not indicate the importance of keeping financial records. They provided simplistic responses such as 'to see money on the farm'. This indicated an inadequate command of language.

In Question 2.1.3, some candidates could not calculate the profit because they were unable to provide the correct formula.

In Question 2.1.4, most candidates did not interpret the key verb 'deduce', and their responses did not provide a deduction from the table. This also indicated that they struggled with data response questions.

In Question 2.1.5, some candidates gave general ways of generating capital and not those reflected in the data provided.

Question 2.2.2 on entrepreneurial skills was asked from a perspective different from the norm. Some learners mentioned the entrepreneurial skills of the farmer and not the manufacturer of the device.

Question 2.4 contained considerable data on graphs, which might have been overwhelming for many learners. For example, in Question 2.4.3, learners failed to determine quantities as 100s and simply wrote 2 and 3 instead of 200 and 300.

(ii) SUGGESTIONS FOR IMPROVEMENT

Refer to the overviews of Paper 1 and Paper 2 for general suggestions, particularly with regard to dealing with the reading required, terminology, language, concepts, graphs, use of previous NSC papers and exposure to different types of questions. The following suggestions are made in the context of this question:

Teachers should ensure that there is integration with subjects such as Accounting in order to facilitate understanding of the importance of financial record-keeping, and with Mathematics and Mathematical Literacy for a comprehensive understanding of formulae and correct calculations.

'Deduce' is one of the key action verbs indicated in the examination guidelines and is used to introduce higher-order questions. Such key words should be regularly used in formative and formal assessment tasks, so that learners can become familiar with them.

It is important that candidates differentiate clearly between entrepreneurial skills and entrepreneurial characteristics/ properties. Learners should know how the supply and demand graphs work as well as the relationships involved. The elasticity of the graphs should be explained carefully and clearly.

Teachers need to be careful to focus not only on aspects of content that have come up in previous question papers, but on all content topics as indicated in the Examination Guidelines. These might be topics which have not been covered in recent question papers, but they remain important content topics.

QUESTION 3: PRODUCTION FACTORS AND MANAGEMENT

The general level of response to this question was average. There were, however, instances of poor performance in sub-questions 3.1.1, 3.1.3, 3.3.2, 3.4.1 and 3.6.1.

(i) COMMON ERRORS AND MISCONCEPTIONS

Learners found it difficult to motivate or apply their knowledge to substantiate an answer. In Question 3.2, learners had to provide three functions of land and instead responded by giving economic characteristics of land. Learners could not gather the required information from the data provided: e.g. in Question 3.4, learners lacked understanding of the relevant management skills.

In Question 3.1.1, some candidates failed to follow the instruction and merely listed all assets, without indicating whether they were fixed or movable. They also did not arrange their answers in a table format as required.

In Question 3.1.3, the majority of the candidates could not explain the term, 'net worth'. They seemed very unfamiliar with it.

It is clear from Question 3.1 that, besides 'net worth', most of the learners did not know the difference between fixed, movable and working capital.

Question 3.3.2 was not well answered by most candidates. This was because they merely re-wrote the whole passage from the case study as a reason for a farmer to have the most motivated workforce.

In Question 3.4.1, some candidates tried to describe letters (A–F) without providing them as answers to (a–e).

Answers to Question 3.6 suggest that teachers should ensure that learners understand the aims of the basic laws applicable to agriculture. From the responses, it was clear that the learners did not know the legislation and could not

quote the Acts.

(ii) SUGGESTIONS FOR IMPROVEMENT

Refer to the overviews of Paper 1 and Paper 2 for general suggestions, particularly with regard to dealing with the reading required, terminology, language, concepts, graphs, use of previous NSC papers and exposure to different types of question, including case studies.

The following suggestions are made in the context of this question:

- Case studies and scenarios need to be included in assessment tasks given to learners during the school year, in order to expose them to activities which would improve their skills in answering these types of questions. These interventions could assist in improving reading and understanding skills, application of knowledge, and awareness of how to follow instructions. This could be done by imposing penalties for not following instructions.
- The section on legislation appears to have been neglected and teachers should cover the most important legislation that regulates agricultural production as mentioned in the Examination Guidelines.

QUESTION 4: BASIC AGRICULTURAL GENETICS

This was generally the most poorly answered question in the paper. In this question, learners missed opportunities to use data which could lead them to the answers.

(i) COMMON ERRORS AND MISCONCEPTIONS

Most candidates' responses indicated that basic genetics is still a challenge to both teachers and learners. Sub-questions which reflected particularly poor answers were 4.1.1, 4.1.2, 4.1.3, 4.3.1, 4.4.1 and 4.4.2. The hormonal control of the oestrus cycle was again included and learners battled to respond to these questions.

Most learners struggled with the diagrams in Question 4.1 and Question 4.2. In Question 4.1.2, learners could not distinguish between the different types of dominance. Most learners offered 'co-dominance' as the answer, because it is the most common type of dominance after 'complete dominance'. In Question 4.1.3, learners could not explain the different types of dominance and referred only to 'complete dominance'.

In Question 4.3.1, some candidates could not deduce a reason from the passage and instead tried to describe Nguni cattle. It is clear that they do not understand the different crossings and other terminology in this section. Teachers need to give special attention to this content topic and make sure learners are extensively assessed on these concepts and knowledge.

Question 4.4 on the schematic representation line breeding was answered very badly. In general, learners did not understand the different breeding systems. In Question 4.4.1 on line breeding, some candidates simply picked figures randomly as common ancestors. In Question 4.4.2, most candidates' responses reflected that they were not familiar with methods of breeding.

(ii) SUGGESTIONS FOR IMPROVEMENT

The following suggestions are made in the context of this question:

- Candidates' responses implied that there is still a content gap in this section. Terminology and monohybrid crossings have not yet been mastered by the majority of candidates. Specific classroom attention needs to be devoted to

selection methods and techniques. These, together with the different methods of improving the condition of animals with the focus on aim, advantages and disadvantages, must be clearly explained to and illustrated for learners.

The following suggestions should improve performance in this area:

- The teaching of genetics should be enhanced by providing practical examples within the learning site, such as plants, flowers and livestock.
- There should also be integration with Life Sciences, as genetics is taught comprehensively in Life Sciences.
- Key to mastering basic genetics is the understanding of terminology. Learners should be able to describe concepts and provide practical examples to illustrate them.
- The use of agricultural magazines to provide additional resources for teachers and learners is particularly relevant to this section of genetics.
- Learners should read questions far more carefully.
- Activities to improve reading skills, interpretation of questions and improvement in basic conceptual knowledge and scientific terms must be emphasised in the classroom from Grade 10.

5.3 BUSINESS STUDIES

The following report should be read in conjunction with the Business Studies question paper of the November 2011 Examination.

SECTION 1 - QUANTITATIVE ANALYSIS

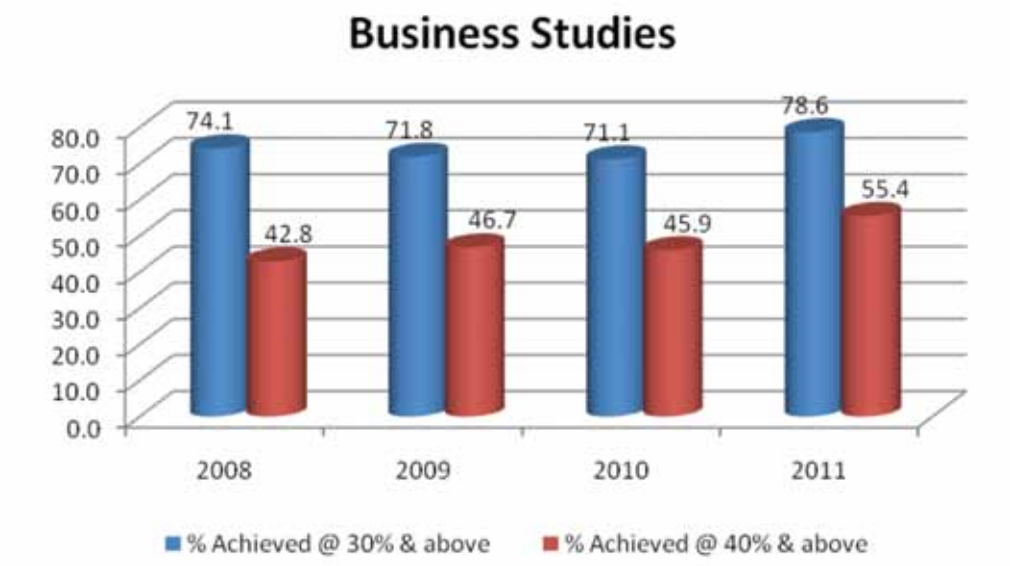
OVERALL ACHIEVEMENT RATES (2008 - 2011)

The performance of candidates in the 2011 Business Studies examination reflected a significant improvement in the quality of work produced and in the pass rates at both the 30% and 40% levels.

TABLE 3: OVERALL ACHIEVEMENT RATES IN BUSINESS STUDIES, 2008 - 2011

Year	No. Wrote	No. Achieved @ 30% and above	% Achieved @ 30% and above	No. Achieved @ 40% and above	% Achieved @ 40% and above
2008	204 963	151 895	74.1	87 553	42.7
2009	206 553	148 469	71.9	96 487	46.7
2010	200 795	142 742	71.1	92 259	45.9
2011	187 677	147 559	78.6	104 027	55.4

FIGURE 3: OVERALL ACHIEVEMENT RATES IN BUSINESS STUDIES, 2008 - 2011



SECTION 2 - QUALITATIVE ANALYSIS OF LEARNER PERFORMANCE

GENERAL OVERVIEW OF LEARNER PERFORMANCE

The performance of learners in Business Studies has improved and the questions were generally answered satisfactorily.

Candidates attempted most of the questions. The improvement in the understanding of basic concepts, and interpretation and analysis of information, is commendable.

The following errors and misconceptions were evident:

- **Basic concepts**: The section on the business environment forms the basis for all content in the curriculum. Teachers need to ensure that these concepts are properly covered from Grade 10.
- **Basic mathematical calculations**: These appeared challenging (e.g. simple interest). Teachers should conduct short formative class tests on calculations.
- **Revision of basic knowledge from previous grades**: Teachers should ensure that revision of essential prior information from the Grade 11 curriculum is done before or while new relevant Grade 12 content is covered.
- **Time allocation**: Teachers should train learners in the art of managing their time and adhering to the suggested time allocations provided in the paper.
- **Language**: This appears to be challenging for most candidates, who have difficulty reading, understanding and interpreting some of the higher order questions, including case studies and scenarios. This also leads to a failure to interpret action verbs correctly, and to write complete sentences in responses. Most candidates gave one-word answers for questions requiring them to 'describe', 'explain', 'define' and 'list'. Their inability to write paragraphs and essays indicates insufficient practice in Grades 10 - 12. The use of previous NSC examination papers would assist learners in this regard.
- **Essay techniques**: Many candidates used the correct essay structure. Learners must be taught how to write essays as part of the formative assessment activities in the classroom. The examination guidelines require candidates to use headings and sub-headings in order to assist them to set out the essays logically. Essay questions demand full explanations, not simply a series of one- or two-word responses; however, full sentences in point form may be used. The introduction and conclusion should reflect the candidates' interpretation of or stance on the topic and should not merely repeat the question. Learners should be informed about how essays will be marked, including the breakdown of the 32 marks. The concept of LASO (i.e. layout, analysis, synthesis and originality) must be clearly explained to them to avoid unnecessary loss of marks. Learners should be given sufficient practice in essay writing. They must be taught to read a question properly and to identify key action verbs which indicate how or what should be answered.
- **Responding to case studies**: Learners need to learn how to identify specific aspects of or issues in the given case study (e.g. challenges, in the case of Question 2). They should be taught how to read, understand and interpret questions related to each case study. They should also be guided on how to use the information. This can be done only through continual exercise in the classroom, using case studies and scenarios from previous question papers or question banks available on various topics for the Grade 12 learner.
- **Data response**: Questions based on data response appeared challenging to most candidates. Short, formative class tests and use of previous NSC examination papers would assist learners in this regard.

The attention of teachers is drawn to the following:

- **Examination guidelines**: There is an indication that many teachers appear not to be consulting the examination guidelines in the planning of what should be taught, e.g. the majority of learners did not answer Question 5 on the National Credit Act 34 of 2005, and those who did, either did not answer it very well or mentioned irrelevant points or confused it with credit cards and credit trading.

- **Short, formative assessment tasks**: These can be used effectively to give learners a chance to practise questions on all topics. These tasks would enable learners to deal with various issues in manageable quantities, e.g. in mastering writing skills using business studies language, building vocabulary necessary to discuss topics at length, using correct formats when writing essays, answering the different questions which might be posed, and mastering the calculations and formulae used within the subject.

- **Liaison with teachers of other subjects**: The Business Studies teacher must also work hand in hand with the English, Mathematics and Mathematical Literacy teachers to help improve the ability of learners to deal with the language proficiency requirements and to gain confidence in the required calculations.

- **Workshops**: Content-based cluster meetings should be run by cluster leaders and subject advisers on various challenging issues, e.g. to assist teachers who find calculations a challenge. Exam banks and previous NSC papers can be used to collect exemplars to be used at these sessions. In this way, the subject advisor is able to address a number of challenges at the same time and give guidance where necessary. Teachers can also share strategies on how to approach the concepts in class so as to make them more interesting and accessible for the learners. The teacher development unit can also run workshops on this section if necessary.

B. ANALYSIS OF LEARNER PERFORMANCE IN INDIVIDUAL QUESTIONS

SECTION A: MULTIPLE CHOICE/SHORT ANSWER QUESTIONS

QUESTION 1: COMPULSORY: MULTIPLE CHOICE, CHOOSING CORRECT WORDS AND MATCHING COLUMNS

Most candidates did very well in this question. The cognitive levels catered for differing levels of ability. This section does not normally pose challenges since it is usually straightforward.

(i) COMMON ERRORS AND MISCONCEPTIONS

It appears that some candidates did not read the questions properly and therefore chose the wrong multiple-choice or matching options.

Many learners were challenged by the identification of an expense item (Question 1.1.5), the role of the CCMA (Question 1.1.8), tax rebates (Question 1.1.10), overtime (Question 1.2.5) and defining a go-slow strike (Question 1.3.1). For instance, in Question 1.1.8, learners chose the workplace forum as the correct answer instead of the CCMA. The employees are part of the workplace forum; the candidates did not understand the question properly.

(ii) SUGGESTIONS FOR IMPROVEMENT:

Teachers should make use of question banks available in the form of newspaper supplements or publishers' exam supplements. They should also make use of previous NSC question papers available on the DBE website to train learners how to answer typical examination questions. In the case of multiple-choice or matching questions, the learners should read the questions carefully before answering and, if they do not know an answer, they should be able to work it out by eliminating the obviously incorrect options.

Class tests and quizzes can be used from Grade 10 to reinforce and boost learners' confidence in answering these types of questions. Shortcomings should be addressed in Grades 10 and 11 to reduce the amount of revision time necessary in Grade 12.

SECTION B: LONGER AND PARAGRAPH QUESTIONS, USING CASE STUDIES AND INFORMATION

QUESTION 2: COMPULSORY: CHALLENGES & SOCIO-ECONOMIC ISSUES

The question was well answered by most learners as case studies are regularly covered in detail in earlier grades.

(i) COMMON ERRORS AND MISCONCEPTIONS

The question on the sector (Question 2.1.1) was misinterpreted by some learners since they responded by giving alternative answers on the sectors. Only a few learners saw JJ Taxis as part of the Tertiary Sector.

In the question on the challenges (Question 2.1.2), some learners were unable to recognise challenges from the case study. Many did not answer in the table format but wrote answers in essay or paragraph format under the correct headings. The linking of the environment and the extent of control of the challenge was a problem for some.

In the question on stress levels (Question 2.2), candidates came up with very creative ways of reducing stress levels in the workplace, but many used repetitive examples and therefore could not be credited for each example provided. Others appeared to be confused and discussed 'employee well-being' instead of ways of 'reducing stress of employees'.

In the question on the advertisement (Question 2.3), candidates could not get full marks because they failed to respond to the action verb '***Explain'.*** In Question 2.3.3, candidates spent a lot of time extensively elaborating on recruitment and subsequently lost marks. Many candidates merely repeated information from the advertisement to answer this question, instead of outling the required procedure.

In the question on HIV/Aids and its impact on business (Question 2.4), some learners did not indicate the implications of HIV for business, but appeared to use their Life Orientation knowledge to generalise about the social impact of the disease.

(ii) SUGGESTIONS FOR IMPROVEMENT

Learners should be taught how to read, understand and interpret questions related to case studies. They should also be coached or guided on how to use and adapt the information given in answering the questions, instead of merely repeating the information. This can only be done through continual exercise in the classroom, using case studies and scenarios from previous question papers or question banks available on various topics for the Grade 12 learner. Subject Advisors should assist the schools to ensure that these resources are available.

QUESTION 3: COMPULSORY: FORMS OF OWNERSHIP, ENTREPRENEURSHIP, TEAM DYNAMICS & INVESTMENTS

The performance of candidates in this question was average. The main challenges were the calculations and assumptions they had to make concerning the investments. The questions on the forms of ownership, entrepreneurial qualities, successful teams and causes of conflict were answered very well by most candidates.

(i) COMMON ERRORS AND MISCONCEPTIONS

In the question on the Partnership (Question 3.1), many learners managed to identify the characteristics of partnerships but could not give reasons to motivate why it could be considered a good form of ownership.

In the question on entrepreneurial qualities (Question 3.2), some candidates did not read the question properly and answered on the success factors of the business instead of the entrepreneurial qualities.

In the question on causes of conflict (Question 3.4), many learners repeated examples and provided examples of conflict instead of focusing on the causes.

In the question on investments (Question 3.5), some candidates' responses were partly correct, earning them part marks, but it was observed that many learners did not answer the second part of the calculation (on Rate of Return), consequently losing a substantial number of marks. Candidates were not sure whether to calculate the percentage return or the amount of the return. Of concern is that many candidates did not see that 'simple interest' was asked in the calculation and not 'compound interest'. Many lost marks because of this.

(ii) SUGGESTIONS FOR IMPROVEMENT:

Learners need to be exposed to calculating returns on investments using different methods of calculation. They should also be taught how to evaluate investments and to motivate or support their answer. Teachers can use previous NSC papers and exam supplements to find questions relevant to the topic for use in formative assessment tasks.

Teachers should ensure that revision of essential prior knowledge from the Grade 11 curriculum is done before or while new relevant Grade 12 content is covered or while preparing learners for the Grade 12 paper.

Learners need to be taught to understand the nature of the different forms of ownership and not only the advantages or disadvantages.

QUESTION 4: COMPUSORY: STRATEGIES, LABOUR RELATIONS, PROBLEM- SOLVING, ETHICAL & PROFESSIONAL BEHAVIOUR, INSURANCE & DATA RESPONSE

Learners generally did not do well in this question, but most knew the functions of the trade unions (Question 4.3) and were able to do the question on analysis of non-verbal information very well (Question 4.6 – graph).

(i) COMMON ERRORS AND MISCONCEPTIONS

In Question 4.1, many candidates erroneously confused the problem-solving steps with steps to resolve conflict or the procedure to solve grievances. In the question on types of strategies (Question 4.2), many candidates appeared to be confused. Although they knew the types of strategies, they could not match them correctly to the scenarios given. Although the question on trade unions (Question 4.3) was generally well answered, some answers were too vague to earn marks.

In the question on insurance (Question 4.4), many candidates could not give reasons why insurance for a bond is necessary and appeared not to be familiar with the term 'mortgage bond'.

In the ethical question on pricing in rural areas and sexual harassment (Question 4.5), many candidates could not explain how and why high pricing in rural areas could be an unethical action and how it should be addressed by businesses. Some candidates did not draw a clear distinction between pricing in rural areas and sexual harassment, in their answers and combined them in such a way that full marks could not be awarded. Some candidates erroneously assumed that sexual harassment is a problem only in the rural areas and many failed to give a recommendation on this aspect as well.

(ii) SUGGESTIONS FOR IMPROVEMENT

Teachers should make learners aware of the distinction among problem-solving, conflict management and grievance procedures.

Special attention should be given to teaching the different types of strategies, e.g. diversification, divestiture and liquidation. The learners should memorise and understand the different types of strategies. Examples should then be used to give practical meaning to the different strategies. A list is available in the examination guidelines.

Teachers ought to encourage learners need to keep abreast of major developments in the business environment and to apply basic general knowledge in their responses to the higher-order questions in an examination paper. Use of a 'news corner' in the classroom could be effective in this regard.

In respect of data-response questions, learners must be taught to differentiate between different types of graphs, especially bar graphs and histograms.

SECTION C: (ESSAY QUESTIONS: LEARNERS HAD TO ANSWER ANY TWO QUESTIONS)

Candidates performed very poorly in this section, particularly in Question 5. Their responses were poorly structured, and often did not focus on the topic.

QUESTION 5: LEGISLATION (NATIONAL CREDIT ACT 34 OF 2005)

Very few learners attempted this question. Those who knew the National Credit Act were able to achieve good marks.

(i) COMMON ERRORS AND MISCONCEPTIONS

Some learners did not know the National Credit Act 34 of 2005, but still attempted to answer this question. They wrote generally about credit, which they seemed to understand well, but focused on credit cards and credit trading, instead of the purpose of the Act, and its advantages and disadvantages. Learners mixed up the information and it was difficult for markers to find the answers.

(ii) SUGGESTIONS FOR IMPROVEMENT

Educators must consult their Examination Guidelines to determine content to be taught when preparing learners for NSC examination. The National Credit Act 34 of 2005 must be taught, together with other relevant legislation as specified in the examination guideline.

Subject advisors need to ensure that all schools in their districts are fully equipped with the relevant teaching and learning material, to bridge the gaps which might exist where the topic is not covered in particular textbooks. The content of the National Credit Act is an important case in point.

QUESTION 6: HUMAN RIGHTS, INCLUSIVITY AND ENVIRONMENTAL ISSUES

The question was answered by many learners and performance ranged from very poor to very good.

(i) COMMON ERRORS AND MISCONCEPTIONS

Many learners displayed sketchy knowledge of inclusivity, and they erroneously discussed the concepts of inclusivity and

human rights interchangeably. They did not read the question carefully and therefore gave incorrect or illogical answers.

Many could not explain the nature of human rights, inclusivity and environmental issues. Some gave only a brief one-sentence report on each concept, while it was clear from the question that a more comprehensive response was required.

The second part of the question (relating to the scenario at North West University) could have been addressed as a separate part or it could have been an extension of the discussion of each of the three concepts. If it was addressed as a separate part, candidates were expected to subdivide it into the three concepts, which many did not do. The examples in the scenario should have been used in such a way as to illustrate or support the concepts covered in the question.

Learners appeared to be unfamiliar with the terms 'nature' and 'evaluate' and therefore lost marks because they did not discuss the concepts appropriately.

(ii) SUGGESTIONS FOR IMPROVEMENT

Learners should be taught to discuss and evaluate a concept and also use examples to illustrate the application of the concept.

Headings and sub-headings should be used to show how the concept is applied. For example:

HUMAN RIGHTS	INCLUSIVITY	ENVIRONMENTAL ISSUES
Discussion	Discussion	Discussion
Evaluation/Examples	Evaluation/Examples	Evaluation/Examples

QUESTION 7: LEADERSHIP AND MANAGEMENT

The question was well answered by those who knew what the different leadership styles entailed, while others were confused and thought it was the difference between leadership and management.

(i) COMMON ERRORS AND MISCONCEPTIONS

Although the evaluation of the three leadership styles was very straightforward, few candidates followed the instruction to analyse the statement, report on it and provide examples. The discussion by candidates was not always to the point and did not often produce useful material, as few candidates could explain how these styles could be applied in the workplace. Owing to their failure to comply with the LASO requirements (see general overview above), some learners failed to gain full marks.

(ii) SUGGESTIONS FOR IMPROVEMENT

Educators should teach learners about the different leadership styles, and the difference between leadership and management. It is important to provide practical examples or scenarios to illustrate the characteristics, advantages, disadvantages and uses of each. Previous question papers and currently available question banks can be used to teach learners on how to attempt essays on this topic.

QUESTION 8: QUALITY OF PERFORMANCE IN THE BUSINESS FUNCTIONS

Most of the candidates attempted this question and many did very well. However, many other candidates wrote a lot but without any insight into how quality of performance within the business functions could contribute towards successful operations. Few candidates could provide appropriate examples in their discussions.

(i) COMMON ERRORS AND MISCONCEPTIONS

The answers provided by the candidates lacked impact and understanding of what was required. Many candidates failed to focus on the quality of performance and concentrated only on the functions of Business Management.

Many learners lost marks for lack of originality as they were not able to think of relevant examples. (Refer to LASO requirements in the overview above).

(ii) SUGGESTIONS FOR IMPROVEMENT

Learners should be coached on how to evaluate the quality of performance within the context of the different business functions. The case study or information given in this question was intended to lead the candidates to answering this question. Before answering a question, learners should use their judgement on whether or not the given information should be used in the answer.

5.4 ECONOMICS

The following report should be read in conjunction with the Economics question paper of the November 2011 Examination.

SECTION 1 - QUANTITATIVE ANALYSIS (2008 - 2011)

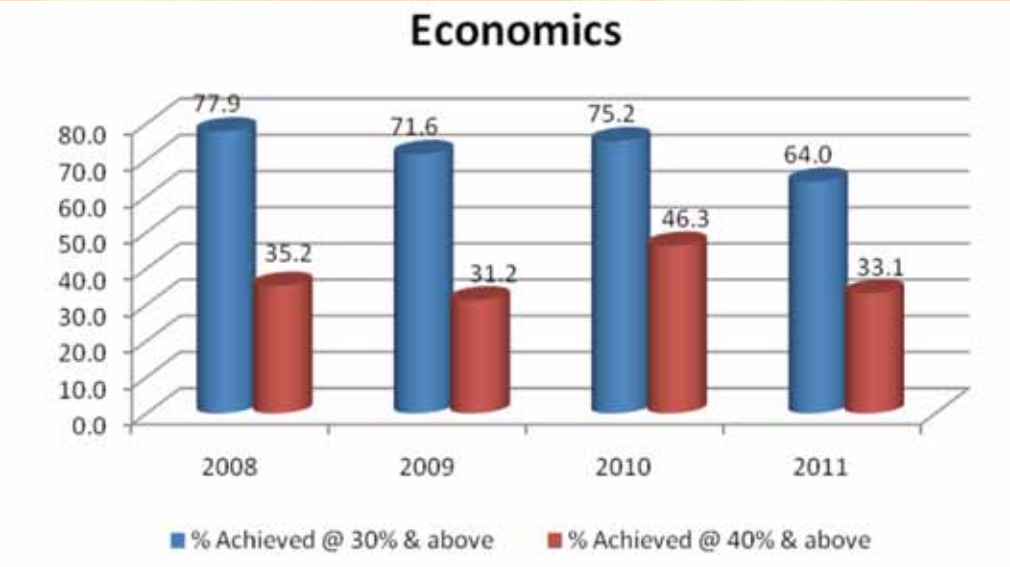
OVERALL ACHIEVEMENT RATES (2008 - 2011)

The performance of candidates in the NSC 2011 Economics examination reflected a disappointing decline. There was a noticeable decrease in the pass rate at the 30% and 40% levels. It appears that many candidates were unable to cope with the demands of the curriculum, including basic conceptual knowledge. This is an area which will require intervention in the preparation for future NSC examinations.

TABLE 4: OVERALL ACHIEVEMENT RATES IN ECONOMICS, 2008 - 2011

Year	No. Wrote	No. Achieved @ 30% and above	% Achieved @ 30% and above	No. Achieved @ 40% and above	% Achieved @ 40% and above
2008	154 518	120 520	78.0	54 158	35.0
2009	153 522	109 955	71.6	47 969	31.2
2010	147 289	110 824	75.2	68 164	46.3
2011	133 358	85 411	64.0	44 205	33.1

FIGURE 4: OVERALL ACHIEVEMENT RATES IN ECONOMICS, 2008 - 2011



SECTION 2 - QUALITATIVE ANALYSIS OF LEARNER PERFORMANCE

A. GENERAL OVERVIEW OF LEARNER PERFORMANCE

Judging from the general performance of candidates in the 2011 paper, the aspects commented on below appears to have been neglected in many centres. The suggested practices are expected to lead to improved performances in future NSC Economics papers and should be built into the work plan for the year:

- **Coverage of content:** All content specified in the curriculum should be addressed, because the final question paper covers all content in the NCS over a three-year period. Spotting of certain topics is prevalent, which could seriously disadvantage candidates.
- **Consideration of Examination Guidelines:** Teachers are advised to study the 2009 Examination Guidelines for Economics in detail to ensure correct and comprehensive handling of topics. If textbooks are deficient in any respect, additional content from other approved textbooks should be used to prepare learners well.
- **Terminology and language:** Language deficiency is still a major drawback for most second and third language learners. This problem should be addressed by teachers as they prepare learners for the final examinations. In general, the reading skills of learners need to be upgraded, as should the use of Economics terminology.
- **More care in choice of questions:** Teachers need to guide learners on how to choose questions in Section B. In Section B, it often happens that, if learners attempt all four questions, only the first three are marked, with the fourth struck through and ignored. This must be emphasised to learners. Learners must choose questions carefully before starting to answer them.
- **Use of formative tasks to improve basic conceptual knowledge:** Teachers must not only teach the theoretical content to learners, but must also ensure that learners understand the content. Small, formative assessment tasks should be used to ascertain whether learners are able to apply their knowledge, placing emphasis on their opinion and understanding. The teacher should not simply give learners a marking memorandum, but should give them guidance on getting to the answer.
- **Motivation of learners:** Teachers should realise that they play an important role in motivating their learners not only to attempt the shorter type of questions in examination papers, but also to study for the longer type of questions.
- **Exposure to different types of questions:** More tasks on data response questions, even on an informal basis, must be given to learners as early as Grade 10, to improve their performance in these types of questions. Learners should be supported by appropriate assessment activities. Where a discussion is needed, learners must discuss the topic in the question. Learners struggled to answer the higher-order questions. Some learners attempted only one or did not answer any of the essay questions. Learners need constant practice in answering a variety of questions, including case studies, cartoons, graphs and statistical information.
- **Expressing opinions:** Learners need guidance on how to express opinions that are clear and relevant to context. Formal assessment tasks such as projects and assignments must be consistent with examination guidelines.
- **Essay writing skills:** More practice in challenging content is required. Learners should be taught how to structure an essay – For example: clear introduction, content, clear conclusion, and devices used to bring about cohesive arguments. Teachers must use various teaching strategies to teach essay questions. Learners should practice responding in essay form. Learners should be taught how to write meaningful sentences and avoid incomplete and meaningless statements which do not address the requirements of the question. Teachers should monitor the progress of learners in writing longer pieces.
- **In-service training and support:** Subject/cluster meetings should be compulsory for all teachers. In these meetings, current economic developments should be discussed to ensure a broad general knowledge of Economics. Adequate support should be given to teachers, especially with regard to challenging content, and regular monitoring of weaker centres should take place.

- **Appropriate use of resource material:** Relevant newspaper cuttings should be given to learners as class work so as to improve their comprehension skills and ability to answer questions on extracts. Teachers should include explanations of abbreviations in their teaching and assessment tasks and not take it for granted that learners know their meanings. The Subject Assessment Guidelines and Examination Guidelines are to be used when developing lesson plans, so as to ensure that relevant content and context is taught. Teachers should keep abreast of developments in the subject through use of the media. Learners should be exposed to actual data, graphs & statistics.

B. ANALYSIS OF LEARNER PERFORMANCE IN INDIVIDUAL QUESTIONS

QUESTION 1: SHORT ITEMS

Most candidates performed satisfactorily in this question.

(i) COMMON ERRORS AND MISCONCEPTIONS

Most candidates did not understand the following concepts:

- Economies of scale (Questions 1.1.5); and
- Industrial Development Zones (Question 1.1.7);
- Furthermore, most candidates could not differentiate between:
- Depreciation and devaluation; and
- Equilibrium and disequilibrium.

The majority of candidates still do not understand what is depicted in microeconomic graphs.

A lack of knowledge and understanding of basic terminology cost candidates marks.

(ii) SUGGESTIONS FOR IMPROVEMENT

Candidates, who decided to write the description, instead of the letter, were awarded marks if they wrote the full description.

Focused teaching, learning and practice of concepts and terminology would improve the general quality of answers. Abbreviations related to the curriculum should be taught and learners should be regularly assessed on this content. Teachers are advised to start their lessons with the relevant Economic terms before teaching content. Continuous testing of concepts and terminology throughout the year should also be conducted.

Teachers need to be trained to deal with microeconomic graphs.

QUESTION 2 – MACROECONOMICS

Several centres performed exceptionally well in this question.

(i) COMMON ERRORS AND MISCONCEPTIONS

Question 2.2 - Many candidates mentioned goods and services that government provides. The emphasis on non-

excludability of these goods was not considered, leading to poor performances by most candidates.

Question 2.3 – Most candidates performed poorly in the data-response questions and could not calculate the trade balance. A variety of incorrect figures was used to calculate this figure. The only part of this question answered correctly was the definition of the Balance of Payments (BOP). Analysis and calculation of figures seem to be a huge problem for learners, although the calculations are very straightforward. Questions that required learners to give reasons were not mastered well and serve as evidence that learners are often not taught the basic knowledge, application and skills.

Question 2.5 – Most candidates performed poorly in this question, because they discussed exogenous instead of endogenous reasons for business cycles.

Question 2.6 – The question indicated the interaction between households and the state. Those candidates who did not do well neglected to focus on the interaction and simply described the two participants separately, earning a maximum of 4 marks.

- Candidates lost marks because they did not read instructions carefully; and
- Some responses were not commensurate with the mark-allocation.

(ii) SUGGESTIONS FOR IMPROVEMENT

The format of the BOP as published by the Reserve Bank is of the utmost importance and must be covered in depth by teachers in the classroom. Learners should be provided with worksheets on calculating national accounts aggregates.

Teachers should teach their learners to distinguish clearly between 'public goods' and 'community goods'. Focus must be placed on basic concepts, such as 'balance of payments' and 'trade balance'.

Candidates should be taught to identify the key words in a question.

Teachers ought to demonstrate how the amount of detail included in an answer is related to mark allocation.

QUESTION 3: MICROECONOMICS

(i) COMMON ERRORS AND MISCONCEPTIONS

Question 3.2 – Most candidates could not understand the action verb/key word and thus gave a wrong response.

Question 3.3 - Most learners showed a lack of interpretation and calculation skills as well as basic knowledge relating to graphs.

It is obvious that certain teachers experience difficulty in teaching graphs. Intensive workshops on this aspect and intensive revision by teachers of past NSC papers should solve this problem.

Question 3.4 - Interpretation of cartoons is challenging for learners. Most struggle to give a valid interpretation of a cartoon.

Questions 3.3 & 3.4 - Learners had little understanding of the theory of the firm.

Question 3.5 – Learners could not distinguish rationale, uses and steps taken in the CBA.

(ii) SUGGESTIONS FOR IMPROVEMENT

More teaching and revision time should be set aside for

- Micro- and macro-economics;
- The use and labelling of graphs;
- Profit maximization, the types of profits and determination of the size of profits;
- The drawing of all the cost and revenue curves and explaining the reasons for the shapes of the curves for both perfect markets and monopolies;
- Data response questions;
- The drawing, explanation and interpretation of graphs for both perfect and imperfect competition; and
- Differentiation among the rationale, steps and uses.

QUESTION 4: ECONOMIC PURSUITS

(i) COMMON ERRORS AND MISCONCEPTIONS

Most candidates could not understand the action verb/key words and thus gave a wrong response.

Question 4.3 - Most learners displayed poor knowledge of both concepts.

Question 4.4 - Most candidates were unable to interpret the cartoon.

Questions 4.5 & 4.6 - Most candidates displayed little or no knowledge of demand-side policies.

Question 4.4.2 - The concept 'globalisation' is mostly dealt with in Grade 11 and not in any detail in Grade 12. It was evident from the learners' responses that it had not been revised or had only been mentioned vaguely in the classroom.

Question 4.6 - Again, learners explained these economic concepts poorly, and displayed limited knowledge of the concept of free trade.

(ii) SUGGESTIONS FOR IMPROVEMENT

- Teaching of answering techniques needs to be emphasised.
- Basic concepts and terms used in the subject should be taught and assessed continually.
- Content dealt with in Grade 11 needs to be revised before the final NSC examinations.
- There should be focused study of cartoon interpretation.
- Policies applicable to the subject should be taught.

QUESTION 5: CONTEMPORARY ECONOMIC ISSUES

(i) COMMON ERRORS AND MISCONCEPTIONS

- Basic knowledge was lacking.
- Questions were poorly read: there was an inability to identify the action verb and respond appropriately.
- There was poor understanding of IKS, the trend of the graph and how to extract information from the text.

(ii) SUGGESTIONS FOR IMPROVEMENT

Refer to the general overview above, particularly with regard to exposure to different types of questions.

QUESTION 6: MACROECONOMICS & CONTEMPORARY ECONOMIC ISSUES

(i) COMMON ERRORS AND MISCONCEPTIONS

Question 6.2 - Grasp of content was limited.

Question 6.3 - Most candidates struggled with the calculation and interpretation of this question.

Questions 6.3.2 and 6.3.3 were answered very poorly regarding the calculation and interpretation of data, and candidates did not understand the concept of gross capital formation.

Question 6.4 - Once again, candidates displayed a poor grasp of the significant concepts.

Question 6.5 - The majority of learners performed poorly in this question. Some candidates confused public sector failure with public sector provisioning and market failure.

Question 6.6 - The majority of learners performed poorly in this question.

(ii) SUGGESTIONS FOR IMPROVEMENT

Refer to the general overview above regarding the coverage of the content, terminology and language.

The essential concepts that must be taught by teachers on this topic include that of (GDP(P) = GDP(E) = GDP(I)). This should start in Grade 10. Teachers should clarify differences between among different concepts.

QUESTION 7: MACROECONOMICS

(i) COMMON ERRORS AND MISCONCEPTIONS

Many attempted the question but performance was generally poor. Although the Examination Guidelines require a detailed discussion of both demand and supply reasons for international trade, candidates did not know what was expected of them. The question narrowed the candidates' response to supply-side reasons only.

Although candidates could supply reasons for international trade and could provide examples for every reason, they expanded their answers with unnecessary details.

Many candidates misinterpreted the question and discussed various topics related to international trade but completely irrelevant to the question. Some candidates could not differentiate between demand and supply reasons for international

trade, thereby losing marks in this question.

(ii) SUGGESTIONS FOR IMPROVEMENT

- The concept of demand and supply needs emphasis and careful mediation.
- Essay-writing skills need development.
- Examples of good essays should be provided.

QUESTION 8: MICRO-ECONOMICS

(i) COMMON ERRORS AND MISCONCEPTIONS

Many candidates could not draw the graphs properly. Candidates forfeited marks by omitting details such as labelling of axes, curves and plotting the equilibrium point.

Many were confused by the position of the AC curve, which was necessary to indicate economic profit and losses. Candidates could not distinguish clearly between economic profit, economic loss and normal profit. Many candidates included data not requested in the question paper, e.g. characteristics of the perfect market and market structure. Learners have an idea of the expectations but fall short in accuracy and application.

(ii) SUGGESTIONS FOR IMPROVEMENT

In teaching this challenging section of work on micro-economics, teachers are advised to seek the assistance of knowledgeable colleagues, particularly with regard to the construction of graphs. Teachers should show learners where the marks are allocated, e.g. for the labelling of the axis or the shape of the curve.

Teachers are also advised to use the available resources such as previous NSC question papers, to give learners a full understanding of how questions on this topic are phrased.

QUESTION 9: ECONOMIC PURSUITS

(i) COMMON ERRORS AND MISCONCEPTIONS

Most of the learners performed poorly in this question and misinterpreted the question on indicators connected to business cycles.

Many candidates discussed the economic indicators used in forecasting the business cycle and failed to respond to the question appropriately. Candidates tend to focus more on discussing the given headings as individual topics instead of discussing them as economic indicators.

(ii) SUGGESTIONS FOR IMPROVEMENT

- The applicable concepts need to be thoroughly taught.
- Essay-writing skills need to be emphasised.

QUESTION 10: CONTEMPORARY ECONOMIC ISSUES

(i) COMMON ERRORS AND MISCONCEPTIONS

Approximately half of the candidates who attempted this question performed well.

Some learners answered the causes of demand-pull inflation but included cost-push inflation in their responses.

Some learners misinterpreted this question by giving full explanations on the other kinds or types of inflation, e.g. hyperinflation, stagflation or consumer inflation.

(ii) SUGGESTIONS FOR IMPROVEMENT

This question required that learners discuss both causes and consequences of demand pull inflation. Their responses should have been divided into the two component parts. Teachers need to place emphasis on careful reading of questions and responding precisely to what has been asked.

GENERAL COMMENTS

Short formative tests, self- or peer-marked, should serve to improve learners' understanding of basic concepts and data.

Common controlled tests should maintain and motivate the quality of teaching, learning and assessment.

Teachers need to refer to all five approved textbooks and prepare notes rather than depend on one textbook. The approved textbooks are:

- *Enjoy Economics* published by Heinemann;
- *Economics for all* published by Macmillan;
- *Focus on Economics* published by Maskew Miller;
- *OBE for FET on Economics* published by Nasou; and
- *Oxford Successful Economics* published by Oxford.

In addition, the South African Reserve Bank (SARB) *Quarterly Bulletin*, newspapers, magazines and other media should be used to illustrate current economic developments in the country and the world.

5.5 ENGLISH FIRST ADDITIONAL LANGUAGE

The following report should be read in conjunction with the English First Additional Language question papers of the November 2011 Examination.

SECTION 1 - QUANTITATIVE ANALYSIS (2008 - 2011)

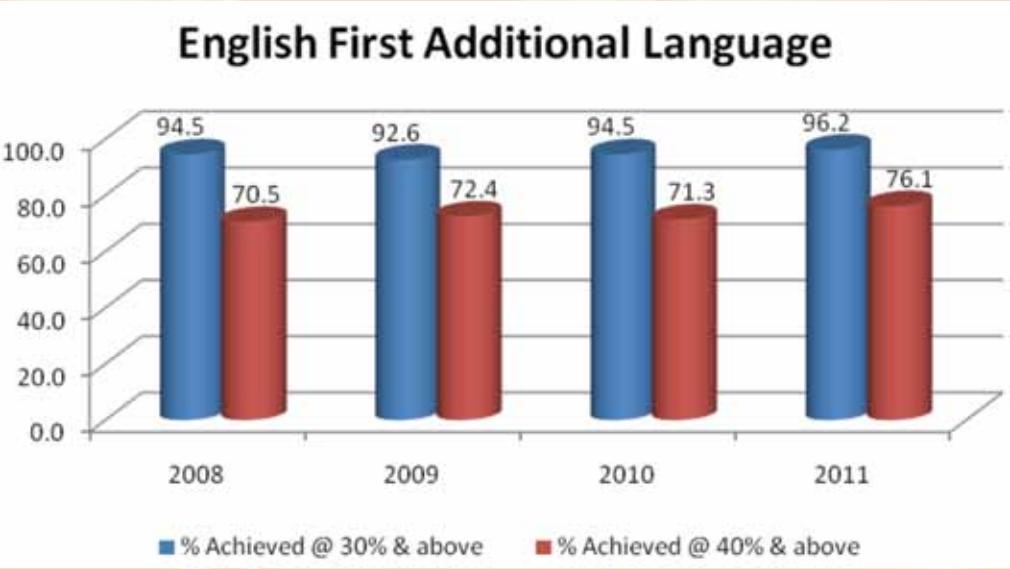
OVERALL ACHIEVEMENT RATES (2008 - 2011)

A comparison of statistics from 2008 – 2011, shows some fluctuations in the various attainment levels. The results in the 2011 examination indicate that a higher number of candidates passed at the 30% and at 40% levels than in the past three years.

TABLE 5: OVERALL ACHIEVEMENT RATES IN ENGLISH FIRST ADDITIONAL LANGUAGE, 2008 - 2011

Year	No. Wrote	No. Achieved @ 30% and above	% Achieved @ 30% and above	No. Achieved @ 40% and above	% Achieved @ 40% and above
2008	472 756	447 310	94.6	327 335	69.2
2009	469 486	435 104	92.7	339 715	72.4
2010	449 080	424 392	94.5	320 350	71.3
2011	414 480	398 740	96.2	315 313	76.1

FIGURE 5: OVERALL ACHIEVEMENT RATES IN ENGLISH FIRST ADDITIONAL LANGUAGE, 2008 - 2011



SECTION 2 - QUALITATIVE ANALYSIS OF LEARNER PERFORMANCE

PAPER 1

GENERAL OVERVIEW OF LEARNER PERFORMANCE

The paper was generally well received by candidates. The texts used to assess the relevant Learning Outcomes and Assessment Standards were interesting and relevant. The overall performance in the paper was satisfactory.

A. ANALYSIS OF LEARNER PERFORMANCE IN INDIVIDUAL QUESTIONS

SECTION A: COMPREHENSION

QUESTIONS 1

Candidates were able to respond to both the texts set for comprehension: Text A, 'Baby Fat' and Text B, 'Money Smart'. The majority of candidates were able to answer questions dealing with cognitive levels 1 to 3 satisfactorily. A measure of difficulty was experienced with questions on cognitive level 4. The open-ended questions in each text produced some interesting responses.

(i) COMMON ERRORS AND MISCONCEPTIONS

The following errors and misconceptions were evident:

- Lack of correlation between answers and marks allocated to the various questions;
- Inability of candidates to answer questions in their own words;
- Answers irrelevant to the questions set;
- Vague, unfocused and ambiguous answers;
- Failure to take note of or follow instructions;
- Use of information from general knowledge to answer questions;
- Poorly expressed answers; and
- Illegible handwriting.

(ii) SUGGESTIONS FOR IMPROVEMENT

The following remedial measures are suggested:

- Demonstration of how length of answers is related to the allocation of marks per question;
- Teaching candidates how they should answer questions in their own words;
- Techniques of identifying relevant information in the text, such as identifying key words and taking note of line and

paragraph references in the question;

- Practical lessons on clear, concise and focused answering techniques;
- Emphasising the need to follow all instructions carefully;
- The importance of basing answers on the given text, except in cases where candidates are asked for their own views;
- Teaching the basics of English grammar, spelling, idiomatic usage, vocabulary extension, sentence construction and paragraphing; and
- Illegible handwriting.

SECTION B: SUMMARY

QUESTION 2

This question was generally well answered as most candidates were able to relate to the subject of the text, which dealt with ways to improve one's self-image.

(i) COMMON ERRORS AND MISCONCEPTIONS

The following errors and misconceptions were evident:

- Failure to follow the given instructions;
- Inability to identify some of the main points;
- Heavy reliance on words from the texts;
- Writing in paragraphs instead of point form;
- Incorrect word count or omission of number of words used; and
- Poorly expressed responses.

(ii) SUGGESTIONS FOR IMPROVEMENT

The following remedial measures are suggested:

- Repeated reminders on the importance of following all instructions carefully;
- Extensive practice in summary writing on a variety of texts;
- Use of 'model' answers to teach summary writing techniques; and
- Intensive teaching of grammar.

SECTION C: LANGUAGE

QUESTION 3: ANALYSING AN ADVERTISEMENT

The advertised product (Pure Joy Fruit Juice) was found to be appealing to the majority of candidates. The visual texts which consisted of pictures of children of different races playing happily together appeared to be a strong point of connection.

(i) COMMON ERRORS AND MISCONCEPTIONS

The following errors and misconceptions were evident:

- Inability to appreciate fully the effect of advertising techniques such as font size, persuasive use of language and slogan; and
- Poorly expressed answers.

(ii) SUGGESTIONS FOR IMPROVEMENT

The following remedial measures are suggested:

- Analysing a variety of advertisements in class-based exercises with special reference to techniques used by advertisers to promote their products; and
- Lessons on sentence construction.

QUESTION 4: ANALYSING A CARTOON

The subject of the cartoon was relevant to the majority of the candidates. The cartoon illustrated the generation gap that exists between parents and children with regard to their tastes in music. The response to questions on techniques used by the cartoonist to convey his impressions of life was generally very satisfactory.

(i) COMMON ERRORS AND MISCONCEPTIONS

The following errors and misconceptions were evident:

- The failure of some candidates to read body language;
- Inability to see the link between the verbal and visual texts in the cartoon; and
- Poorly expressed answers.

(ii) SUGGESTIONS FOR IMPROVEMENT

The following remedial measures are suggested:

- Studying a variety of cartoons in class-based exercises with special reference to techniques used by cartoonists to convey their impressions of life;
- Exploration of the links between the verbal and visual texts in the cartoon; and
- Lessons on sentence construction.

QUESTION 5: LANGUAGE AND EDITING SKILLS

The answers of the majority of candidates in this section revealed an unsatisfactory grasp of basic language concepts.

(i) COMMON ERRORS AND MISCONCEPTIONS

The following errors and misconceptions were evident:

- Poor knowledge of: verb tenses, parts of speech, passive voice, tag questions, contractions of words, sentence constructions, and the rules of conversion from direct into indirect speech; and
- Failure to follow instructions.

(ii) SUGGESTIONS FOR IMPROVEMENT

The following remedial measures are suggested:

- The implementation of an intensive language teaching programme across all grades at school; and
- Repeated emphasis on the importance of following all instructions.

PAPER 2

A. GENERAL OVERVIEW OF LEARNER PERFORMANCE

The examination paper comprised questions on the following prescribed genres and texts:

Novels: *To Kill a Mockingbird*, *Lord of the Flies* and *A Grain of Wheat*

Drama: *Romeo and Juliet* and *Nothing but the Truth*

Short Stories: 'Manhood' and 'The Dube Trai'n

Poetry: 'Death be not proud', 'An elementary school classroom in a slum', 'The birth of Shaka' and 'A prayer for my countrymen'

The responses of candidates ranged from very poor to excellent. Candidates who answered contextual questions generally fared better than those who answered essay questions. The most popular selections were Poetry, Short Stories and the drama, *Nothing but the Truth.* Candidates experienced considerable difficulty in responding to the essay and contextual questions on *A Grain of Wheat,* and a measure of difficulty with *Lord of the Flies.*

B. ANALYSIS OF LEARNER PERFORMANCE IN INDIVIDUAL QUESTIONS

ESSAY QUESTIONS: (QUESTIONS: 1, 3, 5, 7, 9, 11)

Answers to essay questions were generally satisfactory. Candidates were able to demonstrate their understanding of the texts in response to the questions. It was evident, however, that several candidates lacked literary essay writing skills.

(i) COMMON ERRORS AND MISCONCEPTIONS

The following errors and misconceptions were observed:

- Retelling of the story;
- Insufficient knowledge of the structure of literary essays;
- Uncertainty regarding the names of characters and their character traits;
- Confusion about plot development and the chronology of events;
- Inability to express answers in correct language;
- Attempts to answer questions on texts that had not been studied; and
- Answering more than the required number of questions: either both the essay and the contextual questions or answering questions on more than two of the prescribed genres.

(ii) SUGGESTIONS FOR IMPROVEMENT

The following remedial measures are suggested:

- Illustration of the difference between narration of the plot and discussion of issues required by the questions;
- Teaching and consolidating literary essay writing skills with examination-type exemplar questions;
- Analysing characters in detail;
- Using visual ways to illustrate plot development (e.g. diagrams to illustrate chronology and inter-connectedness);
- Returning to the teaching of the basics of language, with special emphasis on sentence and paragraph construction;
- Advising learners to answer questions only on the texts studied at school and giving guidance on how to make judicious selections of questions where choices are offered; and
- Reading and following all instructions in examination papers.

CONTEXTUAL QUESTIONS

(QUESTIONS: 2, 4, 6, 8, 10, 12-16)

Contextual questions were generally well answered. Candidates were able to use information provided in the set passages as well as their knowledge of the texts to answer the questions. Weaker candidates lacked satisfactory knowledge of plot

and character.

(i) COMMON ERRORS AND MISCONCEPTIONS

The following errors and misconceptions were observed:

- Lack of correlation between the answers of candidates and the marks allocated to the questions;
- Difficulty in responding to questions dealing with figures of speech;
- Inability to focus on the requirements of the set questions;
- Inaccurate quotations from the set passages (when required); and
- Irrelevant answers.

(ii) SUGGESTIONS FOR IMPROVEMENT

The following remedial measures are suggested:

- Teaching skills to answer contextual questions taking into account the mark allocation;
- Lessons on figures of speech and the way they function in given contexts;
- Techniques of analysing the key requirements of specific questions;
- Emphasising the need for quoting accurately from the text; and
- Giving learners practice in answering examination-type contextual questions school based tasks.

PAPER 3

SECTION 2 - QUALITATIVE ANALYSIS OF LEARNER PERFORMANCE

A. GENERAL OVERVIEW OF LEARNER PERFORMANCE

The paper was generally well answered as candidates were able to relate to the topics which were mainly about life experiences. In Section A, candidates showed a preference for narrative essays. Discursive, descriptive and argumentative essays were avoided by the majority of the candidates. The most popular text in Section B was the question on dialogue, while the magazine article was the least popular. In Section C, candidates generally found some of the concepts and the meaning of terms difficult.

B. ANALYSIS OF LEARNER PERFORMANCE IN INDIVIDUAL QUESTIONS

The examination paper consisted of three sections: Section A; Essay, Section B; Longer Transactional Text and Section C, Shorter Text: Transactional/Referential/Informational. The questions indicated below are those with which candidates appear to have experienced the most difficulty:

SECTION A: ESSAYS

Question 1.1 'It was a dream come true':

Some candidates wrote about what they dream to achieve in the future instead of writing about what they have already achieved.

Question 1.3 'Technology has changed the lives of teenagers. Do you agree?'

Candidates who attempted this question did not write an argumentative essay as expected, but turned it into a narrative essay which lacked content.

SECTION B: LONGER TRANSACTIONAL TEXTS

Question 2.4: Magazine article

The very few candidates who attempted this question did not do well. Candidates appeared not to understand the phrase 'the sporting highlights' and wrote articles focusing on only one particular code of sport.

SECTION C: SHORTER TEXT: TRANSACTIONAL/ REFERENTIAL/INFORMATIONAL

Question 3.1 Advertisement

This question was popular but candidates did not use concepts crucial to advertising, such as persuasive language, slogans and logos. A large number of candidates used illustrations despite the note that marks would not be awarded for them.

Question 3.2 Postcard

Many candidates appeared to be uncertain about the meaning of the term "Holiday resort". As a result their responses centered on a holiday spent in another city or town.

(i) COMMON ERRORS AND MISCONCEPTIONS

The following errors and misconceptions were observed:

- Argumentative essay written in the form of a narrative essay;
- Insufficient planning and editing of drafts;
- Narrow interpretations of topics and severely limited responses;
- Poor grasp of writing skills;
- Inadequate knowledge of the idiom and grammar of the English language;
- Poor sentence and paragraph construction, vocabulary and spelling;
- Inappropriate tone, register and format;
- Inability to read and/or follow instructions; and

- Lack of depth and focus on the selected topics/questions.

(ii) SUGGESTIONS FOR IMPROVEMENT

The following interventions are suggested:

- Teaching the essential characteristics of the various types of essays with special emphasis on argumentative and discursive essays;
- Emphasising the value of careful planning and editing and giving learners opportunities to practice these aspects;
- Guidance on topic interpretation and selection;
- Lessons on information gathering techniques;
- Teaching the basics of English grammar, spelling, idiomatic usage, vocabulary extension, sentence construction and paragraphing; and
- Reading for a variety of purposes, especially for pleasure.

5.6 GEOGRAPHY

The following report should be read in conjunction with the Geography question papers of the November 2011 Examination.

SECTION 1 - QUANTITATIVE ANALYSIS (2008 - 2011)

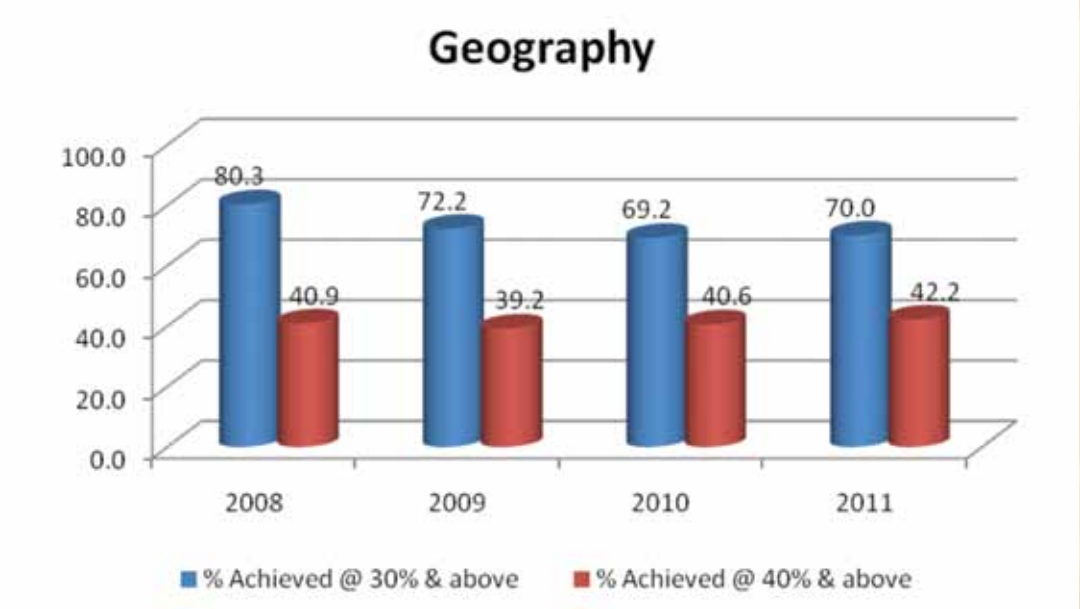
OVERALL ACHIEVEMENT RATES (2008 - 2011)

There has been a consistent improvement in learners' performance in Geography at the 40% and above achievement level since 2009.

TABLE 6: OVERALL ACHIEVEMENT RATES IN GEOGRAPHY, 2008 - 2011

Year	No. Wrote	No. Achieved @ 30% and above	% Achieved @ 30% and above	No. Achieved @ 40% and above	% Achieved @ 40% and above
2008	214 299	172 242	80.4	87 308	40.7
2009	215 120	155 481	72.3	84 279	39.2
2010	209 854	145 187	69.2	85 241	40.6
2011	199 248	139 405	70.0	84 169	42.2

FIGURE 6: OVERALL ACHIEVEMENT RATES IN GEOGRAPHY, 2008 - 2011



SECTION 2 - QUALITATIVE ANALYSIS OF LEARNER PERFORMANCE

PAPER 1

A. GENERAL OVERVIEW OF LEARNER PERFORMANCE

The question paper was well received by educators and learners. It was generally commented that the paper was of a fair standard and catered for weaker and stronger learners. Learners had enough time to finish the question paper.

Reports from various PEDs indicated that learners performed better overall. There are, however, concerns regarding the basic knowledge that learners need to enable them to perform better. This is clear from the number of definitions that learners could not answer. The follow-up questions were therefore poorly answered.

In order to improve on learner performance, teachers need to use past examination papers to ensure that the standard questions, used in school-based assessment tasks is appropriate. This will also assist teachers to get learners accustomed to the style of question setting. Teachers should ensure that the distribution of marks in the internal assessment tasks is according to the Subject Assessment Guidelines document, i.e. 30% lower order, 40% middle order, and 30% high order. If too many lower order questions are set in the internal assessments conducted at schools, learners are not exposed to the higher order questions that are set in the examination and are therefore left with a false notion of their performance. Teachers need to locate interesting, unseen resources on which to base their questions.

QUESTION 1: PHYSICAL GEOGRAPHY

All the questions were answered fairly well, with the exception of some sub-questions which were poorly answered. These are mentioned in below.

(i) COMMON ERRORS AND MISCONCEPTIONS

- Many candidates interchanged the terms ‘Polar Cell’ and ‘Polar Front’;
- Learners could not distinguish between the three pressure cells in the tri-cellular arrangement in terms of their strength;
- Candidates could not distinguish between pressure belts and pressure cells;
- Candidates were not familiar with the term *plan view;*
- Candidates found it difficult to match profiles with the plan view sketch;
- Candidates had a problem with the question on *categories of tropical cyclones*;
- Candidates could not link petrol use to flooding;
- Candidates struggled with questions on the *flow hydrograph*; and
- Candidates struggled to identify slopes and slope elements.

(ii) SUGGESTIONS FOR IMPROVEMENT

- Teachers need to address the tri-cellular arrangements in terms of the strong, the weaker and the weakest. This must be linked to cells that are heat generated i.e. the Polar Cell and the Tropical/Hadley Cell;
- The plan view is an additional concept to address along with the cross-profile and longitudinal profile;
- Explain how tropical cyclones are classified in term of strength i.e. category 1 to category 5;
- More petrol use releases greenhouse gases resulting in global warming, and therefore more rainfall and flooding;
- The flow hydrograph needs to be extensively covered in class. Educators should start with the basic concepts/ terminology that describes a flow hydrograph i.e. flood peak, lag time, rising limb and falling limb. The impact of the building environment on the flood peak and lag time is essential to know i.e. the flood peak rises and the lag time is reduced;
- The development of structural landforms must be linked to the four slope elements;
- The development of all structural landforms must be taught thoroughly; and
- Landforms need to be addressed through topographic maps, orthophoto maps and diagrams.

Teachers need to make use of relevant and recent resources. This question allows teachers to use newspapers as useful resources for recent events, e.g. the occurrence of tropical cyclones, mass movements, flooding, etc. Teachers should collect newspaper clippings and make learners aware of natural disasters that occur. In addition, teachers should organise trips to weather service centres in their areas (airports). Learners need to be encouraged to watch weather news on various TV channels to learn about aspects of weather elements.

Learners should be taught how to analyse the question in order to arrive at the answer. The action verbs such as discuss, explain, outline, and describe should be clearly explained to learners.

Teachers should share information and ideas. Subject advisors should organise content workshops for teachers on climatology. Subject advisors should organise extra resource materials such as DVDs on difficult content areas. Past examination papers should be used. The internet also gives access a wealth of information.

Basic concepts should be taught and teachers should ensure that they have the knowledge to teach effectively. Resources should be collected on an ongoing basis. Learners should be aware of what is happening in the world around them, example natural disasters. Material referring to COP-17 should be used as it is a current issue that deals with climate change. Topics that are commonly examined should be researched and the content should be correctly taught.

Questions on structural landforms are commonly set in examination papers. Educators need to concentrate on the theoretical aspect of the development of these landforms and how these landforms can be used. The development of the specific landform - tor - that was tested is not well taught by many educators since they struggle with the subject content.

A wide variety of diagrams and photographs are available and educators need to expose learners to resources other than the text book. The aspect of horizontally aligned and inclined sedimentary strata is not well-taught.

Concepts that are not clearly understood should not be ignored. Subject advisors should provide the necessary guidance.

QUESTION 2: PHYSICAL GEOGRAPHY

Generally this question was well answered. Learners understood the questions and used the resource materials to their full extent. It is apparent that that this was a more popular choice than Question 1.

(i) COMMON ERRORS AND MISCONCEPTIONS

- Candidates struggled with the concept of an *anticyclone*;
- Candidates struggled to identify the tornado;
- Many candidates could not discuss the consequences of changing weather patterns for coastal cities;
- Candidates could not describe the underlying rock structure that is common to the dendritic drainage pattern;
- Candidates could not answer the question on the tor;
- Candidates could not give solutions to prevent mass movement, even though they understood the causes of mass movement; and
- Many candidates confused mass movements with the movement of people from rural to urban areas.

(ii) SUGGESTIONS FOR IMPROVEMENT

- Candidates should be exposed to all the weather phenomena as set out in the examination guideline;
- The consequences of climate change cannot be ignored when teaching climatology;
- Anticyclones are not merely linked to the anticyclonic movement of air (true only for the southern hemisphere), but to the opposite actions of a cyclone; and
- All stream patterns should be addressed in terms of how they originate and in terms of the underlying rock structure.

Teachers need to make use of relevant and recent resources. This question allows teachers to use newspapers as useful resources for recent events, such as the occurrence of tropical cyclones, mass movements and flooding. Teachers should collect newspaper clippings and make learners aware of natural disasters when they occur. In addition, teachers should organise trips to weather service centres in their area, such as airports. Learners should be encouraged to watch weather news on various TV channels to learn about aspects of weather elements.

Candidates struggled to identify a tornado. It is evident that it was not taught at a large number of schools.

QUESTION 3: SETTLEMENT GEOGRAPHY AND PEOPLE AND THEIR NEEDS

Candidates did not perform well in this question since the basic concepts needed for higher cognitive level questions were not clearly understood.

(i) COMMON ERRORS AND MISCONCEPTIONS

- Candidates confused Gross National Product with Gross Domestic Product;
- Candidates did not understand the concept of *sustainable cities*;

- Many candidates wrote about the causes of pollution instead of effects;
- Candidates struggled with the term *high cost producer*;
- Candidates did not understand the concept of *food security* and confused it with securing foods e.g. how to keep it safe;
- The term *balance of trade* was unfamiliar to many candidates; and
- Candidates could not comment on the importance of the secondary sector in the economy of South Africa.

(ii) SUGGESTIONS FOR IMPROVEMENT

Candidates could not place sustainability within the context of an urban environment. It is usually dealt with in the context of resources and the natural environment. Educators should be able to equate urban sustainability to resource sustainability. The urban environment remains a system with its own set of resources.

Questions on food security were often misunderstood by candidates. Candidates related food security to the safekeeping of food sources. Food security, linked to levels of development and population growth, is a contentious issue that should be dealt with in class. Case studies across Africa are available and need to be studied so that learners stay informed.

It is suggested that teachers use diagrams when teaching the concepts in order for learners to have a better understanding, and not just memorise facts. The use of diagrams in teaching enables the learners to interpret, analyse and apply knowledge. Power point presentations also enable learners to see and understand what urban decay looks like, and give a better understanding of a settlement with unsustainable and sustainable features.

Learners do not know the difference between characteristics and functions, and between effects and causes. Educators should put more emphasis on teaching the difference between these aspects.

QUESTION 4: SETTLEMENT GEOGRAPHY AND PEOPLE AND THEIR NEEDS

Candidates performed well in this question, and it was a more popular choice than Question 4.

(i) COMMON ERRORS AND MISCONCEPTIONS

- Candidates confused push and pull factors;
- Candidates could not provide some ideas for the Government to reduce rural depopulation;
- Candidates confused *informal trade* with *informal settlements*; and
- Some candidates had difficulty in explaining some of the challenges facing informal traders.

(ii) SUGGESTIONS FOR IMPROVEMENT

Careful consideration should be given to the topics mentioned above. Educators and learners should not confuse the issue of the 'informal sector' and 'informal settlements'. Although there is a link between the two concepts, informal sector activities are common trade in the formal building environment.

More exposure to contextual analysis questions is needed. These types of question are common in Questions 3 and 4.

Photographs should be used to show the difference between informal trade and informal settlements.

PAPER 2

A. GENERAL OVERVIEW OF LEARNER PERFORMANCE

The question paper was also well received by teachers and learners.

B. ANALYSIS OF LEARNER PERFORMANCE IN INDIVIDUAL QUESTIONS

QUESTION 1: MULTIPLE CHOICE – GENERAL

Candidates performed relatively well in this question.

(i) COMMON ERRORS AND MISCONCEPTIONS

- Identifying the time when the photograph was taken; and
- Identifying slopes.

(ii) SUGGESTIONS FOR IMPROVEMENT

Learners should be trained to have a 'geographical eye' when handling maps. To determine time on an orthophoto map, learners should be able to look for the shadows, determine their (shadows) length and the side to which they fall, i.e. east or west. If shadows are cast to the west, the photo was taken before noon. If shadows are cast to the east the photo was taken after noon. Learners can work in pairs and the educator should provide guidance. Training learners to have a 'geographical eye' is not a once-off exercise but one which requires continual engagement with maps.

Learners should not only know the different types of landforms and slopes, but they should also be able to identify them on the map and in the surrounding environment.

QUESTION 2: CALCULATIONS

Generally candidates performed poorly in this section, since it dealt with calculations. Many candidates did not even attempt to answer several sections in Question 2.

(i) COMMON ERRORS AND MISCONCEPTIONS

- Calculating gradient;
- Identifying features on cross-sections; and
- Calculating vertical exaggeration.

(ii) SUGGESTIONS FOR IMPROVEMENT

Calculation of gradient and vertical exaggeration

The challenges relating to calculations can be resolved through repeated practice. All areas of calculations should be taught and learners should be able to follow the steps when doing calculations.

Identification of features on a cross section

For learners to identify features on a map, they need the correct skill, particularly when deriving information from a drawn cross-section. In order to answer this question, learners should:

- Have a piece of paper;
- Place the edge of the paper on the drawn cross-section in the question paper;
- Mark the starting point and the end point using a pencil;
- Mark the points X and Y on the sheet of paper;
- Place the piece of paper on the windmill (block E4) and trigonometrical station 184 (block E6);
- Determine where the points X and Y are on the map; and
- Identify the features.

Unless learners master the skills, they will not arrive at the right answers.

QUESTION 3: APPLICATION OF THEORY AND MAP INTERPRETATION

Candidates performed poorly in this question. They could not apply knowledge gained in the theoretical section of Geography to the topographic map and orthophoto map.

(i) COMMON ERRORS AND MISCONCEPTIONS

- Identifying shape of settlement;
- Identifying street patterns;
- Comparing residential zones in terms of certain specifications;
- Identifying the dome (landscapes in general); and
- Identifying types of photos.

(ii) SUGGESTIONS FOR IMPROVEMENT

Learners need to be well versed in the various sections of the curriculum in order to perform well in this section. The following strategies are suggested:

- Regular and correct use of geographical concepts in class to improve learners', understanding;

- Continuous integration of content knowledge with map work as early as Grades 10 and 11;
- Regular worksheets to improve map-reading and interpretation skills;
- Exposure of learners to past examination papers where similar questions, as well as questions of the correct difficulty levels are provided;
- Identification of landforms and drainage patterns on topographic maps when those concepts are taught;
- Identification of settlement outlines, street patterns and land use zones on topographic maps when those concepts are taught; and
- Teaching of the different types of photographs, namely horizontal, vertical and oblique, and differentiation between high oblique (horizon visible) and low oblique (horizon not visible) photographs.

QUESTION 4: GEOGRAPHIC INFORMATION SYSTEM (GIS)

This question was poorly answered and many candidates did not attempt to answer some of the questions.

(i) COMMON ERRORS AND MISCONCEPTIONS

This entire question is problematic and attention should be paid to GIS as a whole.

Very specific problems were:

- Data manipulation; and
- Buffering.

(ii) SUGGESTIONS FOR IMPROVEMENT

GIS concepts should be taught in context. While it is important for learners to know the concepts and be able to define them when required, learners need to be able to apply the concepts in practical life situations. Teachers should therefore be aware of the fact that GIS will not just consist of theory and definitions, but rather be practically applied to the map examined.

Teachers should also teach map projections together with GIS, and not in isolation because the two are linked.

Scenarios to challenge learners to apply knowledge on their understanding of concepts should be created. GIS knowledge across the various topics of the subject (integration) should be applied. The following are examples:

- Learners could be required to apply GIS in flood prevention (buffering);
- Learners could apply GIS in choosing a site for the development of a settlement (data layering);
- Learners should be given different types and sizes of maps, and be asked to create a new map (data integration); and
- Learners need to be alerted that GIS can contribute to solving social and environmental challenges.

Refer to past examination question papers to get an idea on how GIS questions are set and then adapt your teaching approach accordingly.

Teachers should be trained in GIS. A GIS specialist should be invited to address cluster and regional meetings. A comprehensive GIS intervention guide should be made available to educators.

5.7 HISTORY

The following report should be read in conjunction with the History question papers of the November 2011 Examination.

SECTION 1 - QUANTITATIVE ANALYSIS (2008 - 2011)

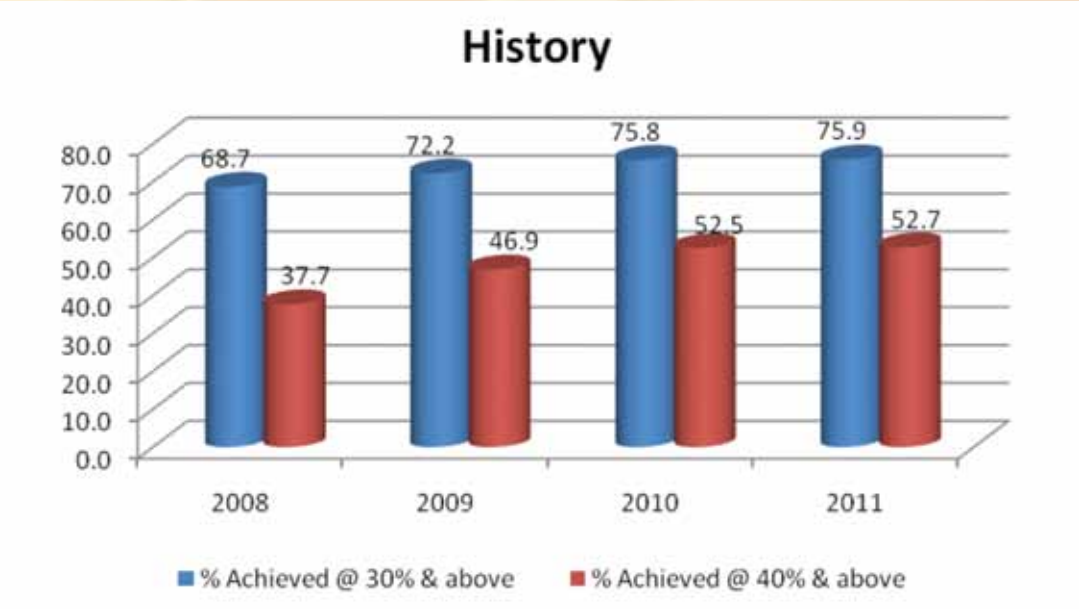
OVERALL ACHIEVEMENT RATES (2008 - 2011)

The percentage of learners passing History at 40% has increased by 0.2% and at 30% by 0.1 % as compared to the figures of 2010.

TABLE 7: OVERALL ACHIEVEMENT RATES IN HISTORY, 2008 - 2011

Year	No. Wrote	No. Achieved @ 30%	% Achieved @ 30%	No. Achieved @ 40%	% Achieved @ 40%
2008	93 666	64 355	68.7	35 290	37.7
2009	90 054	65 025	72.2	42 266	46.9
2010	87 676	66 429	75.8	46 042	52.5
2011	85 928	65 239	75.9	45 277	52.7

FIGURE 7: OVERALL ACHIEVEMENT RATES IN HISTORY, 2008 - 2011



SECTION 2 - QUALITATIVE ANALYSIS OF LEARNER PERFORMANCE

A. GENERAL OVERVIEW OF LEARNER PERFORMANCE

The performance of learners in the subject ranged from fair to good. The questions were generally satisfactorily answered. Most learners completed the papers in the allocated time.

Many learners who obtained full marks displayed a thorough understanding of the content and the associated historical skills required to answer the source-based and extended-writing questions. Generally, these learners excelled in answering source-based questions because they were able to interpret, analyse, evaluate and synthesise evidence from the sources and their own knowledge. They were also able to comment on the usefulness, limitation, degree of bias and accuracy of the sources. With regard to paragraph and extended-writing questions, learners were able to construct an original argument by using the available evidence. They were able to sustain and defend a coherent and balanced line of argument, and were also able to synthesise evidence from the sources provided, to construct an original argument. Some teachers had taught and assessed the curriculum according to the demands of the SAG document. Learners who performed poorly generally displayed a poor command and understanding of the English language. It is evident that some learners had scant content knowledge and simply could not answer the questions posed. On the other hand, some learners were simply ill-prepared and had not studied hard enough.

It appears that learners who performed poorly had not been taught the prescribed content properly. Teachers should be trained on how to plan, develop and effectively teach the new content areas to learners. A focused content and assessment workshop should be held early in 2012 so that both teachers and learners are exposed to the new sections, demands of the curriculum and assessment policies.

PAPER 1

B. ANALYSIS OF LEARNER PERFORMANCE IN INDIVIDUAL QUESTIONS

(i) COMMON ERRORS AND MISCONCEPTIONS

Many learners struggled to provide cogent responses to the extended-writing questions. Learners who attempted Questions 1 and 4 performed poorly, because of a lack of appropriate content knowledge. Some learners appeared to have performed poorly because of a language barrier.

The following are the questions in which learners performed poorly. Reasons for learners' poor performance per question are provided:

Source- based questions:

Q. 1. (1.1.3; 1.1.4; 1.3.1; 1.4)

Q. 2. (2.1.1 (a); 2.4)

Q. 3. (3.2.2; 3.4; 3.5.2)

Q. 4. (4.1.2; 4.2.2; 4.2.4; 4.4)

- The majority of the learners are additional language English speakers, and hence experienced difficulty in interpreting some of the questions. Some learners were unable to understand the questions set. They also displayed a limited understanding of the key historical concepts, such as African Socialism, Marxist-Leninism and Black Consciousness. They were unable to ascertain usefulness, compare evidence, make judgements or interpret and analyse sources. Failure to grasp words, such as 'limitations', 'bias', 'similarities' and 'differences,' also contributed to poor performance.
- Learners displayed poor content knowledge, especially with themes 1 and 4. Theme 1 (Cuban Missile Crisis) was introduced only in 2011;
- Evidence of poor teaching and learning;
- Evidence of a lack of reading, writing and language skills;
- Lack of appropriate resources, especially for the new themes; and
- Limited exposure to examination-type questions.

PARAGRAPH –TYPE QUESTIONS

Q. 2.5, Q. 3.6, Q. 4.5

Many learners were unable to construct reasonable paragraphs for the following reasons:

- Inability to write a coherent paragraph;
- Inability to use evidence from the sources and their own knowledge to write an organised paragraph in response to the question posed – many candidates used telegraphic English when writing paragraphs;
- Inability to synthesise information from the sources: evidence from the sources was used in an elementary manner and/or information was copied directly from the sources provided;
- Constraints imposed by the number of words required to write a focused paragraph (80 words);
- Poor language and writing skills; and
- A lack of knowledge of how to construct a paragraph, and how it would be assessed.

EXTENDED WRITING LEVEL 1: GENRE: ESSAY

Q. 1.7.1; Q. 2.6.1; Q. 3.7.1; Q. 4.6.1

Many learners were unable to write a logical essay for the following reasons:

- Lack of ability to write a coherent and well-balanced essay following the given line of argument;
- Technical flaws – no introduction, lack of a logical, coherent argument, and conclusion;
- No attempt to answer the question;

- Inadequate content: mostly irrelevant and superficial responses. Learners lacked the necessary skills to discuss how Julius Nyerere's policy of *ujamaa* transformed Tanzania into a socialist state during the 1960s and 1970s. In this regard, most candidates gave a narrative account of the success and failures of the policy of *ujamaa*.
- No analysis and historical explanation, lack of structure. Many candidates wrote general accounts of the Civil Rights Movement. They were incapable of synthesising the information on the role and impact of the Civil Rights Movement in a lucid essay. Most candidates wrote vague and generalised responses about Steve Biko's contribution rather than focusing on the role and impact of the Black Consciousness Movement.
- Learners were not taught how to construct an essay and how it would be assessed; and
- There was evidence of prepared essays that made no attempt to answer the question.

LEVEL 2: GENRE: ESSAY USING SOURCES

Q. 2.6.2; Q. 3.7.2; Q. 4.6.2

Many learners were unable to write an essay which required the use of sources and application of one's knowledge:

- No attempt to focus on the topic;
- Technical flaws – lack of an introduction and a conclusion;
- Poor or no historical knowledge of the topic;
- Inability to develop and construct an essay by synthesising the information from the various sources, as well as using their own knowledge;
- In some cases, completely irrelevant responses;
- Copying of information directly from the sources; very little evidence of interpretation, analysis and the ability to construct an original argument; and
- It is evident that a high proportion of candidates who attempted this question had not been exposed to the demands of this genre of writing, and how the holistic rubric is used to assess their work.

PAPER 2

A. GENERAL OVERVIEW OF LEARNER PERFORMANCE

The performance of learners in this paper ranged from fair to good. In the main, most questions were satisfactorily answered. There seems to be an improvement in the quality of learner responses and overall performance. Candidates who attempted Questions 3 and 4 performed better than those candidates who attempted Questions 1 and 2. Most learners completed the paper in the allocated time.

Some learners had a thorough understanding of the content and the associated historical skills required to answer the source-based and extended-writing questions, and obtained full marks. Generally, these learners excelled in answering source-based questions because they were able to interpret, analyse, evaluate and synthesise evidence from the sources

and their own knowledge. They were also able to comment on the usefulness, limitations and accuracy of the sources. With regard to paragraph- and extended-writing questions, learners were able to construct an original argument by using the evidence from the sources and their own knowledge. Learners were also able to sustain and defend a coherent and balanced line of argument, and to synthesise evidence from the sources provided to construct an original argument. Some teachers taught and assessed the curriculum according to the demands of the SAG document.

Learners who performed poorly generally displayed a poor command and understanding of the English language. It is evident that some learners had little content knowledge, and simply could not answer the questions posed. On the other hand, some learners were simply ill-prepared and had not studied hard enough.

Some learners' responses showed a thorough understanding of the content, and hence gave the impression that they had been well prepared for the examinations. This effort is commendable and should be encouraged.

It appears that learners who performed poorly had not been taught the prescribed content properly. Teachers should develop an understanding of how to plan, develop and effectively teach the new content areas to learners. A focused content and assessment workshop should be held early in the year, so that both teachers and learners are exposed to the demands of curriculum and assessment policies.

B. ANALYSIS OF LEARNER PERFORMANCE IN INDIVIDUAL QUESTIONS

(i) COMMON ERRORS AND MISCONCEPTIONS

Generally, Questions 1 and 2 were poorly answered. It was evident that learners lacked content knowledge.

Because the themes continue to change, text books are not covering them adequately. The DBE will strive to provide resource material on Angola, the theme for 2012.

The following are the questions in which learners performed poorly. Reasons for learners' poor performance per question are provided:

SOURCE-BASED QUESTIONS:

Q. 1 (1.1.2; 1.2; 1.4; 1.5.3; 1.6)

Q. 2 (2.1.3; 2.1.5; 2.1.6; 2.3.1; 2.3.3)

Q. 3 (3.1.3; 3.1.4; 3.3.3; 3.4)

Q. 4 (4.1.2 (A) & (B); 4.2.2; 4.2.3; 4.3.2; 4.3.3; 4.4)

- The majority of the learners are additional language English speakers and hence experienced difficulty in interpreting some of the questions. Some learners were unable to understand the questions posed. Learners gave one response when the question required two. They also displayed a limited understanding of the key historical concepts, such as reconciliation. Learners were also unable to ascertain usefulness, compare evidence, make judgements and interpret and analyse sources. They also could not identify bias in a source. Some learners could not interpret the cartoons.
- Learners displayed poor content knowledge, especially with themes 1 and 2. Theme 2 (Egypt) was introduced only in 2011;

- There was evidence of poor teaching and learning;
- There was evidence of a lack of reading, writing and general language skills, especially among FAL learners;
- Resources were lacking, especially for the new themes; and
- Exposure to examination-type questions appears to have been limited.

PARAGRAPH- TYPE QUESTIONS:

Q. 1.7; Q. 2.4; Q. 3.5; Q. 4.5

Many learners were unable to construct reasonable paragraphs for the following reasons:

- Lack of ability to write a coherent paragraph;
- Inability to use evidence from the sources and the candidate's own knowledge to write an organised paragraph on the question posed;
- The use of evidence from the sources in an elementary manner/the copying of information directly from the sources provided;
- Inability to interpret, analyse and integrate the information from the source, to write a coherent and logical paragraph;
- Being constrained by the number of words required to write a focused paragraph (80 words);
- Poor language and writing skills;
- Lack of knowledge on how to construct a paragraph, and how it would be assessed;
- Lack of the requisite content knowledge to answer the question posed: for example, in Question 4.5 most candidates merely wrote on the aims of the TRC and were unable to evaluate its work. This shows that candidates were not taught the necessary paragraph-writing skills and were also not exposed to the prescribed analytic rubric that was used in the assessment of paragraphs.

EXTENDED WRITING: LEVEL 1: GENRE: ESSAY

Q. 1.8.1; Q. 2.5.1; Q. 4.6.1

Many learners were unable to write a logical essay for the following reasons:

- They lacked the ability to write a coherent and well-balanced essay that followed the given line of argument;
- Some essays had technical flaws – no introduction or conclusion, or an independent line of argument. For example, in Question 1.8.1, most candidates focused exclusively on the impact that the policies of *glasnost* and *perestroika* had on Russia rather than on South Africa;
- There was an inability to understand the question posed. For example, in Question 2.5.1 candidates lacked the necessary content knowledge to discuss how the collapse of the USSR contributed to Egypt's re-imagining itself. In 4.6.1, most candidates mainly focused on the success and failures of the TRC. Responses were vague and disjointed. There was no attempt to support their answers with specific case studies;

- Often, there was no attempt to answer the question, inadequate content and responses that were mostly irrelevant and superficial;
- In many cases, there was no analysis and historical explanation;
- Learners were not taught how to construct an essay and how it would be assessed; and
- There was evidence of prepared essays that made no attempt to answer the question.

Level 2: Genre: Essay using sources

Q. 1.8.2; Q. 2.5.2; Q. 3.6.2; Q. 4.6.2

Many learners were unable to write this type of essay, which required the use of evidence from the sources and one's own knowledge:

- Such learners made no attempt to focus on the topic;
- There were technical flaws – lack of an introduction and a conclusion;
- Poor or no historical knowledge of the topic was displayed. This was evident in answers to Questions 3.6.2 and 4.6.2, in which most candidates showed very little or no understanding of how to write/construct an essay, using the information from the sources and their own knowledge;
- Many candidates made no effort to use evidence from the sources to answer the question;
- Some learners' responses were completely irrelevant and obtained a failing mark;
- Learners copied directly from the sources without acknowledgement. There was very little evidence of interpretation, analysis and the ability to construct an original argument, for example in Question 4.6.2; and
- There was evidence that learners had not been taught how to respond to this type of essay question, and how it would be assessed.

(ii) SUGGESTIONS FOR IMPROVEMENT

Papers 1 & 2

- Teachers need to ensure that they follow the National Examination Guidelines during the teaching and assessment of the sections prescribed. The Examination Guidelines are designed to provide clarity on the scope and depth of the concepts that need to be taught, learned and assessed. Learners need to be taught examination techniques;
- Necessary and essential skills for working with sources are interpretation, analysis, usefulness, comparison, and how to integrate information from the sources and the learner's own knowledge;
- Techniques for constructing a coherent, well-planned and structured paragraph and essay need serious attention;
- Adequate resources should be provided to schools so that they can do justice to the theme. Teachers ought not to rely on ONE textbook. There needs to be more workshops on content knowledge, especially for themes 1 and 2 (Papers 1 & 2). Source-based skills need to be taught as well as how to work with sources and extended writing;

- Techniques for constructing a coherent, well-planned and structured paragraph and essay need serious attention. More exposure on the TRC is needed, especially with regard to how to work with sources;
- It is necessary to have a thorough knowledge of the content focus areas. The planning, preparation and teaching of History must be rigorous;
- Learners must be exposed to a variety of sources and the related source-based skills such as reading, interpreting, analysing, evaluating, comparing/contrasting, and ascertaining limitations and usefulness;
- Greater emphasis should be placed on the teaching of paragraph- and essay-writing skills. Learners should be taught how to answer the question posed, with an appropriate introduction, a body of historical knowledge and a relevant conclusion;
- In the teaching and learning process, learners should be taught the relevant theme using interactive and user-friendly teaching methodology, and given the relevant notes (mandatory), with a focus on content and related historical skills.;
- Assessment, both informal and formal, should be ongoing and must assess historical skills such as interpretation, analysis, evaluation and synthesis of evidence from the given sources;
- A detailed analysis of learners' results should be undertaken to identify areas of concern/weakness. After this is done, appropriate remediation measures should be put in place to assist learners to develop the requisite historical skills;
- Past examination question papers should be made available and learners should be required to work with them. This would assist in familiarising candidates with the questioning techniques of examiners;
- There should be interaction with the latest resource materials and teaching trends in History (listening to matric radio programmes, newspaper supplements, etc);
- Schools that have produced outstanding results should be identified and networking established with them: i.e. twinning of schools;
- Teachers must cover the whole syllabus. More practice in dealing with challenging content is required;
- Adequate support should be given to teachers, especially with regard to the more challenging aspects of content, and regular monitoring ought to take place;
- Common controlled tests would maintain and improve the quality of teaching, learning and assessment;
- Teachers should seek the assistance of the Curriculum Adviser and other experts in the field of History;
- Regular assignments, homework and tests will motivate learners;
- Teachers need ongoing professional support (workshops) on how to work with different types of sources and how to write coherent essays. Comprehensive source/resource booklets should be developed and made available to both teachers and learners. Workshops and focused cluster meetings on curriculum and assessment matters should be considered, as these will be very valuable;
- Teachers need continued professional support and guidance on new content areas, such as themes 1 and 2;

- Educators should be encouraged to further their studies in the subject;
- Educators need to teach in English and not in vernacular, since learners are required to write the paper in English;
- User-friendly resource materials and DVDs on the new themes should be developed and made available to both teachers and learners;
- Teachers and learners should work with past examination question papers so that they can acquire the necessary historical skills. Teachers should be encouraged to network with the curriculum advisers and other experts in the field of History;
- Using the prescribed SAG document, teachers should be empowered on how to set quality questions by effectively using the content, LOs, ASs and the various levels of questions. Reference to past question papers to benchmark the setting of questions for tests and class work should be encouraged. Cluster groups should practise the setting of test and examination question papers, and have them moderated by subject advisors to ensure standardisation;
- Subject advisors should encourage team-teaching within and between clusters and districts;
- On-site guidance and support during school visits would benefit teaching and learning;
- There should be monitoring of SBA programmes and quality assurance of SBA tasks;
- NSC question papers and marking memoranda must be readily available;
- User-friendly resource materials should be developed and used, especially for the new content areas (such as Egypt). Learner support materials should ideally include self-study activities based on the format of typical examination-type questions, i.e. source-based (45) and extended-writing questions (30); and
- Where possible, if textbooks are not available, subject advisors and subject experts should compile workbooks on the different sections. These workbooks should cater for all levels of learners.

5.8 LIFE SCIENCES

The following report should be read in conjunction with the Life Sciences question papers of the November 2011 Examination.

SECTION 1 - QUANTITATIVE ANALYSIS (2008 - 2011)

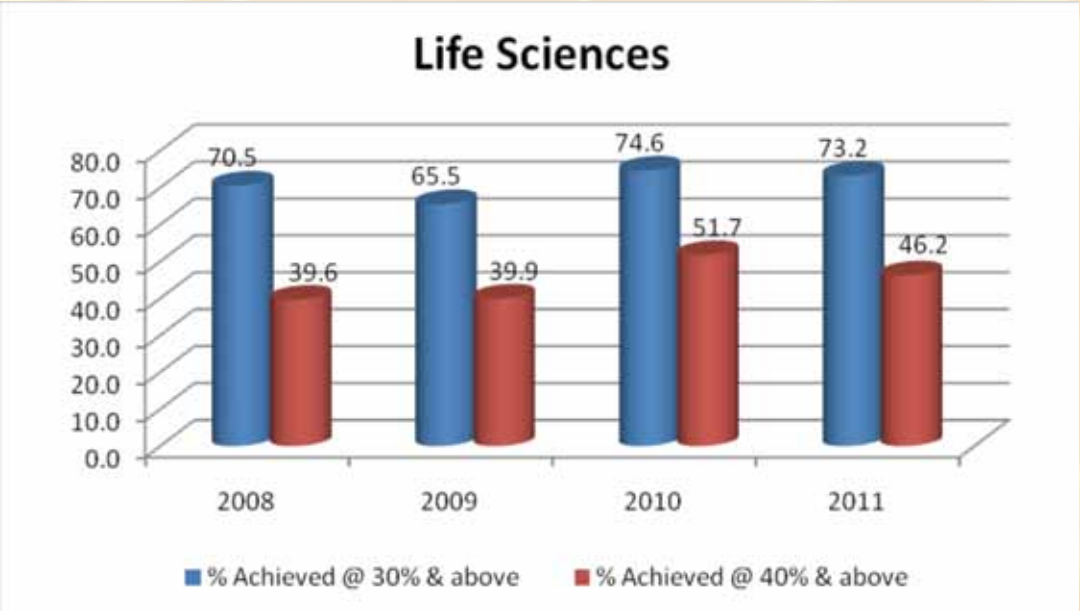
OVERALL ACHIEVEMENT RATES (2008 - 2011)

There is a 1,4% decrease in the percentage of learners who achieved 30% and above, and a 5,5% decrease in the percentage of learners who achieved 40% and above in 2011 compared to 2010 in Life Science.

TABLE 8: OVERALL ACHIEVEMENT RATES IN LIFE SCIENCES, 2008 - 2011

Year	No. Wrote	No. Achieved @ 30% and above	% Achieved @ 30% and above	No. Achieved @ 40% and above	% Achieved @ 40% and above
2008	298 210	210 283	70.5	117 787	39.5
2009	298 663	195 652	65.5	119 069	39.9
2010	285 496	212 895	74.6	147 518	51.7
2011	264 819	193 946	73.2	122 302	46.2

FIGURE 8: OVERALL ACHIEVEMENT RATES IN LIFE SCIENCES, 2008 - 2011



SECTION 2 - QUALITATIVE ANALYSIS OF LEARNER PERFORMANCE

PAPER 1

A. GENERAL OVERVIEW OF LEARNER PERFORMANCE

Learners generally performed poorly in this paper.

Biological terminology still poses a great challenge to many learners. This poor understanding of basic terminology and concepts impacts negatively on their interpretation of questions and their responses to them.

Teachers need to ensure that they follow the National Examination Guidelines (2011) carefully during the teaching and assessment of the knowledge areas prescribed for Paper 1. These guidelines are designed to provide clarity on the scope and depth of the concepts that need to be taught, learned and assessed.

A significant design feature of both the examination papers in Life Sciences was the change in the weighting of the Learning Outcomes, as illustrated in the table below:

TABLE 1: Changes in weighting of Learning Outcomes from 2010 to 2011

LEARNING OUTCOMES (LO)	MARK ALLOCATION		PERCENTAGE OF TOTAL MARKS		PERCENTAGE INCREASE/ DECREASE
	2010	2011	2010	2011	
LO 1 (SKILLS)	60	45	40	30	-10
LO 2 (CONTENT)	60	90	40	60	+20
LO3(INDIGENOUS KNOWLEDGE & HISTORY)	30	15	20	10	-10

This has negatively affected learner performance in Life Sciences since teachers appear not to have taken cognisance of the greater emphasis on content issues as well as conceptual understanding in the different topics indicated by the higher mark allocation.

Answers to Question 4.4 were exceptionally poor. Most learners did not know how to read, analyse and answer the essay question fully.

B. ANALYSIS OF LEARNER PERFORMANCE IN INDIVIDUAL QUESTIONS

QUESTION 1: MULTIPLE CHOICE, MATCHING COLUMNS, BIOLOGICAL TERMINOLOGY

This question comprised of multiple choice questions, biological terminology, matching focusing of different concepts in Life Sciences presented in columns A and B, and the interpretation of a pedigree diagram on incomplete dominance. This question covered Evolution, Molecular studies, as well as Genetics.

The performance of learners in the question as a whole was satisfactory. A notable exception was Question 1.2 (biological terminology) which was very poorly answered.

Question 1.4 presented a problem to many learners, who failed to see that the pedigree diagram showed incomplete

dominance and, as a result, could not identify the genotype of the offspring.

(ii) SUGGESTIONS FOR IMPROVEMENT

1. Terminology is still a serious problem. Teachers should use the following strategies to improve the teaching of terminology:

- Identify new terms/concepts in every lesson and write them on the board;
- Instruct learners to take down terms/concepts at the back of their notebooks, noting the correct spelling;
- Encourage learners to define/write down the meaning of these words by listening to the educator's lesson or finding the meaning in a dictionary or textbook;
- Break down the concept/term where possible – give the meaning of prefix and suffix e.g. photo (light) synthesis (to build up);
- Use new concepts in sentences;
- Ensure that learners do the above, on a daily basis, by asking learners to define concepts or by checking their note books;
- Include biological terms in all daily assessment tasks; and
- By the end of the year, all learners should have a comprehensive glossary of all terms/concepts.

2. Teachers need to differentiate clearly between the concepts of co-dominance and incomplete dominance. In both concepts, since there is no dominance of one allele over the other, capital letters are used to denote the genotypes of the parents and the offspring. In co-dominance both alleles express themselves equally in the phenotype, whereas in incomplete dominance the phenotype of the heterozygous condition is expressed as an intermediate condition.

QUESTION 2: GENETICS PROBLEMS, CONCEPTS AND THE DRAWING OF A HISTOGRAM

Question 2.1: This question posed a challenge to many learners who seemed to have a problem with questions involving sex-linked inheritance. Many learners did not use 'X' and 'Y' in their answers because they could not properly differentiate between male and female sex chromosomes (gonosomes and autosomes).

Question 2.3: Although there is an improvement in the drawing of graphs by the majority of learners, many of them failed to distinguish between the bar graph and histogram and, as a result, lost marks for the incorrect type of graph (bar graph) that was drawn.

Question 2.3.2: The majority of learners could not correctly provide an in-depth explanation of polygenic inheritance.

(ii) SUGGESTIONS FOR IMPROVEMENT

1. The following format should be used when learners do problems in genetics:

GENETICS PROBLEM FORMAT

P_1 phenotype x ✓
genotype x ✓
Meiosis
G x ✓

Fertilization

OR

gametes		

1 mark for correct gametes
1 mark for correct genotypes

F_1 genotype ✓
phenotype ✓

P_1 and F_1 ✓
Meiosis and fertilization ✓

Learners should be given multiple opportunities (at least 5 problems in each of the following) to solve monohybrid genetic problems (up to second generation level) based on:

- Complete dominance;
- Incomplete dominance;
- Co-dominance;
- Inheritance of sex (gender); and
- Inheritance of haemophilia and colour blindness as sex-linked characteristics.

2. Learners need to be taught that in sex-linked genetic problems, the presence of only one recessive allele, on the X chromosome, can result in males having haemophilia/colour blindness because the Y chromosome does NOT have the allele for this trait and therefore cannot mask the effect of the single recessive allele. In females, on the other hand, two recessive alleles must be present for the female to have haemophilia/colour blindness.

3. Learners should be given multiple opportunities, in class work exercises and assessment tasks, to draw histograms, bar graphs, line graphs and pie charts.

4. Teachers need to clearly differentiate among polygenic inheritance (e.g. for traits like skin colour and height) and monogenic inheritance (e.g. for traits like attached/unattached ear lobes and tongue rolling/non tongue rolling).

QUESTION 3: FOSSIL STUDIES, EVOLUTION

Question 3.1.2: Many learners had difficulty providing visible differences between the skulls of *Homo erectus* and *Homo sapiens*. Instead, they provided differences from their previous knowledge on the topic of the *Homo species*.

Question 3.2:- Knowledge of the line of evidence of the 'Out of Africa hypothesis' is generally non-existent in the minds of learners. They could only correctly provide examples of fossils that were found in Africa. However, they conflated the discovery of some of the fossils with the 'Out of Africa' hypotheses.

Question 3.3.1: There was a notable improvement in the answering of this question on Darwin's theory of natural selection. The disturbing trend in this question was that learners could not contextualise their knowledge of natural selection to answer question 3.3.3.

Question 3.3.4: Learners confused allopatric speciation with that of sympatric speciation. They were unable to articulate how sympatric speciation occurs in a particular population where there is no geographical barrier is present.

In questions 3.3.1 - 3.3.3, many learners could not formulate a hypothesis and did not understand what validity meant.

(ii) SUGGESTIONS FOR IMPROVEMENT

1. Teachers should give learners many opportunities to look at visible differences between sets of drawings.
2. Teachers need to outline the 'Out of Africa' hypothesis clearly. The details are stated clearly in the Examination Guidelines 2011 document.
3. Learners need to be taught how to write a hypothesis.

   A hypothesis is a testable statement about a relationship involving two variables. When a hypothesis is formulated the following is a guideline should be used:

- There need to be two variables that must be mentioned in the hypothesis: dependent and independent variables;
- A hypothesis should state the relationship between the two variables; and
- The hypothesis must be testable.

4. Teachers need to teach learners to distinguish between validity and reliability issues when doing or criticising scientific investigations, because the principles of validity and reliability are fundamental cornerstones of the scientific method.

What is reliability?

The idea behind reliability is that any significant results of an investigation must be more than a once-off finding and be repeatable. Other researchers must be able to perform exactly the same experiment, under the same conditions and generate the same results. This will reinforce the findings of the experiment and ensure that the wider scientific community accepts the hypothesis. In questions which ask learners to state how the reliability of the investigation could have been improved, the correct answers could generally be the following: repeat the experiment/investigation OR increase the sample size.

What is Validity?

Validity questions **how** the experiment/investigation was carried out. Have all the factors/variables been controlled/fixed except the variable/factor being tested? Have the samples been chosen randomly? Is the design for the investigation appropriate? Validity therefore speaks to whether the scientific research method was done with the appropriate care and diligence. In questions which ask learners to suggest some factors that might have decreased the validity of an investigation, the answers should centre around criticism of the scientific process, for example some factors/variables that were not fixed/controlled when carrying out the investigation.

QUESTION 4: DNA, TRANSCRIPTION, POLYPLOIDY, MEIOSIS

Questions 4.1.1 - 4.1.3: These questions involving DNA structure were well answered in the main. There was a great degree of confusion between the deoxyribose sugar and the phosphate group. Many learners simply referred to the structure either as sugar or a pentose sugar. They did not distinguish between ribose and de-oxyribose and lost marks as a result.

Question 4.2.1: This question was poorly answered. Most learners confused DNA profiling/fingerprinting and simple fingerprinting.

Question 4.2.2: This question was also poorly answered. Many learners lost marks due to the misunderstanding mentioned in 4.2.1.

Question 4.3.1: This question was satisfactorily answered. Some learners simply discussed transcription but did not answer the question. Most learners however, were able to indicate that DNA acts as a template for the transcription of mRNA.

Question 4.3.1-4.3.3: This question on protein synthesis was generally well answered by most learners.

Question 4.4: The essay question was very poorly answered. Most learners did not know how to read, analyse and answer the essay question fully. The essay, which focused on meiosis, polyploidy and Down's syndrome, was generally not well structured. Learners simply regurgitated the different phases of meiosis. Most learners could not explain the process of crossing over and how it promotes genetic variation in humans and animals.

The concept of independent assortment presented learners with a challenge in that this led to sex gametes having a different mix of maternal and paternal chromosomes.

While most learners stated that Down's syndrome is caused by an extra chromosome 21, they were unable to explain properly that this phenomenon came about due to polyploidy. Furthermore, very few learners could give an explanation of polyploidy.

(ii) SUGGESTIONS FOR IMPROVEMENT

Teachers need to give learners many opportunities to write essays in class work exercises and in assessment tasks.

The following is a guide to essay writing:

- Plan the essay before writing it;
- Read the essay thoroughly;

- Interpret and analyse the essay;
- Write down all the aspects of the essay that the question requires to be discussed;
- Decide on sub-headings to be used;
- Write the essay in a logical and sequential manner, linking each aspect that is discussed;
- Read the draft of your essay and make changes/corrections if necessary; and
- Write out the final version of your essay.

PAPER 2

A. GENERAL OVERVIEW OF LEARNER PERFORMANCE

The performance of learners in this paper was generally satisfactory.

As in Paper 1, learners struggled with biological terminology and concepts, and with scientific process skills (LO1).

B. ANALYSIS OF LEARNER PERFORMANCE IN INDIVIDUAL QUESTIONS

QUESTION 1: MULTIPLE CHOICES, MATCHING COLUMNS, BIOLOGICAL TERMINOLOGY, STRUCTURE OF THE BRAIN AND STRUCTURE OF TWO DIFFERENT TYPES OF FLOWERS

Multiple choice questions focused on biological processes involving symbiotic relationships, metamorphosis, reflex arc, human population studies and reproduction. Learners generally performed satisfactorily in this question.

Biological terminology was also poorly answered in this paper. The question on matching items in Column A with those in Column B focused on various concepts in structure and life processes, population ecology and community structure.

Learners performed well in this question. The question on brain structure and functioning was well answered by the majority of learners. Question 1.5.3 posed a problem to many learners, who could not indicate whether flower A or B was greater in size.

(ii) SUGGESTIONS FOR IMPROVEMENT

1. Refer to the report on Paper 1 for strategies to improve performance in biological terminology.
2. The skill of interpreting magnification/scaling is an important scientific skill. The magnification given in the drawing is a clue and generally indicates that the higher the magnification, the smaller the structure that is drawn will be.
3. Learners should be given multiple opportunities in class work exercises and assessment tasks to interpret graphs, tables, age-gender pyramids and to label diagrams, all of which featured in Question 1.

QUESTION 2: EAR, EYE, INFLUENCE OF HORMONES ON MENSTRUAL CYCLE IN HUMAN REPRODUCTION AND INVESTIGATION ON NERVOUS CO-ORDINATION

Question 2.1.3: which dealt with the adaptations of the ear's tympanic membrane and oval window for the amplification of sound, posed a challenge to the majority of learners because they failed to relate the two structures mentioned above when answering the question.

Question 2.2: was answered satisfactorily but many learners confused pupillary mechanism with accommodation.

Question 2.3.5 was poorly answered by most learners because learners could not identify how changes in the thickness of the endometrial lining between day 14 and day 21 actually occurred. They could not explain that the corpus luteum was initiating the thickness of the endometrial lining.

In question 2.4.2, learners found it difficult to explain how validity of the experimental investigation that was outlined could be improved. Many learners confused validity with reliability.

(ii) SUGGESTIONS FOR IMPROVEMENT

1. Learners need to study the structure and functioning of each part of both the eye and the ear.
2. The explanation of the answer for question 2.1.3 is as follows: In the air-filled middle ear, the tympanic membrane/ eardrum (which has a relatively large surface area) is connected to the smaller oval window (which has a relatively smaller surface area) by the three ossicles. This, therefore, has a 'funneling' effect in that sound vibrations increase in intensity as they pass from the larger tympanic membrane to the smaller oval window.
3. Learners need to understand that the pupillary mechanism is concerned with the amount of light that enters the eye, while accommodation refers to the ability of the lens of the eye to change its shape so that a clear image is formed on the retina. This occurs whether one is looking at an object that is greater than 6 meters away (distant vision) or when one is looking at an object that is less than 6 meters away (near vision).
4. Learners should be given many opportunities to practice answering questions on graphs of the human menstrual cycle and the influence of hormones on it. Past question papers have many different graphs on this section.
5. Refer to the report on Paper 1 for an explanation on the difference between validity and reliability.

QUESTION 3: MARK RECAPTURE METHOD, POPULATION STUDIES, COMMUNITY INTERACTIONS

In Question 3.1, learners were not able to distinguish between planning steps and precaution measures.

Question 3.2 which was on the Logistic growth form was answered well.

Question 3.3: centred on a case study, which outlines tensions and issues around mining at Mtunzini, in which learners were required to state two advantages and two disadvantages of mining activities at Mtunzini. Learners were expected to make inferences from the article concerning advantages and disadvantages of mining activities and not simply regurgitating responses from the article directly. Furthermore learners could not comprehend correctly the meaning of stakeholders and role-players and how they affect community based projects

Question 3.4.1 – was difficult for the majority of learners as they could not identify the community interaction represented in picture A (resource partitioning). Poor knowledge of subject terminology prevented learners from correctly responding to what was asked of them.

The correct response here was resource partitioning which is merely the coexistence of species. However, learners confused the concept with that of a mutual relationship existing between the species.

(ii) SUGGESTIONS FOR IMPROVEMENT

1. Teachers should outline what planning entails when scientific investigations are designed. Generally, planning for a scientific investigation involves the following:
    - Ethical issues around the investigation, e.g. by getting permission from the appropriate authorities before the investigation is conducted;
    - Making all the logistical arrangements, e.g. by identifying and getting all the materials to be used in the investigation;
    - Deciding on the method/procedure that is going to be used or followed e.g. how to catch the fish for the investigation outlined in question 3.1; and
    - Dealing with how the data will be collected, recorded, analysed and presented.
2. Teachers need to identify and give learners opportunities to answer questions around tensions and issues of human demand versus conservation of the natural environment using the following examples:
    - The hunting industry;
    - Sustainable harvesting of natural resources; and
    - Creation and management of game reserves.

    These issues can be found in newspapers and magazines. These type of questions are based on LO3 (Remember that at least 15 marks are devoted to assessing LO3).
3. Teachers need to ensure that all the concepts in the section on community structure are thoroughly dealt with. This section includes many new concepts that were not found in previous syllabi e.g. resource partitioning and competitive exclusion principle. Learners should be given many opportunities, in class work exercises and assessment tasks to interact with the new concepts.

QUESTION 4: HUMAN POPULATION STUDIES, HYPOTHESIS TESTING, NEGATIVE FEEDBACK MECHANISM IN CONTROLLING GLUCOSE LEVELS

Question 4.1: In this question, learners were required to draw a graph showing the growth of the human population from 1650 to 2050. Learners had difficulty in plotting the graph using a suitable scale. Extrapolating from the graph was problematic for many learners.

In question 4.2, which involved an investigation of the effect of different concentrations on elongation of cells in young stems, learners experienced the following problems:

- Formulating the hypothesis;
- Drawing incorrect conclusions from results given; and

- Identifying the different variables (fixed and manipulative).

The essay in (Question 4.3) allowed the learners to approach an area of homeostasis holistically. They could discuss physiological effects and relate these to everyday life. Many learners understood the causes of diabetes to mean lifestyle causes, whereas physiological causes were required. Many learners also restricted their understanding of negative feedback to the interplay between TSH and Thyroxin only.

(ii) SUGGESTIONS FOR IMPROVEMENT

- Learners should be given multiple opportunities to draw the different type of graphs.;
- Refer to the report on Paper 1 for strategies to formulate a hypothesis correctly;
- Teachers should clearly outline to learners how negative feedback mechanism in the human body occurs. Candidates were familiar with one type of negative feedback mechanism, namely, that between TSH and thyroxin. However, more emphasis needs to be placed on other negative feedback mechanisms that are naturally occurring in the human body. In this instance, the relationship between insulin and glucagon is one negative feedback mechanism because they work antagonistically towards each other;
- Learners need to be guided more intensively in the writing of biological essays; and
- Refer to the report on Paper 1 for strategies to improve writing of essays in Life Sciences.

GENERAL COMMENTS

Paper 2 topics and content have changed significantly from Life Sciences Version 2, prescribed from 2008 to 2010. Since a large portion of the new topics and content in Paper 2 are common to the old REPORT 550 curriculum, there is a tendency to teach the depth and range of that curriculum. This results in the teaching of content that is not prescribed by the National Examination Guidelines (2011). This could be one of the reasons why teachers in some schools did not complete the syllabus timeously.

Teachers need to comply with the National Examination Guidelines (2011) in the teaching and assessment of the information areas prescribed for Paper 2. The Guidelines are designed to provide clarity on the scope and depth of the concepts that need to be taught, learned and assessed.

Teachers need to expose their learners to typical examination-type questions in each topic that they teach on a regular or daily basis – these questions are to be found in past examination question papers. This would help learners to experience the standard expected of them in external examination papers and enable them to hone their examination techniques.

5.9 MATHEMATICAL LITERACY

The following report should be read in conjunction with the Mathematical Literacy question papers of the November 2011 Examination.

SECTION 1 - QUANTITATIVE ANALYSIS (2008 – 2011)

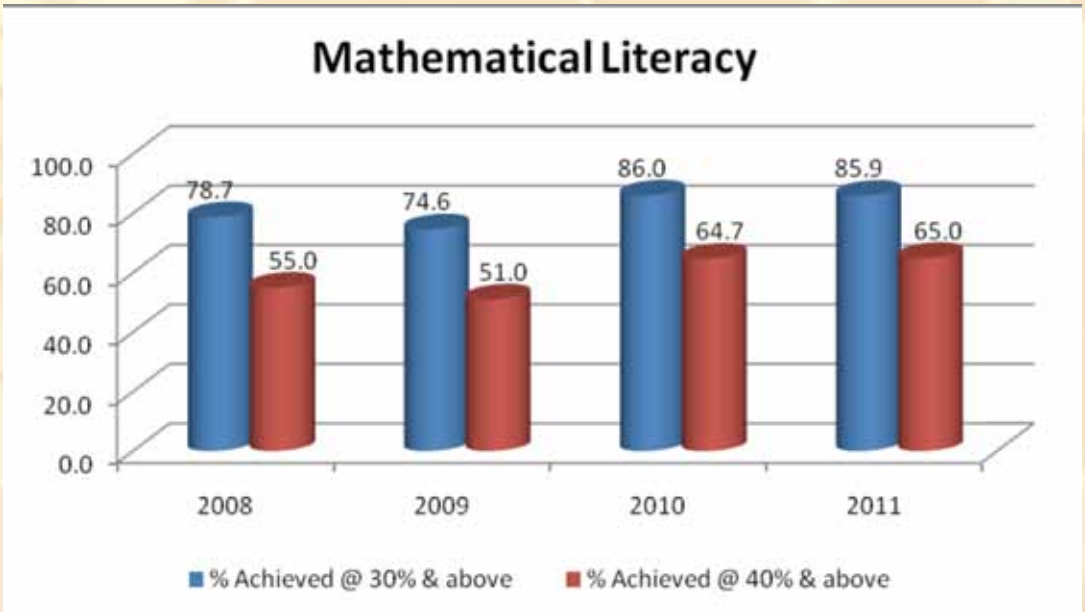
OVERALL ACHIEVEMENT RATES (2008 - 2011)

There has been a consistent improvement in learners' performance in Mathematical Literacy at 40% and above achievement level since 2009.

TABLE 9: OVERALL ACHIEVEMENT RATES IN MATHEMATICAL LITERACY, 2008 - 2011

Year	No. Wrote	No. Achieved @ 30% and above	% Achieved @ 30% and above	No. Achieved @ 40% and above	% Achieved @ 40% and above
2008	267 236	210 134	78.6	144 830	54.2
2009	277 677	207 326	74.7	141 708	51.0
2010	280 836	241 576	86.0	181 794	64.7
2011	275 380	236 548	85.9	178 899	65.0

FIGURE 9: OVERALL ACHIEVEMENT RATES IN MATHEMATICAL LITERACY, 2008 - 2011



SECTION 2 - QUALITATIVE ANALYSIS OF LEARNER PERFORMANCE

B. ANALYSIS OF LEARNER PERFORMANCE IN INDIVIDUAL QUESTIONS

PAPER 1

QUESTION 1: THREE SHORTER QUESTIONS

Overall, the learners answered this question well.

(i) COMMON ERRORS AND MISCONCEPTIONS

Learners who did not perform well in this question had problems with or resulting from:

- The rule for dealing with the order of operations (the so-called BODMAS rule);
- Converting between different units (e.g. cm to m): many candidates either multiplied by 100 or 1 000, while others divided by 1 000, instead of dividing by 100 (1 m = 100 cm);
- Not knowing the concept of a dozen;
- A lack of understanding of the concept of probability;
- Converting between units of currency (South African Rand to Botswana Pula);
- An inability to substitute correctly into a given formula;
- Doing time calculations (i.e. dividing hours correctly and adding time);
- Omitting the word, 'millions' when writing large numbers; and
- A failure to read correctly from graphs.

(ii) SUGGESTIONS FOR IMPROVEMENT

- The responses of a large number of the learners revealed that there is generally a lack of emphasis on various problem areas in many of the Mathematical Literacy classrooms. Many problem areas can only be improved through constant practice at all grade levels.
- Learners need to be taught how to use their calculators correctly. Learners need to practise problems involving everyday concepts such as dozens, as well as 12-hour and 24-hour clocks. Converting minutes into fractions of hours is also an important skill. Learners should be exposed to various contexts, since the subject is taught and practised in context.
- Multiplying by 100 instead of dividing when converting centimetres to metres is proof that learners are made to 'remember algorithmic procedures' whenever solving mathematical problems, often without visualising the problem. Learners often know that there is a 100 involved in a relationship between cm and m. What they then forget and have to remember is whether they must divide or multiply. Learners who visualise a centimetre and a metre would always see when a wrong algorithmic procedure (multiplication in this case) has been followed and

immediately change. This problem also manifests itself in the case of finding the number of eggs in $2\frac{1}{2}$ dozens. Very few learners simply write the answer as 12+12+6 = 30. They want to use the 12 and the 6 in some 'algorithmic procedures' that they do not know and end up not getting the answer, when they should know that a dozen is a 12 and half a dozen is a 6. Unnecessary and meaningless calculations were also seen in Question 1.1.4. The starting point there was for learners to recognise (visualise) 22:57 as '3 minutes to 11 p.m.'. Then 2 hours thereafter is 3 minutes to 01 a.m. A further 7 minutes thereafter is the required answer. No scrupulous calculations necessary.

- Formulae of area and perimeter of common figures should be regarded as essential basic knowledge. For instance in Question 1.1.5, learners could not move from a given formula (perimeter) to one side of the square. The key to the question was to know properties of a square (all 4 sides equal in this case), and therefore knowing that the perimeter in question is the sum of 4 equal sides.
- When teaching and learning probability, appropriate mathematical terminology should be used by teachers and learners. For instance in Question 1.1.6, learners could not see that all that was required was to determine if the given day would be a Saturday or not. This question could be regarded as a 'True or False' as expressed in probability.
- Learners should understand that people cannot be fractions and that there is a big difference between 106 and 106 million.
- Learners also need to do conversions between many different international currencies and the South African Rand (ZAR).
- Teachers should ensure that learners know the basic skills necessary for them to firstly write the Mathematical Literacy exam, and secondly, to cope with their lives outside of school.

QUESTION 2: THREE LONGER QUESTIONS ON DIFFERENT CONTEXTS

This question was based on:

- Temperature graph (involving reading from the graph);
- Comparing pie charts; and
- A parking garage graph.

The performance of learners in this question ranged from good to poor.

(i) COMMON ERRORS AND MISCONCEPTIONS

Learners who did not perform well in this question had problems with or resulting from

- An inability to read data correctly from graphs;
- Understanding how to interpret information given in graphs;
- Working with large numbers and percentages; and

- Interpretations of the step-wise graphs and the meaning of open and closed rings/intervals.

Specific examples:

- Question 2.1.5 - Although range is used very often in Statistics as a measure of dispersion, many learners find it difficult to read values from the graph, and to work with negative numbers: 8 – (–2) = 10 was either interpreted as 8 – –2 = 6 or 8 – –2 = –10
- Question 2.2.5 - The worst performance was in this question. While many learners are generally able to work with the pie-chart, they can only work one way: finding the parts when the whole is given. The question required candidates to find the whole, given the part. Most multiplied or divided 3 249 415 by 9 instead of dividing by 6.5% or 0,065.
- Question 2.3 - Concepts such as 'minimum' and 'maximum' should be used in everyday life: e.g. weather forecasts give daily temperatures as minima or maxima.

(ii) SUGGESTIONS FOR IMPROVEMENT

- All types of statistical charts and graphs should be studied and their interpretation practised.
- Mathematical Literacy educators need to continually revise statistical concepts and tools such as the pie charts which learners have studied in previous grades.
- Teachers should also identify methods that make it easier for learners to understand.

Example in Question 2.2.5:

If 6.5% = 3 249 415 then 1% = 3 249 415 ÷ 6.5, so 100% = (3 249 415 ÷ 6.5) X 100.

It is advisable to approach the pie-chart from different angles; the most common is giving learners the whole, and requiring them to find the parts (using percentages and angles). Teachers should consider giving the parts and asking learners to find the whole – a good opportunity to integrate this part of the syllabus with ratio and proportion.

Step-wise graphs are not taught in Mathematics. However, electricity, water and telephone bills are some of the contexts that use these ideas and graphs. Mathematical Literacy learners should be able to interpret the billing system and also use appropriate graphs to display or explain the information.

In Question 2.3, the context suggests that learners need to be taught different interval notations (taught/learnt in Grade 9 Maths).

QUESTION 3: ZOEY'S BUDGET, SEATING PLAN OF THE EXAMINATION ROOM

This question was fairly well answered.

(i) COMMON ERRORS AND MISCONCEPTIONS

Learners who did not perform well in this question had problems with:

- Understanding fixed and variable cost: only variable cost can be compromised when budgeting;
- Including the units when giving an answer;

- General direction, which is always a problem even though directions are relative and not absolute; and
- Calculating the length, times breadth of the desks, while ignoring the given information.

Specific examples:

- In Question 3.2 most learners took the number of years to be 4 instead of 3, i.e. they did not grasp the context – Zoey is already at university and has three years left. They ignored the given weekly transport cost and used either the calculated monthly cost or the annual cost. They seemed to be confused by 'weekly', 'monthly', and 'per annum' in the same question;
- Writing a percentage as a decimal fraction was problematic. There was incorrect substitution of P, and n; and
- In Question 3.3.4, candidates were unable to recognise that **if** 1 : 0,75 m^2, **then** 32 : 0,75 m^2 x 32.

(ii) SUGGESTIONS FOR IMPROVEMENT

- Teachers need to find resources in the media (similar to the one in the question paper) and then develop questions from the resources. This will prepare their learners for the NSC examination;
- In order to answer the questions correctly, learners need to have a good understanding of the language of the examination (i.e. English and Afrikaans). For learners to be assisted with this, the teachers should try to ensure that they use the language of the examination as much as possible in the classrooms;
- When asked to calculate values of A, B, C and D, candidates should not simply write down values without showing what they represent;
- There should be intensive consolidation of compound interest, as well as the values of n and i ;
- Fractions can be written in different formats: i.e. decimal, percentage or $\frac{a}{b}$; and
- Even if the compass is not given, it is acceptable that the top of the page is North, the bottom South, the left West and the right East.

QUESTION 4: SWARTBERG HIGH UNIFORM SHOP – STATISTICS INVOLVING SHOE SIZES, VOLUME OF SHOE BOX, AND FITTING BOXES BETWEEN FIXED SPACES.

Candidates' performances in this question were average to good.

(i) COMMON ERRORS AND MISCONCEPTIONS

Candidates who did not perform well in this question struggled with:

- Confusing mean and mode;
- Calculating the average of two numbers (the concept of adding first before dividing);
- The concept of rounding down; and
- Calculating the volume of a rectangular prism inclusive of the unit of measurement.

(ii) SUGGESTIONS FOR IMPROVEMENT

- The learners should be given the opportunity to work with and analyse two sets of data;
- Statistics must be practised continually so that learners do not confuse terminology like 'mean', 'median' and 'mode';
- The concept of rounding down must be thoroughly revised;
- Answering questions in context must be emphasised; and
- The concepts of maximum and minimum should be taught in a variety of contexts.

QUESTION 5: MOTHER'S DAY FUND RAISING – MAKING CHOCOLATES (VOLUME, SURFACE AREA, SUBSTITUTION INTO FORMULA, PROBABILITY)

Candidates' performances in this question were average to good.

(i) COMMON ERRORS AND MISCONCEPTIONS

Candidates who did not perform well in this question struggled with:

- Substitution into formulae;
- Working with BODMAS: learners disregard brackets in formulae;
- Interchanging addition and multiplication signs in formulae;
- Units of measurement – that perimeter has linear units, area has square units and volume has cubic units (learners lost up to 3 marks for not using the correct unit of measure);
- Using the given value of π in their calculations;
- Substituting incorrect values in formulae; and
- The concept of probability.

(ii) SUGGESTIONS FOR IMPROVEMENT

- Teachers need to ensure that they spend sufficient time in class on calculating the perimeter, area and volume of a variety of different shapes;
- Teachers also need to do as much revision work as possible with a variety of questions to help learners develop the skill of correctly identifying the correct formula to use, substituting correctly into the formula, simplifying correctly and writing the answer with the correct unit;
- Learners should be encouraged to show all the steps in their calculations so as to score as many consistent accuracy (CA) marks as possible;
- In tests and class-work, more than one formula should be given, and not only where it will be used;
- Learners need to be shown how to highlight relevant information; and

- Teachers should emphasise using a formula instead of a process of elimination.to find answers.

QUESTION 6: GOLDEN GIRLS HOCKEY CLUB (SALARIES AND GOALS SCORED; DRAWING LINE GRAPHS)

Learners scored either very well or poorly.

(i) COMMON ERRORS AND MISCONCEPTIONS

Learners who did not perform well in this question had problems with:

- Straight line graphs; and
- Knowing that probability must be written as a common fraction, a decimal fraction or a percentage, but not as a ratio.

Specific examples:

- Question 6.1.1 - Manipulation of formulae is problematic;
- Question 6.1.3 - Candidates were unable to use the given scale in plotting the points – hence produced an incorrect line graph, they could not label the graph;
- Question 6.1.4 - Some learners had no idea what a break-even point is; or how to indicate it on the graph;
- Question 6.2.1(a) - Failure to understand the concept of perimeter in context, when the word 'perimeter' is not used;
- Question 6.2.1(b) - Unawareness that a semi-circle is half of a circle, and inability to deduce the area of a semi-circle after calculating the area of a circle; and
- Question 6.2.2 - Inability to apply direct proportion in real-life situations (context) and incorrect conversion of minutes to hours. This was the worst answered question, if attempted at all.

(ii) SUGGESTIONS FOR IMPROVEMENT

- Candidates need to be given the opportunity to work with drawing graphs on the same system of axes;
- They should be exposed to different types of graphs (drawing, identifying and relating to the relevant equation);
- Plotting of points and appropriately connecting them should be done for different contexts;
- It should be understood that graphs are used to display information or show relationships between variables. Note that a picture is worth more than a thousand words; and
- Learners ought to know how to use different formulae (substitution into formulae and manipulation of formulae to calculate different variables).

PAPER 2

QUESTION 1: TIMOTHY'S JOB OFFER (DRAWING LINE GRAPHS FROM EQUATIONS, FINDING THE BREAK-EVEN POINT, MISREPRESENTATION OF STATISTICAL DATA)

This question was fairly answered by candidates who could write down equations, and yet poorly answered by candidates who could not translate mathematical terms into equations.

(i) COMMON ERRORS AND MISCONCEPTIONS

- Learners did not know that a formula is an equation;
- They wrote the answer as: '750 x no of working days' instead of

'Salary = 750 x no of working days' or they rewrote the given formula as it was: Salary = R 3000 + 500 x no of days';

- Learners could not achieve all the marks on the graph. The information given stated that Timothy would be paid only if he worked for more than one day. This applied to both the job offer from ABC Cigs and to that from MEDS SA. Learners ignored this fact, drew the graphs starting at zero and were penalised one mark;
- In Question 1.2.1, candidates did the calculations on a single trip and did not achieve maximum marks;
- Learners found it difficult to work with various units and mixed up units: e.g. cents x litres = kilometres;
- In Question 1.2.3, candidates experienced difficulty with language and did not understand the word, 'criticise';
- They explained the graph as it was and lost marks;
- The learners' comprehension and understanding of language need improvement;
- The learners struggled to provide justifications or reasons, and answers to questions that require taxonomy level 4; and
- Learners mostly criticised the annual decline by arguing that smoking is bad and will result in death.

(ii) SUGGESTIONS FOR IMPROVEMENT

- In Question 1, the learner was expected to draw graphs from formulae given as well as formulae 'derived'. It is important that learners are taught how to correctly derive the formula as well as how to sketch these types of graphs;
- Learners should also be taught that should they use a variable in the formula that they have to derive, they should also explain what the variable means: e.g. 750 x number of days OR 750 x n, where n is the number of days worked;
- In Question 1.2, learners needed more exposure to calculations involving rates and percentages. It is advisable to expose learners to terms like 'maintenance costs' and 'travel costs' linked to 'consumption rate';
- Learners need to be taught to identify the errors in a misleading graph and also to explain why the graph is misleading. For example Question 1.2.3 required learners to 'criticise' the manager's statement. The instruction

readily suggested to learners that there is something wrong in the statement which learners had to find out. Instead of indicating that the graphs are misleading, most learners somehow agreed that lung cancer contributes most to the number of deaths relating to smoking, then followed by…,etc. They needed to address the claimed **annual decline in the number of deaths** in relation to the **percentage of death cases per type of disease in the descending order** that was presented;

- More written work should be given to learners on graphs, in both table and equation forms; and
- Teachers should ask higher order questions in class (Criticize, Verify, Justify, Evaluate, etc.) so that learners can learn how to respond to such questions.

QUESTION 2: CAR REPAIR CHOICES (HOURLY RATES, CALCULATIONS INVOLVING VAT, ANALYSING GRAPHS, CHOICE OF PANEL BEATERS)

On the whole, candidates' performance in this question ranged from average to weak.

(i) COMMON ERRORS AND MISCONCEPTIONS

The question tested learners' ability to work with rates, conversions and graphs.

- Question 2.1.1 - Learners did not understand the concept of rate. This is simple division and yet learners were not able to answer the question. It seems that they did not understand what was expected of them because they had to use values which were in table format. They therefore battled to read off the correct value needed for the calculation. They did not realise that the answer must be in the same unit in order to compare. This question required learners to compare one item (Strip & Assemble) across the three quotations. Many learners seemed to have no idea that the amount shown against this item is calculated from the hours shown, from which an 'hourly rate' can be calculated. Furthermore, learners misread the question as saying they should answer it without doing calculations;
- Question 2.1.2 - Very poorly answered. Learners had to calculate the amount excluding VAT from an amount where the VAT was already included. Reverse VAT calculations are important. Learners were unsure about prices being inclusive or exclusive of VAT;
- Questions 2.2.1 & 2.2.2 - It is clear that learners struggled to read from the given graphs. They did not understand the scale on the axes of the graphs, and therefore found it difficult to read off an answer between the given values. Most of the learners could identify the correct graph but could not explain their choice; and
- It is also evident that learners are unable to do conversions. This was a simple conversion from hours to minutes; and still the responses were poor. Candidates read 3.2 as 3 hours and 20 minutes.

(ii) SUGGESTIONS FOR IMPROVEMENT

- It is strongly suggested that learners be given exercises which test their use of percentages as well as the calculation of rate. Teachers should make use of everyday examples to expose learners to the relevant types of scenario. All learners can easily be exposed to rates and percentages since it is a simple concept. Once a learner has grasped what a percentage is and how they can use it or determine it whether it be increase or decrease, they will develop the skill of applying their knowledge. Teachers should also remember to teach both the percentage increase and the percentage decrease;

- Concepts of VAT included/excluded must be revised;
- Teachers should also make use of examination-type questions from various provinces when they teach the concepts in the classroom. Teachers should remember that the aim is to teach conceptual understanding and its application. Simple concepts like conversion of time can be easily taught and consolidated using various types of questions;
- Teachers need to give extra information as a class work exercise so that learners can practise the skill of sifting information and selecting the appropriate one as a way of solving the given problem.

QUESTION 3: MAPS AND SCALES (MEASURING DISTANCES ON MAPS, USING SCALES TO CALCULATE ACTUAL DISTANCE, TIME CALCULATIONS, FUEL CONSUMPTION, FOLLOWING AND GIVING DIRECTION)

This question was quite well answered.

(i) COMMON ERRORS AND MISCONCEPTIONS

Learners struggled to measure the distance accurately;

- Question 3.1.2 - Candidates made the error of not converting the time given in hours and minutes into a time given in hours only (i.e. total minutes divided by 60 leads to a decimal fraction of an hour). The answer can then be presented in hours or km. Some substituted the actual time (8:15 or 14:30);
- Learners should also learn to use their answer to justify a conclusion or a decision at the end of the question, and not to simply rewrite or rephrase the question;
- Question 3.2 - Candidates were unable to accurately follow a route on a map. Some candidates went in the opposite direction; others went completely off the track. The responses from some learners were, 'Drive straight to Upington'. This is how learners visualise the shortest distance for a trip. Most candidates did not understand what national roads are; and
- Candidates were also confused by N3 and N13. They thought '**N13'** was '**NB**'. Learners need to be made familiar with the concept of national roads and, how they are indicated in South Africa.

(ii) SUGGESTIONS FOR IMPROVEMENT

- Make use of the contexts used in Geography when teaching the measurement and calculation of scales. This allows the learner to be aware of the integration of subjects as well as developing the learners' life skills;
- Question 3.1.1b - Teachers need to ensure that when teaching learners to determine the scale, they should insist that the distances be shown. Learners need to develop the practice of writing down the values and showing the addition;
- Question 3.1.3a - Candidates tended to do half of the calculation needed to justify the answer and seemed to expect that the marker would read between the lines. Learners should be taught to look at their answers together with the mark allocation, and to ensure that they have fully answered the question asked;
- When studying the use of rates, learners need to be made aware of what happens when dividing R/l. If learners are shown how the units cancel, they will understand why the answer will be in litres. Learners often multiply values but then they are not sure what units the answer should be in: e.g. if they are calculating the cost of petrol, it can

only be in Rands; and

- When teachers work with route maps, they should show learners on a bigger map how to follow a route. The floor plan of the school building or of a supermarket can be used in a simple introduction. Teachers can even make use of the simple device of inviting learners to draw their own route to school. Once learners are comfortable with simple routes, the concept of national roads and how they are indicated on maps can be introduced.

Concepts to emphasise:

- Ratio and proportion, including cross-multiplication in proportion;
- Conversions e.g. time given in hours and minutes into time in hours only, or converting units in the metric system into each other (metres to kilometres and vice versa)**;**
- How to find or derive a scale, and use of scale;
- Calculations using same units;
- Compass directions;
- Basic calculations involving +; –; ÷; x and making an unknown the subject of the formula; and
- Substitution into formulae.

QUESTION 4: SCALE DRAWINGS AND FLOOR PLANS (CALCULATING WIDTH, AREA OF WALLS TO BE PAINTED, CALCULATING COSTS OF PAINT AND LABOUR COST TO PAINT)

This question was extremely challenging for almost all of the candidates.

(i) COMMON ERRORS AND MISCONCEPTIONS

- Question 4.1 was poorly answered because learners did not know what 'general direction' meant. Learners took the position of the bedroom in the drawing in relation to the position of the compass and they gave the answer, as South West;
- Question 4.2 called for a conversion from centimetres to metres. An error which most learners made was forgetting to convert their answers. Learners commonly confuse the conversion of cm to m with cm^2 to m^2 and therefore arrive at the incorrect answer;
- In Question 4.3.1, the most common error was to calculate the area of the bedroom floor. Learners seemed to be used to understanding Area once it is on a horizontal surface like a floor. Calculating the Area of a wall required visualizing a vertical surface which learners could not see in the diagram provided. As such, they could not figure out how to find the total inside wall area of Bedroom 2, using the width of the floor multiplied by the height of the wall. Linguistic ability also played a role here in that learners were hasty in answering the question because they only saw the words 'area' and 'bedroom'. As a result, some learners calculated the area of the bedroom floor and stopped there. No consideration was given to the mark allocation of 10 marks for this question. In Mathematical Literacy Paper 2, learners should not expect a question of this nature to be broken up into subsections;
- In Question 4.3.2, learners again struggled with the division of area in the form of m^2 by the rate of painting an area i.e. m^2/l, and as a result *either divided only by* 4 or by 5 and then forgot to do the rounding up correctly. This showed

a lack of competence in working with the various units and also a lack of understanding of rounding up; and

- In Question 4.4, the learners calculated the extra 50% on the normal rate paid, but they forgot to add that to the standard rate. As a result, their final total was incorrect. This is also a problem caused by incorrect interpretation of the language of the question. For instance, some learners did not understand the meaning of 'verify'.

(ii) SUGGESTIONS FOR IMPROVEMENT

- The misinterpretation of 'general direction' can be rectified in the classroom if the learners are taught how to make correct use of the compass. Moreover, 'general direction' refers to only the cardinal point on the compass. Learners should have avoided looking at the position of the compass on the sketch in relation to the position of the bedroom. The position of the points on the compass is the same for all the rooms. The room was therefore facing South.
- Learners need to be taught to multiply units of the same kind and to make sure of the conversions. There is a difference between the conversion from cm to m, and from cm^2 to m^2.
- In order for learners to be able to answer the sections on space and shape accurately, they need to be exposed to these sections. Teachers should give learners sufficient practice with conversions so that they are able to apply the various conversions when they have problems to solve.
- Conversions must include conversion of square units and cubed units, since these are the conversions that learners find most difficult.
- Teachers should make use of as many examples as possible in order to assist learners to improve their ability, not only to calculate areas but also to interpret the sketches given.
- Teachers should focus more on conversions. When the solution must be given in a different 2D unit, learners should first convert the 1D units into the required units and then determine the required area. This is strongly suggested because learners find it difficult to convert an area from cm^2 to m^2: they tend to divide by 100 instead of 10 000. Classroom equipment should be used as practical examples in explaining these concepts.
- Teachers should also spend more time on how to change the subject of the formula by giving more homework and writing informal tests. The different sections of percentages should be part of teachers' daily classroom practice.
- Reading to comprehend should be encouraged.
- Learners should be encouraged to use units in every step of their solution. This will help to make them understand which values to add/subtract/divide/multiply, especially when dealing with rates, e.g. cost per litre.
- Teachers should consolidate work on rates, payment and invoices.
- Percentages need to be taught on a daily basis so that candidates are able to apply this skill in their daily lives.

QUESTION 5: STATISTICAL DATA OF TWO SCHOOLS (ANALYZING STATISTICAL DATA, PROBABILITY, MEAN, MEDIAN, MODE, CALCULATING SCORES, PROBABILITY)

Candidates did better in this question than in Questions 3 and 4.

(i) COMMON ERRORS AND MISCONCEPTIONS

- The only sections which were poorly answered were probability and the section which required the candidate to analyse a set of results and determine which school performed better;
- The writing of a probability in the form of a ratio is still a common error, even though it has been mentioned in previous reports. Teachers must please take cognisance of how a probability can be presented;
- In Question 5.1.2b, candidates were able to correctly choose the better performing school, but they were challenged when they had to describe their choice. Learners were not sure how to make use of range, mean and median to explain their choice;
- In Question 5.2.3, the learners had to analyse critically a set of results, but it was clear that they did not realise that the quality of the results took preference over the quantity. It was also incorrect to assume that a smaller number of learners (30) compared to a larger number in another school (153), would be the better-performing school with its pass percentage of 96.67% as compared to an 87.58% pass rate at the other school. This question also tested the learners' ability to make an informed decision about a set of data;
- In Question 5.1.2 (b), candidates had a problem with simplification;
- They failed to realise that probability could not exceed 1 as a fraction or more than 100% as a percentage;
- In Questions 5.1.2, candidates were able to calculate the mean, range and median, but could not use them to compare two sets of data and as such draw conclusions; and
- In Question 5.2.1, reverse percentage sums are difficult for learners. They might not have realised that the number of learners per type of matric pass were not the totals of passes. They thought they should calculate 96.67% of 29 and round it off to one.

(ii) SUGGESTIONS FOR IMPROVEMENT

Most of the learners' responses in this particular question were satisfactory. The only problem was still with the presentation of probability as a ratio.

- It is cause for concern that in the sections where learners have to calculate the mean, median and range, they tend to write down the answers only. Learners should become accustomed to showing all their working, because in some cases the answer is incorrectly rounded off or the data are not arranged, especially in the case of determining the median of the data;
- Teachers should consolidate simplification of fractions/ratios;
- There ought to be emphasis on the methods/steps of calculating the measures of central tendency (e.g. mean, mode, median) and measures of spread (e.g. range);

- Teachers should use contexts that will show learners the effect of the mean or range
- on a set of data, as well as the interpretation thereof;
- Although calculations of Quartiles and Percentiles are not examinable, according to the Subject Assessment Guidelines the interpretation of the two concepts is examinable. Teachers need to focus on how to use the percentiles to analyse data, as well as the correlation between percentiles and quartiles; and
- Learners need to be exposed to more Level 4 questions in the classroom.

5.10 MATHEMATICS

The following report should be read in conjunction with the Mathematics question papers of the November 2011 Examination.

SECTION 1 - QUANTITATIVE ANALYSIS (2008 – 2011)

Analysis based on Maths P1 and P2 only

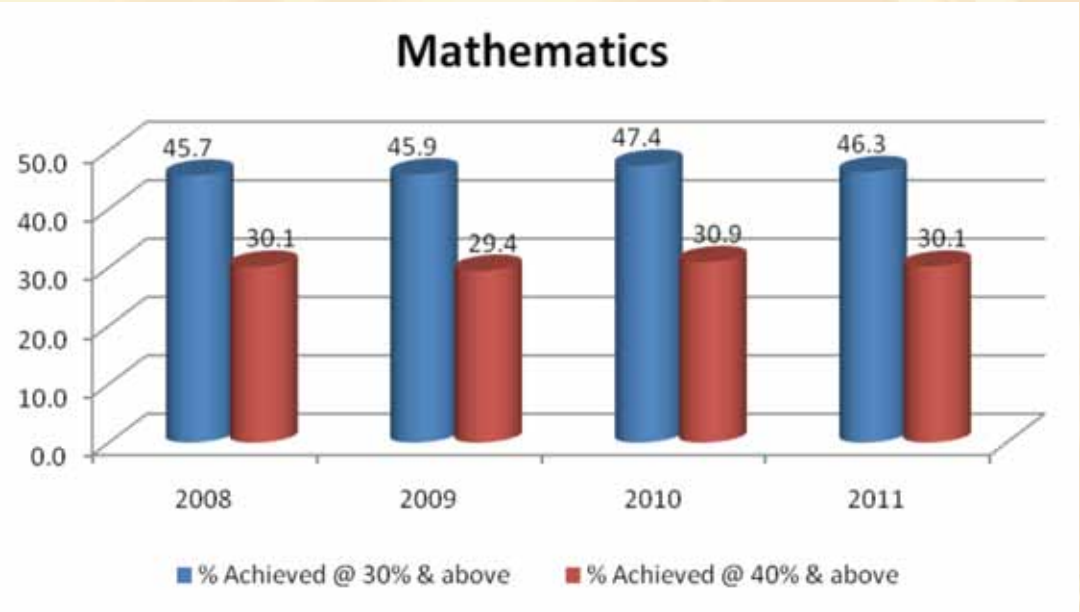
OVERALL ACHIEVEMENT RATES (2008 - 2011)

The number of learners who wrote Mathematics in 2011 decreased by 38 427 compared with the number of learners who wrote Mathematics in 2010. This is a worrying trend. There was an improvement in the nature of responses of Mathematics candidates across all provinces. Reasons for this include learners being better prepared for the examination, and teachers being more familiar with the subject content. However, this improved performance did not translate into the expected improvement in the pass rate at the 30% and 40% levels, as it is clear that a considerable number of centres are still producing candidates who do not understand basic subject content. Nevertheless, the improved general quality of work produced by candidates augers well for future NSC examinations, provided that basic applications and conceptual knowledge are embraced in all centres.

TABLE10: OVERALL ACHIEVEMENT RATES IN MATHEMATICS, 2008 - 2011

Year	No. Wrote	No. Achieved @ 30% and above	% Achieved @ 30% and above	No. Achieved @ 40% and above	% Achieved @ 40% and above
2008	300 008	136 184	45.4	89 788	29.9
2009	290 407	133 505	46.0	85 356	29.4
2010	263 034	124 749	47.4	81 374	30.9
2011	224 635	104 033	46.3	67 541	30.1

FIGURE 10: OVERALL ACHIEVEMENT RATES IN MATHEMATICS, 2008 - 2011



SECTION 2 - QUALITATIVE ANALYSIS OF LEARNER PERFORMANCE

PAPER 1

A. GENERAL OVERVIEW OF LEARNER PERFORMANCE

While some candidates performed excellently in this paper, many performed poorly. Many of the errors made in answering this paper have their origins in a poor understanding of the basics and foundational competencies taught in the earlier grades, such as algebraic manipulation, factorisation, solution of equations and inequalities. This suggests that interventions to improve learners' performance should focus also on knowledge, concepts and skills learnt earlier and not just on the final year of the FET phase.

Many candidates struggled with concepts in the curriculum that required deeper conceptual understanding. Questions which required candidates to interpret, explain or provide justification presented challenges. This suggests that many learners are exposed to 'stimulus-response' methods only, and will obviously have great difficulty when faced with questions testing the same procedures as previously tested but asked differently.

Because of their poor language ability, the majority of learners did not provide good answers to contextual questions such as 7, 11 and 12. Thus they could not identify the mathematical skills involved.

B. ANALYSIS OF LEARNER PERFORMANCE IN INDIVIDUAL QUESTIONS

QUESTION 1: ALGEBRA AND EQUATIONS

(i) COMMON ERRORS AND MISCONCEPTIONS

This was the question in which learners responded best. With the exception of Question 1.2.1, all parts of the question were of a routine nature and made lower level cognitive demands. The solution for quadratic equations and inequalities were tested. Many of the common errors made in answering this question can be traced back to misconceptions regarding work studied in the GET phase or earlier. Errors in rounding off numbers and multiplying negative integers after substitution led to incorrect answers to Question 1.1.2.

While most candidates were able to obtain the values where the expression $3x^2 - 4x - 8$ was equal to 0 in 1.1.3, and even to obtain the graphic solution of the inequality, they were not able to write out the solution to the inequality correctly. In this case, the use of 'or' was essential. The solution had to be written as: $x \leq 0{,}25$ OR $x \geq 1$.

Because of unfamiliarity, many learners struggled with Questions 1.2.1 and 1.2.2. Learners should be exposed to different ways of solving simultaneous equations and not merely the stimulus-response type of answering. The poor performance in this question indicates a lack of fundamental understanding of what a ratio is and how to use the word 'hence' when answering questions. Many learners ignored the word 'hence' and solved the simultaneous equations in the conventional way by substitution of a linear equation $x = 8 - y$ into the given equation. Learners need to be careful when using the quadratic equation to solve for *y*. Learners tend merely to write '*x* = ...' since this is routine for them, but it causes problems when they are solving for *y* first in the simultaneous case.

(ii) SUGGESTIONS FOR IMPROVEMENT

Learners need to practise basic calculator work throughout the year. Educators should teach the various options of solving quadratic inequalities to learners, including graphical solutions. Teachers need to emphasise the difference between the words 'and' and 'or' when used in Mathematics. Learners should be able to factorise a simple equation or expression since most learners used both long and time-consuming methods of applying the quadratic formula to find the roots of a simple equation.

QUESTION 2: PATTERNS AND SEQUENCES

(i) COMMON ERRORS AND MISCONCEPTIONS

On the whole, this question was poorly answered. Question 2.1 was better answered because it required routine knowledge of the definition of arithmetic and geometric sequences. It is disappointing to note that learners still see only one solution to the equation, $x^2 = 128$ as $x = \sqrt{128}$ and not $x = \pm\sqrt{128}$. Again, this shows that most learners did not truly understand the mathematical concepts but are simply doing questions as per routine methods.

In Question 2.2, many learners chose the incorrect summation formula. It is also evident in the responses to this question that learners struggle with using exponential laws.

(ii) SUGGESTIONS FOR IMPROVEMENT

Teachers should stress the existence of two solutions to a quadratic equation. Learners need to be taught how to differentiate between and identify arithmetic or geometric series. This needs to be emphasised to learners in many practice exercises. Teachers should be reminded to revise exponential laws, and working with exponents when teaching geometric sequences.

QUESTION 3: PATTERNS AND SEQUENCES

(i) COMMON ERRORS AND MISCONCEPTIONS

Most learners struggled with this question given that it was an integrated sequence, involving both the arithmetic and a geometric. They were unable to distinguish the two sequences and consequently battled to identify that the 52^{nd} term of the given sequence was the 26^{th} term of the geometric sequence and the 51^{st} term of the given sequence was the 26^{th} term of the arithmetic sequence. Learners confused the term 'infinite sequence' with the sum to infinity of a geometric sequence. Mathematical language continues to be a problem in the teaching and learning of Mathematics.

(ii) SUGGESTIONS FOR IMPROVEMENT

Teachers need to emphasise and use correct mathematical language in their teaching. If learners hear the terms regularly and if the terms are explained to them properly, they will begin to interpret questions of this nature more comfortably. Some learners tried to explain the divisibility of the sequence in Question 3.3 in words, but by doing so demonstrated a poor mathematical vocabulary.

To better prepare learners for such questions, teachers should, when teaching this section, not only expose learners to the theory regarding the individual types of sequences, but also concentrate on the number pattern aspect in integrated questions. Question 3.3 required that the learners generalise, but they were unable to do this. Learners can undertake investigations to enhance their understanding of number patterns, sequence and series, e.g. Pascal's Triangle.

QUESTION 4: PATTERNS AND SEQUENCES

(i) COMMON ERRORS AND MISCONCEPTIONS

This question was poorly answered. It tested the concepts underlying quadratic sequences rather than a learnt method as in previous years. Learners thus struggled to calculate the second difference for the sequence, and consequently were unable to determine the sequence.

(ii) SUGGESTIONS FOR IMPROVEMENT

It is clear that more emphasis should be placed on understanding the characteristics of various sequences. It is necessary for quadratic sequences to be studied in depth and not merely as a type of number pattern to be recognised and completed. Teachers are advised to vary the question types used for exercises when teaching quadratic sequences. Teachers and learners should try to devise questions, which explore the structure of quadratic sequences.

QUESTION 5: FUNCTIONS AND GRAPHS

(i) COMMON ERRORS AND MISCONCEPTIONS

In previous papers, the calculations for *x*- and *y*- intercepts of the hyperbola were asked as a single question. Learners need to read for understanding and not just assume what the question is asking. Many learners calculated the *x*- and *y*-intercepts as a unit rather than specifically answering the individual questions. Learners generally knew how to find the intercepts with the axes.

Question 5.1.4 was poorly answered. This suggests that learners and teachers do not spend enough time discussing information that can be obtained from graphs. It is important when studying functions that teaching does not stop at how to sketch the curve, but rather that questions which require using the graph to deduce properties of the function also be considered. In this case, $f(x) > 0$ when the curve is above the *x*-axis, and so the answer to the question was $-3 < x < 3$. Learners who attempted this question failed to notice that x should also be less than 3. The implication is that the concept of an asymptote is not well understood and should be explained clearly by all teachers.

Question 5.1.5 required finding the average gradient between 2 points on the curve. Many learners knew the correct formula to use. Errors were, however, often made, in that arbitrary *y* – co-ordinates were used for the points where x is – 2 or 0. f (–2) needs to be calculated by substitution in the equation, while the *y*-intercept is already known.

Some learners found Question 5.2 unfamiliar and consequently omitted it. Learners who attempted it generally scored at least some marks.

(ii) SUGGESTIONS FOR IMPROVEMENT

Since calculation errors were common, it is important for teachers to emphasise in Grades 9 and 10 the importance of working with algebraic fractions. Teachers should also take care to show learners how to shape their curves, as many curved the arms of the hyperbola away from the asymptotes.

Teachers should note that the need for learners to know the effect of the various parameters in the equation of the parabola is clearly stipulated in the SAG document. In teaching the function, learners should first know the basic curve and then be given the opportunity via worksheets to investigate the effects of changing the values of the various parameters. This could also be the topic of one of the SBA investigations in grade 11.

QUESTION 6: FUNCTIONS AND GRAPHS

(i) COMMON ERRORS AND MISCONCEPTIONS

Learners associate the inverse function with the exponential function, so this was a familiar Question to them. It is important for teachers to take the opportunity, when teaching the inverse function, to revise working with exponents because many learners wrongly equated 2.2^x to 4^x. Teachers should contrast expressions such as 2.2^x and 2^{x+1} with 4^x; $(2\times 2)^x$ and 2^{2x} and $\log_2 2x$ with $2\log_2 x$ when studying algebraic manipulations with exponents and logs. Understanding fully what each means will eliminate many errors.

Question 6.6 illustrates the need to integrate the various topics in the curriculum. Revision exercises and investigation assignments provide opportunities to do so.

(ii) SUGGESTIONS FOR IMPROVEMENT

Teachers should ensure that learners know the standard formula and defining equation of the various families of functions taught so that the learners can visualise a graph from reading the equation of the function. Learners should be exposed to more situations where they are required to convert flexibly between the various representations of functions, i.e. words, symbols and graphs.

QUESTION 7: ANNUITIES AND FINANCE

(i) COMMON ERRORS AND MISCONCEPTIONS

Learners needed to realise that A must be half of P in the formula for depreciation in question 7.1. They seem to be able to use the log function to determine an exponent. There needs to be substantial classroom practice in this regard.

Mathematical language needs to be emphasised in Financial Mathematics. Learners needed to understand that the principal amount was the original amount in the calculation of Radesh's bonus. It is important to emphasise that learners are unfamiliar with the formula sheet and cannot determine which formula to use in each situation.

(ii) SUGGESTIONS FOR IMPROVEMENT

Learners should practice the application of various formulae to find what is required. If they do this, the insecurity of choosing the incorrect formula could be reduced.

Teachers should teach learners to use a time-line to help determine the number of payments correctly in each problem. Learners understand a problem better if they can visually 'see' what is happening in the problem. Teachers also need to warn learners against rounding early in Financial Mathematics problems if amounts are calculated in steps.

It is clear that learners need practice in interpreting the terminology of Financial Mathematics. Performance could be improved if learners were provided with a glossary of terms to learn. The correct use of calculators is an important skill for financial mathematics and from an early stage teachers should regularly test the calculator skills of their learners.

QUESTION 8: CALCULUS

(i) COMMON ERRORS AND MISCONCEPTIONS

While learner performance was better in this question, there are still issues that need attention by teachers so that learners are able to score as many marks as are available. Learners commonly made notational errors in the differentiation

by first principles and consequently lost marks. Teachers need to perform drill and practice exercises where notation is specifically emphasised. It is again evident that more emphasis needs to be placed on multiplying binomials by binomials in the GET phase, since many learners still do this incorrectly but manipulate the answer for the first principles differentiation to be $f'(x) = -8x$.

In Question 8.2.1, many learners struggled to correctly identify the coefficients, variables and exponents in the expression of *y* before differentiating. A general error was to write $\frac{3}{2x}$ as $-6x^{-1}$. This indicates how a lack of mastery of the work on exponents learnt in grades 9 and 10 prevents accurate answers even though grade 12 differentiation methods are understood.

(ii) SUGGESTIONS FOR IMPROVEMENT

Learners need to pay attention to notation so that the function and the derivative are distinguished. Learners need to read questions correctly because $f(1)$ rather than $f^{1}(1)$ was calculated in Question 8.2.2.

QUESTION 9: CALCULUS

(i) COMMON ERRORS AND MISCONCEPTIONS

This question tested the understanding of a cubic graph. Many learners struggled with the application of deriving the equation of the cubic equation.

(5; 18) and (2; – 9) were given as turning points. Five pieces of information could be deduced from this. $f(5) = 18$, $f'(5) = 0$, $f(2) = -9$, $f'(2) = 0$ and $f''(3{,}5) = 0$. Any three of these deductions could be used to formulate equations to solve simultaneously, to determine the values of a, b and c. It is important that learners understand the significance of a turning point or an inflection point.

Question 9.2 tested a routine prescribed procedure. Note that the gradient is found by calculating $f^{1}(1)$, while the y-coordinate is found by calculating $f(1)$. Some learners mixed these up.

Many teachers and learners did not fully understand the concepts underlying calculus.

(ii) SUGGESTIONS FOR IMPROVEMENT

Teachers need to spend time explaining the characteristics of the cubic graphs and how they fit into both the notation used and the working with the equations. Many learners are only taught how to sketch a cubic graph or to determine the key aspects from a given cubic equation. Teachers need to introduce the learners to graphical interpretation questions as is indicated on page 13 of the Examination Guidelines document.

Substituting the values you are required to calculate is an approach that should be discouraged by teachers. Learners also demonstrated that they did not understand when they were working with the expression for a function or an equation. Learners tend to divide by a negative 1 in an expression. This extends back to the GET phase where the difference between an expression and an equation needs to be emphasised constantly.

Subject advisors should arrange workshops for teachers to empower themselves in understanding calculus.

QUESTION 10: CALCULUS

(i) COMMON ERRORS AND MISCONCEPTIONS

This question tested the understanding of the derivative graph and was very poorly answered. By showing the cubic function, the function of the derivative and the function of the second derivative on the same graph, learners should be able to visualise better the connections between the characteristics of the functions.

(ii) SUGGESTIONS FOR IMPROVEMENT

It is important for teachers to teach the understanding behind the different functions and integrate the knowledge that learners acquire. Teachers need to ask probing questions like 'Why …?', 'What if …?' and 'Explain …' when teaching functions.

QUESTION 11: CALCULUS

(i) COMMON ERRORS AND MISCONCEPTIONS

This question tested interpretation of calculus knowledge with regard to rates of change. Most learners struggled with this question.

(ii) SUGGESTIONS FOR IMPROVEMENT

It is important for teachers to do more examples of application of calculus, since this is a considerable part of Mathematics. Learners need to be exposed to questions involving rate of change not only on graphs but in practical situations. When doing examples of this nature, teachers need to encourage learners to always give the units as much as possible, because most of the practical situations need this for the answer to make sense.

QUESTION 12: LINEAR PROGRAMMING

(i) COMMON ERRORS AND MISCONCEPTIONS

Many more learners appeared to attempt the linear programming question and managed to score some marks. The vast majority, however, wrongly deduced one of the constraint inequalities and it is clear that language played a role. Learners wrongly interpreted the statement, 'a school is planning a trip for 500 learners', as implying that at most 500 seats were required, while in fact at least 500 were required.

While formulating the other constraints and graphing them was often well handled, learners were not able to use the search line to find the solutions which minimised cost. Many reverted to testing the vertices of the feasible region, as taught in grade 11. This method did not produce all the answers here as the gradient of the search line coincided with that of the constraint line forming the border of the feasible region. The points (6; 8), (7; 6), (8; 4), (9; 2) and (10; 0) were all solutions.

(ii) SUGGESTIONS FOR IMPROVEMENT

Learners should regularly be exposed to problems where the solution is not necessarily unique and at one of the vertices.

In studying this section, learners need to continually relate mathematical solutions back to the context of the problem to see if they make sense. If, for example, the error mentioned in the first paragraph was made, the feasible region would include (0 ; 0) and the trivial solution of using no buses and taking no learners on the trip would result.

GENERAL COMMENTS

Every effort should be made to encourage logical thought when answering questions and not mere rote application of methods. Teachers need to go back to basics on many topics, including exponents and fractions. It is also important that learners be extended in their understanding of problems, and taught to see how various sections are integrated. Learners should be taught how to sketch a graph and to interpret it. They should master the characteristics of a particular graph.

PAPER 2

SECTION 2 - QUALITATIVE ANALYSIS OF LEARNER PERFORMANCE

A. GENERAL OVERVIEW OF LEARNER PERFORMANCE

In this paper learners performed best on data handling, followed by Co-ordinate Geometry, then Transformation and lastly Trigonometry.

Many of the errors made by candidates in answering this paper have their origins in a poor understanding of the basics and foundational competencies taught in the earlier grades. For example, the basic trigonometric definitions and identities have not been mastered, a poorly developed spatial perception impeding the solving of 2D and 3D problems is evident, and a lack of clear understanding of gradients prevented them from dealing with problems in Analytical Geometry.

Many candidates struggled with concepts in the curriculum that required deeper conceptual understanding. Questions where candidates had to interpret, explain or provide justification presented challenges to most candidates. This suggests that many candidates were only exposed to “stimulus-response” methods, and will obviously have great difficulties when faced with questions testing the same procedures as previously tested but asked differently.

In this paper, learners struggled to integrate knowledge of different sections in order to solve problems. The combination of Analytical Geometry and Trigonometry in question 6, and Trigonometry and the cubic equation in Question 12 was a new approach and candidates clearly struggled to deal with this integrated approach. Question 12 was perceived as the most difficult question by both candidates and various other stake holders such as teachers, mathematics experts and tertiary staff. It was good however that it came at the end of the paper and did not negatively impact candidates early in the examination.

This suggests that they are mostly exposed to compartmentalised teaching and not an integrated approach, which is crucial in developing deeper understanding.

Also questions where candidates had to interpret explain or provide justification presented challenges to most candidates.

From the analysis of the data, it appears as if many candidates are mostly exposed to knowledge and routine questions, and lack the ability to deal with complex and higher-order questions that required deeper insight.

Candidates lacked the necessary insight to deal with questions based on compound angles, understanding of functions, and interpretative questions. Also questions where candidates had to interpret explain or provide justification presented challenges to most candidates. Interpretation of graphs across Mathematics is a serious challenge.

The algebraic manipulation skills in trigonometry and analytical geometry need to be emphasised.

Although the calculator is an effective and necessary tool in Mathematics, learners appear to be over dependent on their calculators. This may impede the development of the conceptual understanding of mathematics and affect their manipulation problem-solving skills.

Although Euclidean geometry is not directly examined in Paper 2 in grade 12, the basic geometry concerning angles of a triangle, properties of quadrilaterals, etc. is still needed and should be revised.

B. ANALYSIS OF LEARNER PERFORMANCE IN INDIVIDUAL QUESTIONS

QUESTION 1: DATA HANDLING

(i) COMMON ERRORS AND MISCONCEPTIONS

With the exception of Question 1.4, this was the question in which most learners performed better. In Question1.4, the learners answered in terms of skewness and not in terms of spread. The learners also gave no explanation/comment about the points scored by the players. The language ability of learners also played a role here. Comprehension of the situation was poor. In many cases, the learners confused the range and the inter-quartile range. Moreover, some learners divided the range by two, showing no real understanding of the meaning of the terminology.

(ii) SUGGESTIONS FOR IMPROVEMENT

Direct calculations in statistics are no longer a problem. The interpretation of spread of data needs more attention. Homework questions ought not to focus solely on direct calculations of values, but should rather include many more interpretive questions.

QUESTION 2: DATA HANDLING

(i) COMMON ERRORS AND MISCONCEPTIONS

The marking process revealed that many candidates made use of a calculator to calculate the standard deviation and showed improved performance. Some candidates still used the ‘pen and paper’ method which is tedious, time-consuming and prone to errors. Many learners do not have a clear understanding of the standard deviation concept and were not able to find scores that lie “outside” one standard deviation.

(ii) SUGGESTIONS FOR IMPROVEMENT

Educators should explicitly teach candidates to calculate standard deviation using a scientific calculator. Also educators should explain to learners the real meaning and use of standard deviation. The learners must be exposed to more examples of the *use* of SD in contextual problems.

QUESTION 3: DATA HANDLING

(i) COMMON ERRORS AND MISCONCEPTIONS

This was the best answered of the statistics questions. In Question 3.2, learners only identified the relationship, but gave no justification for it.

In their answers to Question 3.3, learners gave opinions about real-life situations rather than explaining/answering the question.

(ii) SUGGESTIONS FOR IMPROVEMENT

When it comes to questions that ask which relationship is displayed and requires a justification, the learners need to be clearly taught that the purpose of a justification is to support the relationship.

More emphasis should be placed on the interpretation and analysis of statistical data. Candidates should be taught to effectively communicate conclusions made from an analysis of data. They should be provided with a glossary of terms/concepts used in Statistics, and the significance of each, and should be exposed to more questions that involve interpretation/analysis of data. In class, they should be given opportunities to verbally explain their interpretation and analysis of data.

QUESTION 4: DATA HANDLING

(i) COMMON ERRORS AND MISCONCEPTIONS

With the exception Question of 4.3, this question as a whole was well answered. Many learners used incorrect co-ordinates to draw the ogive. They either used the midpoint of the interval and the cumulative frequency or the lower limit and the cumulative frequency to plot the points. Again most candidates lacked the skills needed to interpret information.

(ii) SUGGESTIONS FOR IMPROVEMENT

It must be ensured that learners clearly understand that when drawing an ogive, they should use (upper limit, cumulative frequency). It is also necessary to emphasise the importance of having a smooth curve and not one where the points are connected with a ruler.

QUESTION 5: ANALYTICAL GEOMETRY

(i) COMMON ERRORS AND MISCONCEPTIONS

Although this question was attempted by most learners, the performances varied from extremely poor to excellent. Many learners lack knowledge of fundamental Analytical Geometry concepts and theory.

Question 5.1 was extremely poorly done. Many candidates started by *assuming* that $a = 4$ and then used that to show that PQ and QR are perpendicular, hence $a = 4$. This represents a circular argument.

Many learners also lack the basic algebraic manipulations and knowledge and, for example stated that $y = -2(x+6) = -2x - 8$. Candidates also battled with the concept $m_1 \times m_2 = -1$ to infer that lines are perpendicular.

The learners could not analyse the diagram in order to get maximum information from it, and the learners did not know the properties of polygons as they were supposed to. In Question 5.3, the learners could see the answer but were not able to prove it: they saw the transformation but wanted to calculate the answer.

Question 5.5 illustrated clearly that many candidates were not familiar with the centre-radius form of the equation of a circle with centre at any point on the Cartesian plane. They consistently used the equation of a circle, with centre at the origin.

Question 5.7, which is regarded as a higher-order question was also very poorly answered. Most candidates did not understand what was required.

(ii) SUGGESTIONS FOR IMPROVEMENT

The frequency of implementing a circular argument in mathematics suggests that many candidates answer questions using procedural knowledge, devoid of understanding, and lack the skill to use mathematical concepts as "tools" in reasoning, in solving a problem appropriately, to illustrate, prove, and make inferences and observations.

The learners need to understand that in a question that uses the instruction 'Show', a value is equal to a specific value (as in question 5.1), they can make use of the value in the questions that follow.

Proper understanding of concepts (radius, diameter) should be emphasised. The concept and implications of parallel and perpendicular lines should be addressed. The ability to substitute correctly in correct formulae is still a problem. Teachers should emphasise the use of simultaneous equations when solving for co-ordinates of points of intersection, and show how algebra is integrated in other topics. Learners need to be taught basic shapes and their properties.

QUESTION 6: ANALYTICAL GEOMETRY

(i) COMMON ERRORS AND MISCONCEPTIONS

This question was poorly done and many candidates provided answers without sound mathematical reasoning. For example in Question 6.1, many candidates stated that the co-ordinates of C are (-1; 5), probably from the fact that it was given that CB = 5. Some candidates just assumed values for the co-ordinates of A and then calculated the length of CA using the distance formula. The word "length" led candidates to immediately opt for the distance formula. Some candidates used the distance formula to find the length once they had calculated point A in Q6.5. Many did not use Pythagoras because they did not know that angle CAB is 90^0.

In Question 6.3, many candidates did not recognise the right angled triangle and were not able to write tan- ratio. Learners gave the size of the angle and not the ratio. They said that the two lines are perpendicular, then used $m_1 + m_2 = -1$ instead of $m_1 \times m_2 = -1$.

Learners need to know and use the axiom that the tangent to a circle is perpendicular to the diameter drawn to the point of contact.

Candidates again used a circular argument by using what they have to prove in Question 6.4 to prove earlier statements. Some candidates calculated point A in Question 6.5 and then used that to calculate the gradient between points A and B. Also many learners did not know that to find the point of intersection of two lines, they had to solve two equations simultaneously, although this is introduced in earlier grades as well as in Paper 1.

(ii) SUGGESTIONS FOR IMPROVEMENT

Teachers should make sure learners know basic facts of circles, triangles and other polygons. Learners need to know that the radius of a circle is perpendicular to the tangent drawn at that point. They need to understand that if the value of tan q is asked, the answer must be given as the ratio and not the value of the angle.

In order to develop their ability to use information from sketches and to deduce what to do, they should be given detailed sketches and asked to write down all the information that they can deduce from them and then to order their information to answer the given questions.

Although Euclidean geometry is not directly examined in Paper 2 in grade 12, the basic geometry concerning angles of a triangle, properties of polygons, etc. is still needed and should to be revised.

QUESTION 7: TRANSFORMATION GEOMETRY

(i) COMMON ERRORS AND MISCONCEPTIONS

It is evident that many candidates did not understand the rules of transformation and struggled to apply rotation through 180^0 about the origin.

Question 7.2 was poorly done. Many candidates found it difficult to unpack the combination of the two concepts: i.e the equation of a circle and reflection in the line $y = x$. Candidates did not realise that the most efficient way to transform a circle is to apply the transformation to the centre and then write the new equation from there. It was evident that many candidates were not exposed to this type of question but rather just the 'stimulus-response' type of questions.

(ii) SUGGESTIONS FOR IMPROVEMENT

Transformation geometry is a very visual section and its understanding can be greatly enhanced by using dynamic software such as "Geogebra". For learners to memorise the rules is dangerous. It is better that they discover by figuring it out for themselves, so that when they need it, they can make a rough sketch and check for example, what happens to the co-ordinate when you rotate a point by 180º, etc.

Teaching should be a two-way street. For example, teachers should ask the learners to give the equation of the circle when they have the centre and the radius. Then they should be given the equation of the circle and asked to determine the centre and the radius. Learners should be able to apply their knowledge directly and indirectly.

Teachers should expose learners to all possible transformations and not only those seen in previous examinations. Transformations should not be done in isolation.

QUESTION 8: TRANSFORMATION GEOMETRY

(i) COMMON ERRORS AND MISCONCEPTIONS

Application-type questions tended to be poorly answered. In answer to Question 8.1, learners explained what transformation was and did not give the given transformation in words. They also struggled to differentiate between the concepts: translation, rotation and reflection.

In Question 8.3, many candidates could not answer the question correctly. They could only give the correct y-coordinate of G. It appears that they are not used to reflections about lines such as $x = -1$, but only to the conventional reflections along x and y axis and $y = x$. Although not directly prescribed in the curriculum, it is an extension of their understanding about reflections and regarded as a higher-order question. This could become routine if learners are regularly exposed to these types of questions.

(ii) SUGGESTIONS FOR IMPROVEMENT

Teachers should help learners to move smoothly from words to symbols, and then to diagrams and vice versa. They should not simply ask the questions in ordinary, predictable forms, but should also use new variations so that the learners can get exposure to the many possible ways of questioning.

Learners should be reminded that a rotation of, for example, 90° anti-clockwise will have the same effect as a rotation of 270° clockwise. A positive angle indicates an anti-clockwise direction and thus a negative angle indicates a clockwise direction.

Teaching should not be done in compartments. Throughout the teaching and learning process, the learners should clearly comprehend and understand that knowledge of various topics can be integrated in the same question.

Educators should emphasise the relationship between scale factor and its impact on area, volume etc.

QUESTION 9: TRIGONOMETRY

(i) COMMON ERRORS AND MISCONCEPTIONS

Questions 9.1 and 9.2 were moderately well done, while Question 9.3 was poorly done. Many candidates used calculators although the questions clearly specified 'without the use of a calculator'. The reduction formula should be clearly taught and applied without calculators.

In Question 9.1.1, candidates provided an incorrect sketch which resulted in them arriving at inappropriate responses. It appears that candidates did not consider the given trigonometric ratio and the domain simultaneously. A common error that occurred in Question 9.2 was $\tan^2 120^0 = -\tan^2 60^0$ and not the correct one, i.e. $\tan^2 120^0 = (-\tan 60^0)^2 = \tan^2 60^0$.

In Question 9.3 many candidates failed to interpret the question which asked for the numerical value of sin RÔP and confused it with the size of RÔP. Many candidates made mistakes when using the formula for rotation in Question 9.3.3 which indicated that they are not clear on which formula was to be used for clockwise and which would be used before anti-clockwise rotation. Although the formula sheet provides both formulae, candidates should be able to make sense of how to apply them.

(ii) SUGGESTIONS FOR IMPROVEMENT

When teaching trigonometry, educators should emphasise the understanding of trigonometrical ratios and expose candidates to an integrated approach to answering questions, since some answers calculated in preceding sub-questions may lead them into finding the answer to the subsequent sub-questions. Also the integration of various topics within this section such as trigonometry, transformation geometry and algebra, should be made explicit.

Teachers should teach learners to work with a sketch/diagram and ensure that they are absolutely sure about which side is *x* and which side is *y*. The reduction formula should be clearly taught and applied without calculators. Both teachers and learners should not be over-dependent on the calculator. Learners need to be taught to use the triangles for the special angles. If a question says NO CALCULATOR, learners should show the steps using reduction formula. If a question asks for a diagram or sketch to be used, the learners should show the diagram or sketch in their answer books and with the correct labels. The learners should learn the skill to work without a calculator when necessary.

QUESTION 10: TRIGONOMETRY (TRIGONOMETRIC FUNCTIONS)

(i) COMMON ERRORS AND MISCONCEPTIONS

Except for Question10.1, this question was generally poorly done. In Question 10.2 many candidates did not understand that $g(x) + 2$ indicated a vertical shift which impacted on the minimum value of *g,* and similarly they could not interpret $f\left(\frac{1}{2}x\right)$ in Question 10.3 as indicating a horizontal stretch, which impacted on the period of *f*. Many of the learners worked out the new period as 180º x ½, thus not clearly understanding the influence of *k* on the period.

Very few candidates had any idea of how to go about answering Question 10.4. Questions like these need to be regularly infused into teaching so that learners are exposed to problem-solving strategies.

(ii) SUGGESTIONS FOR IMPROVEMENT

The impact of the parameters on functions is an important aspect of the NCS curriculum, and is fundamental to a deeper understanding of how to enable candidates to competently deal with questions of this nature. Functions and graphs should be taught in a way that leads to an understanding of the effect of the different parameters. It is also important that learners are familiar with the characteristics such as shape, amplitude and period as well as asymptotes where appropriate. Let the learners sketch the graphs by making use of the characteristics, but also give the graphs and ask the learners to derive the characteristics from them.

Teachers should teach learners how to work with quadratic trig equations. The learners should understand that for example, question 10.4 should end with a conclusion. As in all other questions, integration of sections is needed. Learners should regularly be exposed to different levels of questions in order to develop their logical reasoning skills.

QUESTION 11: TRIGONOMETRY

(i) COMMON ERRORS AND MISCONCEPTIONS

Performance in this question ranged from poor to fair. Many candidates failed to substitute the appropriate (relevant) lengths of both sides of Δ ABC into the area formula. Despite the formulae being provided on the formula sheet, many candidates could not use it appropriately in this question. Educators should ensure that learners use the formula sheet regularly and know how to adapt the formula to the given situation. If they cannot do this, the provision of the formulae is useless. It appears that certain words trigger certain strategies. For example, whenever learners see the expression "Calculate the length", they automatically try to use the distance formula. This underlines the fact that too much rote learning is taking place as opposed to sufficient exposure to strategies to develop deeper conceptual understanding. Basic geometry such as properties of isosceles triangles and parallel lines need to be grounded in lower grades. Learners performed poorly in this question because of a lack of basic "tools". For example many candidates do not understand that the Area rule for a triangle is applicable in any Δ, while $\frac{1}{2}$ × base × ⊥ height can only be applied in a right-angled Δ.

(ii) SUGGESTIONS FOR IMPROVEMENT

Solving of 3D problems must be regularly done in class. There needs to be more classroom attention paid to the application of trigonometric functions and rules to real-life situations. Teachers should teach learners which rule to use and under which conditions to apply it. They should make sure that learners are exposed to typical questions from past examination papers. They should also ensure that learners can apply the rules and not just study, for example, the cosine rule as $a^2 = b^2 + c^2 - 2bc.\cos A$. In class, real life contexts ought to be used. Learners need to understand that they should use the answer to the previous question in the next question. Basic geometry such as properties of isosceles triangles, parallel lines need to be grounded in lower grades.

QUESTION 12: TRIGONOMETRY

(i) COMMON ERRORS AND MISCONCEPTIONS

Question 12.1 and 12.2 were moderately answered but the rest of the question was poorly answered. In Question 12.1, candidates lacked basic manipulation skills and failed to regroup the angles for reduction. Co-functions and negative angles were not well known .e.g. $sin\ (90^\circ + x - a)$ was given as $-(x - a)$ sininstead of $cos\ (x - a)$.

In Question 12.2, candidates who selected the correct variation for cos 2A, managed to determine the general solution. A common error was then the incorrect factorisation when they obtained a quadratic equation.

In Question 12.3, most candidates could not recognise the relationship between sub- questions and many did not attempt this question. It was clear that most candidates could not apply compound angle theory in higher order questions.

(ii) SUGGESTIONS FOR IMPROVEMENT

Candidates need to realise that when given $cos2x$, there are three possible expansions that they have to choose from, and that there are reasons for which one is the most appropriate in a given situation. As a strategy, a teacher could illustrate 3 examples side by side with thorough discussion to demonstrate which expansion has to be chosen in each case, and why, and then allow sufficient opportunities for candidates to practice.

More time should be spent on double and compound angles. The homework should show more of this type of question in order to ensure better ability to manipulate compound and double angles. When determining the general solution, the learners should clearly understand that the angle is valid for any rotation $k.360^{o}$where $k \in Z$.

In Question 12.1, the learners merely expanded the angle; thus it was clear that they did not know what to do with an angle bigger than 360^{o}. Let the learners work with a small diagram of the axis to help them see where the angle is.

Paper 3 (Probability, Data Handling and Geometry)

SECTION 2 - QUALITATIVE ANALYSIS OF LEARNER PERFORMANCE

A. GENERAL OVERVIEW OF LEARNER PERFORMANCE

In general, most learners performed well in this paper. There has been improvement made in the course of the year, even though there are still concerns with the number of learners and schools offering this paper (Mathematics paper 3). Teachers, principals and parents should begin to enroll learners to write Paper 3 because it will enable them to perform strongly in Papers 1 and 2. The effort put in by the teachers and schools offering this paper, not forgetting the learners who provide alternative and creative solutions to the problems posed to them, are commendable.

B. ANALYSIS OF LEARNER PERFORMANCE IN INDIVIDUAL QUESTIONS

QUESTION 1: RECURSIVE SEQUENCES

(i) COMMON ERRORS AND MISCONCEPTIONS

This question was well answered. Learners did, however, misinterpret Question 1.2 and gave the term equal to zero, failing to determine the number of terms that summed to zero.

(ii) SUGGESTIONS FOR IMPROVEMENT

Teachers should ensure that they test different aspects of sequences so as to prepare learners, not merely to expect the routine questions to do with determining the term number and the term value in a sequence. Learners need to ensure

that they read the questions carefully and determine precisely what is being asked.

QUESTION 2: DATA HANDLING

(i) COMMON ERRORS AND MISCONCEPTIONS

This question was fairly well answered, except that Question 2.4 was not answered well at all. Learners only repeated what the question stated. It seems learners do not know what a random sample means.

(ii) SUGGESTIONS FOR IMPROVEMENT

Learners should practice with more real-life situations and problems, especially interpretation of data. Teachers should emphasise reading from graphs and the interpretation of data. Teachers need to spend time on sampling since this is often left to learners to deduce by themselves. There are specific techniques that can be taught to identify whether a sample is random or not.

QUESTION 3: PROBABILITY

(i) COMMON ERRORS AND MISCONCEPTIONS

This question was poorly answered because of a lack of knowledge. Learners simply did not know the formulae nor the terms. Mutually exclusive events: P(A and B) = 0 and Independent events: P(A and B) = P(A) x P(B). Owing to the lack of knowledge, some learners switched the two answers.

(ii) SUGGESTIONS FOR IMPROVEMENT

Teachers need to spend time explaining the rules of probability and the difference between P(A or B) and P(A and B). This topic needs attention in the course of teacher training since many teachers seem to battle with mutually exclusive events and independent events.

QUESTION 4: DATA HANDLING - NORMAL DISTRIBUTION

(i) COMMON ERRORS AND MISCONCEPTIONS

Learners showed a clear understanding of the standard deviation in relation to the mean. The question was well answered by most learners. Learners were also able to interpret the normal curve and some, without a lot of calculation, gave the correct answer. Question 4.3 provided an opportunity for learners to explain and interpret, but this was done poorly by most learners.

(ii) SUGGESTIONS FOR IMPROVEMENT

Learners should understand the use of the normal distribution graph to improve their interpretation of data. Teachers should apply the following principles:

1. Standard deviation: 68% (34% left and 34% right);

2. Standard deviation: 96% (48% left and 48% right);

3. Standard deviation: 100% (50% left and 50% right)

QUESTION 5: PROBABILITY - COUNTING PRINCIPLES

(i) COMMON ERRORS AND MISCONCEPTIONS

This question as a whole was very poorly answered. Learners struggled with interpreting and answering counting principles questions.

(ii) SUGGESTIONS FOR IMPROVEMENT

The teaching of this topic needs more attention. Different methods should be used to teach it. There is the method of using permutations and combinations, and a box-method (with the product-rule), with checking whether letters/digits are being repeated or not. Teachers should attempt to make this section practical for learners so that they can 'see' the manipulation involved. This will help learners differentiate between when to use the factorial notation and when to use the multiplication rule with the same number.

QUESTION 6: PROBABILITY - VENN DIAGRAMS

(i) COMMON ERRORS AND MISCONCEPTIONS

In general, this question was well answered, except for Question 6.3.

(ii) SUGGESTIONS FOR IMPROVEMENT

Learners should know that their answer for x cannot be decimal or negative. Furthermore, they should know that AT LEAST TWO means take the intersections with TWO AND/OR MORE (THREE) elements. Learners also need to be taught reasoning when dealing with questions involving people or objects. It is not possible to have a negative number of people.

Teachers should provide many examples and exercises, so that learners are exposed to a variety of questions, in order for them to get used to the different forms that Venn-diagram-type questions can take.

QUESTION 7: DATA HANDLING – SCATTER PLOT

(i) COMMON ERRORS AND MISCONCEPTIONS

This question was answered well. The scatter-plot and regression question has become a standard and expected question, and the learners answered it well since they have had much practice on it. Unfortunately, learners are still calculating the equation of the least squares regression line and the correlation coefficient by means of the pen and paper method. The National Curriculum Statement specifically indicates that a calculator should be used.

(ii) SUGGESTIONS FOR IMPROVEMENT

The least squares regression line and the line of best fit are not the same. Learners should not draw the line of best fit and read from that. Teachers should also teach their learners to use their calculators, because it will save time during an examination, and provide far less opportunity for learners to make careless errors.

QUESTION 8: EUCLIDEAN GEOMETRY

(i) COMMON ERRORS AND MISCONCEPTIONS

Learners should be able to get full marks for the proof of a theorem. Learners should know their work, and should appreciate that practice makes perfect.

(ii) SUGGESTIONS FOR IMPROVEMENT

Teachers need to spend time doing drill and practice theorem proofs with learners. These are marks that can be guaranteed in an examination. The correct reasons and abbreviations of reasons must be taught to learners from Grade 8 so that they answer geometry riders correctly. Challenging examples need to be completed in class with exhaustive discussion on logical reasoning, which is the cornerstone of Geometry.

QUESTION 9: EUCLIDEAN GEOMETRY

(i) COMMON ERRORS AND MISCONCEPTIONS

This was a well answered question since in most cases, learners were able to use Pythagoras' Theorem correctly. Learners neglected to label the 90^0 angle in the sketch. Learners, however, must be taught not to assume information and should use their diagram sheets correctly. It is important for teachers to emphasise the use of parallel lines in riders.

(ii) SUGGESTIONS FOR IMPROVEMENT

Learners should be exposed to challenging geometry questions.

QUESTION 10: EUCLIDEAN GEOMETRY

(i) COMMON ERRORS AND MISCONCEPTIONS

Candidates tended to give the reason and alternate angles, without mentioning the parallel lines that were given to make the angles equal.

(ii) SUGGESTIONS FOR IMPROVEMENT

Learners should be exposed to challenging geometry questions.

QUESTION 11: EUCLIDEAN GEOMETRY

(i) COMMON ERRORS AND MISCONCEPTIONS

Proportionality definitely needs more attention. Question 11.2 was answered poorly. Learners did not have a clue. Learners missed Question 11.3 completely (prove the similarity of the triangles). This question was poorly answered or not attempted. Basic properties of a parallelogram could not be used effectively. It seemed learners were not aware of Grades 9 & 10 theorems. A common misconception is that the diagonals of a parallelogram are perpendicular to each other simply because they intersect. Learners lost marks for not stating the reasons correctly when using converse theorems.

(ii) SUGGESTIONS FOR IMPROVEMENT

Learners should be taught the correct reasoning for the converse theorems. Teachers should pay special attention to midpoint theorem. Teachers should teach the correct way to prove midpoint.

11 PHYSICAL SCIENCE

The following report should be read in conjunction with the Physical Science question papers of the November 2011 Examination.

SECTION 1 - QUANTITATIVE ANALYSIS (2008 – 2011)

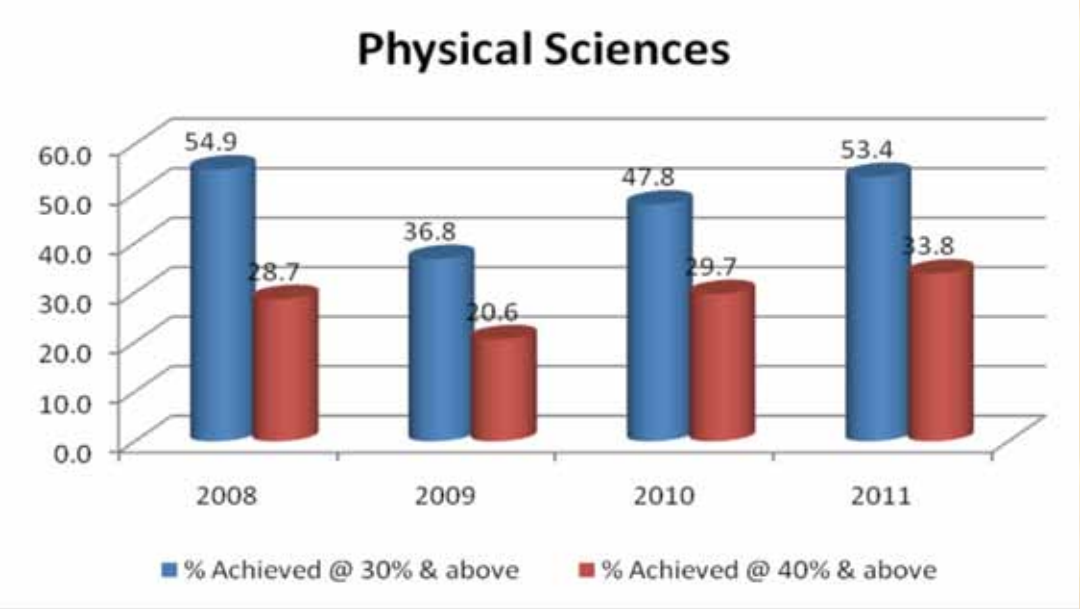
OVERALL ACHIEVEMENT RATES (2008 - 2011)

There has been a consistent improvement since 2009 in the percentage of learners passing at the 30% and above level and at the 40% and above level in Physical Science.

TABLE11: OVERALL ACHIEVEMENT RATES IN PHYSICAL SCIENCE, 2008 - 2011

Year	No. Wrote	No. Achieved @ 30% and above	% Achieved @ 30% and above	No. Achieved @ 40% and above	% Achieved @ 40% and above
2008	217 300	119 206	54.9	62 530	28.8
2009	220 882	81 356	36.8	45 452	20.6
2010	205 364	98 260	47.8	60 917	29.7
2011	180 585	96 441	53.4	61 109	33.8

FIGURE 11: OVERALL ACHIEVEMENT RATES IN PHYSICAL SCIENCE, 2008 - 2011



SECTION 2 - QUALITATIVE ANALYSIS OF LEARNER PERFORMANCE

PAPER 1 (PHYSICS)

A. GENERAL OVERVIEW OF LEARNER PERFORMANCE

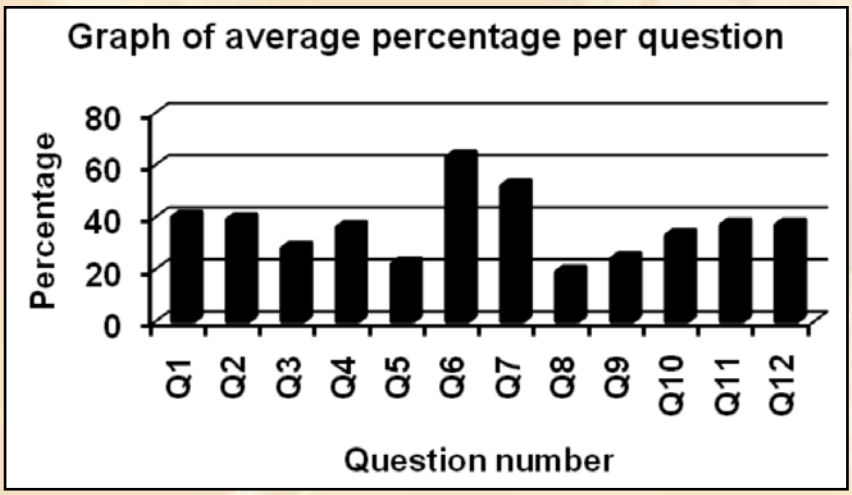
The general performance in this paper was much better than in the previous three years. Well-prepared learners enjoyed the paper and obtained high marks. Unfortunately, many learners did not take advantage of a paper that had several level one and two questions.

There are still too many learners getting zero for pure recall questions because they had not studied enough, were not taught, did not attend class, did not have both Grades 11 and 12 textbooks, etc. There is ample evidence that learners are still not spending enough time on theory and are losing valuable marks in this part of the paper. Furthermore, the responses of a large proportion of learners are clear evidence of a serious lack of practical work in schools.

There is also a serious lack of mathematical skills like interpretation and drawing of graphs, solving equations and working with trigonometric ratios. It is also clearly evident that most learners have little or no problem-solving skills. Most learners cannot grapple with problems. Many learners stopped midway in their answers that involved calculations, possibly due to having no calculators or not having the necessary skills to use the calculators.

Owing to inadequate teaching and learning, learners presented muddled answers to straightforward questions.

Averages per question from a sample are shown in the graph below.



Q1	One-word answer to a statement – all content
Q2	MCQs – all content
Q3	Vertical projectile motion
Q4	Momentum & relative velocity
Q5	Work and energy
Q6	Doppler Effect
Q7	Diffraction
Q8	Electrostatics
Q9	Electric circuits – investigation
Q10	Electric circuit & internal resistance
Q11	AC, motors & generators
Q12	Photoelectric effect

The same trend as shown in the above graph was observed in all provinces. Question 6 (Doppler Effect) and Question 7 (diffraction) were the better answered questions. Question 5 (work and energy), Question 8 (electrostatics) and Question 9 (electric circuits) were the more poorly answered questions. Electrostatics and electric circuits are taught in Grade 11. It seems as if these topics had not been taught in Grade 11 or not revised in Grade 12. Alternatively, learners might not have had access to the Grade 11 textbook in Grade 12.

B. ANALYSIS OF LEARNER PERFORMANCE IN INDIVIDUAL QUESTIONS

QUESTION 1:

Questions 1.1 to 1.4 were well answered by the majority of learners. Question 1.5 was moderately well answered. Although this was a level one question, some learners obtained zero, showing a serious lack of teaching and/or learning.

(i) COMMON ERRORS AND MISCONCEPTIONS

Question 1.1

Cognitive demand: Level 1

A common incorrect answer was *net work done*.

Question 1.2

Cognitive demand: Level 1

Many learners confused the concepts *coherent sources* and *constructive interference*.

Question 1.3

Cognitive demand: Level 1

Some learners gave *insulator* as an answer. Spelling of the term *dielectric* was a huge problem. Answers such as *dialect* or *dialectic* often occurred.

Question 1.4

Cognitive demand: Level 1

Many learners used terms which sounded close to the correct answer, but had a different meaning.

Common mistakes were:

- Alternate current / Alteration current / Alternative current / Alternation current;
- Alternating generator / Alternating motor / Alternating conductor / Alternating commutator

Question 1.5

Cognitive demand: Level 1

The units of measurement still remain a huge stumbling block for many learners.

(ii) SUGGESTIONS FOR IMPROVEMENT

- The only way to ensure that learners study the basics is through frequent informal testing. This should be done on a daily basis – sometimes orally and sometimes as short tests that can be written in homework books and marked by the learners themselves. Learning of such terms comes about through regular repetition. Regular written work

would also help with spelling of terms.

- All schools should be supplied with a list of possible one-word questions. These can be taken from the numerous Grade 12 question papers available. If these questions are arranged according to the different topics, teachers can use them in class tests after completion of a certain topic.
- A list of correct definitions, principles and laws should be made available to all schools and should also be displayed prominently in classrooms. The drill method should be used to reinforce knowledge of basic concepts, definitions, principles and laws.
- Spend ±3 minutes per lesson revising important concepts.
- Teachers should ensure that learners have a summary of terms after teaching each knowledge area.

QUESTION 2: MULTIPLE CHOICE

Questions 2.6 and 2.7 were well answered by the majority of learners while Questions 2.2 to 2.4, 2.8 and 2.9 were poorly answered. Questions 2.1 and 2.10 were moderately well answered.

(i) COMMON ERRORS AND MISCONCEPTIONS

Question 2.1

Cognitive demand: Level 1. Although similar questions were asked in previous papers, many learners could not differentiate between change in momentum and rate of change in momentum and instead gave D as the answer. Learners are not clear about the relationship between F_{res} and Δp.

Question 2.2

Cognitive demand: Level 2. Many learners gave *C* as the answer probably because they were looking for a horizontal force since the object was pulled along a horizontal surface. Learners did not know that a force does positive work when the angle between the direction of the force and the direction of the displacement is smaller than 90°.

Question 2.3

Cognitive demand: Level 3. Many learners could not interpret the graph of the bouncing ball correctly.

Question 2.4

Cognitive demand: Level 3. It seemed as if learners did not know the meaning of the term *nodal line*.

Question 2.5

Cognitive demand: Level 2. This question was well answered by the majority of learners.

Question 2.6

Cognitive demand: Level 2. Many learners gave *B* instead of *A* as the answer. Electric circuits are poorly understood. Proper grounding of electric circuits from grade 10 needs to be done.

Question 2.7

Cognitive demand: Level 2. This question on electricity that is taught at Grade 10, was well answered.

Question 2.8

Cognitive demand: Level 2. Learners did not know that the electric field between two parallel plates is uniform.

Question 2.9

Cognitive demand: Level 1. This was a recall question but many learners did not know the difference between an emission and an absorption spectrum.

Question 2.10

Cognitive demand: Level 1

It was a pure recall question and many learners could not recall theory on electromagnetic waves.

(ii) SUGGESTIONS FOR IMPROVEMENT

- Learners should be exposed to multiple choice questions (MCQs) from Grade 10 in class tests, homework, class work and controlled tests. MCQs from past examination papers in teaching and in informal and formal assessment should be included.
- Learners need to be taught how to approach MCQs. If the answer is not immediately obvious, one should go through steps of eliminating obviously incorrect answers.
- Interpretation of graphs, using a variety of shapes, in various contexts in all knowledge areas should be included. Questions on interpretation of graphs from past examination papers should be included in daily teaching and assessment.
- Learners could be given speed tests (±5 minutes) using well structured MCQs as part of informal assessment.
- Teachers need to teach according to the NCS, SAG and examination guidelines and not leave out any sections of the prescribed content.
- A number of sources often give definitions of work that are misleading. Some sources state the following: *Work done is the product of the force and the magnitude of the displacement in the direction of the force.* This definition does not cater for negative work and creates the perception that work is done only when the force acts in the direction of the displacement. A better definition that does not mislead learners is: *Work done is the product of the magnitude of the force, the magnitude of the displacement and the cosine of the angle between the direction of the force and the direction of the displacement.* This definition emphasises that the *magnitudes* of both force and displacement should be used in calculations of work. Learners often get a wrong answer because they use a negative sign to indicate the direction of the force and then still multiply by the cosine of the angle when calculating work.

QUESTION 3: PROJECTILE MOTION

(i) COMMON ERRORS AND MISCONCEPTIONS

Question 3.1

Cognitive demand: Level 2. This question was poorly answered with a significant number getting zero. Learners failed to express themselves using the correct underlying physics principles in this question. Learners used parts of the question in their answer instead of giving an explanation.

The fact that the camera has the same upward velocity as the balloon was not well understood by the majority of learners. They therefore did not understand that the camera would first move upward when dropped from the balloon. From their answers, it was also clear that learners did not understand the concepts, *inertia* and *Newton's 1st law*.

Question 3.2

Cognitive demand: Level 3. This question was poorly answered. It seems as if learners did not have enough exposure to calculations involving vertical projectile motion, especially the ones where the object moves past the point from where it had been projected. The learners' mathematical skills were severely lacking. Common mistakes were:

- Using an incorrect sign convention (displacement and acceleration in the same direction);
- Copying the formula incorrectly from the data sheet;
- Choosing the wrong equation of motion to solve the problem;
- Substituting of incorrect values into the formula; and
- Incorrect interpretation of positive and negative signs in final answer.

There is usually a lot of data that is given in questions on free-fall and a lot of data that can be inferred, hence taken as given. Learners are not clear on what is given and what needs to be calculated/found.

Question 3.3

Cognitive demand: Level 3. This question was poorly answered. The time to reach the ground was interpreted incorrectly. Drawing of sketch graphs still remains a challenge to the majority of learners. Common mistakes were:

- Not labelling the axes;
- Drawing a position time graph instead of velocity time graph;
- Drawing the graph only above the x axis, even though the motion is in two directions ;
- Drawing a curved graph instead of a straight line; and
- Drawing a flat line parallel to the x axis instead of a sloped graph.

Question 3.4

Cognitive demand: Level 3. This question was poorly answered. The majority of learners did not understand the concept, *constant velocity*. Many failed to interpret their answer and relate it to whether the camera would be caught or not.

Common mistakes were:

- Using $v_f = v_i + a\Delta t$ and $v_f^2 = v_i^2 + 2a\Delta y$ instead of $\Delta x = v\Delta t$;
- Inability to distinguish between horizontal and vertical velocities;
- Calculating the velocity instead of the displacement or time;
- Giving an answer without a calculation;
- Comparing horizontal and vertical velocities to explain the answer;
- Not knowing that for constant velocity a = 0 (a = 9,8 $m \cdot s^{-2}$ was used in the horizontal plane);
- Using the initial velocity as 2 $m \cdot s^{-1}$ and the final velocity as zero in calculations; and
- Being unaware that the x-intercept on the graph is the time when the projectile reaches its maximum height.

(ii) SUGGESTIONS FOR IMPROVEMENT

- Greater emphasis should be placed on the drawing and interpretation of graphs of motion in class;
- Teachers should cover more examples of vertical projectile motion in their teaching. They should use examples of the application of the concepts of inertia and Newton's 1st law when teaching these concepts;
- Learners should be taught to indicate their chosen sign convention at the beginning of the problem; and
- It is quite obvious that there are centres in which the learners do exceptionally well and others where the learners perform very poorly. One can deduce that this section is taught well and properly at centres where learners return above average results. Nonetheless, many learners failed to choose a sign convention for the velocity vector e.g. taking upwards as positive.

QUESTION 4: MOMENTUM

(i) COMMON ERRORS AND MISCONCEPTIONS

Question 4.1

Cognitive demand: Level 2. Some learners answered this question very well. However, many learners had no idea how to calculate this velocity and some gave explanations instead of giving a numerical answer. Many learners omitted the unit.

Question 4.2

Cognitive demand: Level 3. The responses of learners showed the same shortcomings as in question 4.1.

Question 4.3

Cognitive demand: Level 1. This question was not answered as well as expected. Although many stated the law correctly, quite a number mixed up the sentence. Many learners omitted the word 'total' when stating the law. A number of learners incorrectly gave the *principle of conservation of mechanical energy* as the answer.

Question 4.4

Cognitive demand: Level 3. The performance was below average. The vector nature of momentum was not well understood. Common mistakes were:

- Stating the principle/formula incorrectly;
- Wrong substitution (learners had problems assigning opposite signs to objects moving in opposite directions);
- Inability to assign a sign convention;
- Many learners used only the mass of the car and ignored the mass of the truck;
- Omitting the unit at the final answer;
- Using subscripts as superscripts e.g. m_2v^2;
- Using $p_{before} = p_{after}$ OR $p_b = p_a$ as formula – should be Total p_{before} = Total p_{after} ; and
- Using cell phone text e.g. *p4* instead of writing *momentum before.*

Question 4.5

Cognitive demand: Level 3. Common mistakes were:

- Omitting the subscript 'net' in the formula ($F\Delta t = m\Delta v$ instead of $F_{net}\Delta t = m\Delta v$) (this formula is given on the data sheet);
- Failure to compare the force of 85 000 N to the calculated force;
- Substituting 85 000 N into the equation $F_{net}\Delta t = m\Delta v$ and then failing to draw the connection to Δp;
- Using different masses in the calculation of $m\Delta v$; and
- Combining the masses instead of using each separately in the calculation.

(ii) SUGGESTIONS FOR IMPROVEMENT

- Teachers should emphasise the importance of certain key words when teaching laws/definitions. For example, when stating the law of conservation of momentum, the word 'total' is important. *The total momentum in an isolated system remains constant in magnitude and direction* and not just the momentum.
- Learners need to be assisted to understand the meaning of definitions and laws before they can memorise them.
- Learners should be taught the expression for conservation of momentum because *it does not appear on the data sheet, i.e. learners should be taught to use* $m_1v_{i1} + m_2v_{i2} = m_1v_{f1} + m_2v_{f2}$.
- Teachers should expose learners to different types of questions in this section, including multi-step ones.
- Learners should be encouraged to use the same terminology as is used in questions when stating a direction. For example, when the question uses *east* as direction, learners should use either *east* or *west* (if in the opposite direction) in their answers and not words such as *same direction, backward, forward*, etc.

QUESTION 5: WORK – ENERGY THEOREM

(i) COMMON ERRORS AND MISCONCEPTIONS

Question 5.1

Cognitive demand: Level 1. This was also a recall question was and it was not answered well. Learners left out key words that are essential in this theorem. The importance of words such as 'net' and "change" should be emphasised. Common mistakes were:

- Omitting 'net' or 'total' and thus giving the theorem as: *The work done is equal to …* instead of *the net work done is equal to;*
- *Omitting the word "change" in the theorem and thus giving the theorem as: The net work done is equal to kinetic energy* instead of *the net work done is equal to the change in kinetic energy;*
- Stating as the work-energy theorem: *The net work done is equal to force multiplied by displacement*; and
- Giving the following as the work-energy theorem: *The work done by the non-conservative forces is equal to the change in gravitational potential energy plus the change in kinetic energy.*

Question 5.2

Cognitive demand: Level 2. The inability of learners to draw a free body diagram resulted in learners' not attempting or not being able to fully answer this question. Common mistakes were:

- Wrong labelling;
- Inclusion of a normal force in the free body diagram (a normal force is present only when an object rests on a surface);
- Drawing the frictional force in the wrong direction;
- Drawing a force diagram instead of a free body diagram;
- Drawing forces with their starting points from different positions instead of from the same point;
- Representing forces with lines instead of arrows; and
- Forces not making contact with the dot.

Question 5.3

Cognitive demand: Level 2. Although this sub-question was one of the better answered ones in this question, many learners could not differentiate between contact and non-contact forces.

Question 5.4

Cognitive demand: Level 3/4. Common mistakes were:

- Not summing the work done by the three forces and equating the sum to the change in kinetic energy i.e. $W_f+W_g+W_F = \Delta K$;

- Omitting the subscript 'net' in $W_{net} = \Delta K$;
- Not using the work-energy theorem ($W_{net} = \Delta K$) as instructed in the paper;
- Omitting the angle between the force and the displacement;
- Using the work done by the frictional force as a positive value;
- Performing calculations for an inclined plane instead of in the vertical plane; and
- Not realising that $\Delta K = 0$, because speed was constant (the most common answer given was):

$W_{net} = \Delta K$

$= mv_{f2} - mv_{i2}$

$= (80)(4)2 - (80)(0)2$

$= 640$ J

(ii) SUGGESTIONS FOR IMPROVEMENT

- Free body diagrams should be thoroughly revised in Grade 12. Teachers should consult past examination papers and build up a list of subscripts and symbols used for the different physical quantities and use only these when teaching. For example, if it is decided to use F_g as the gravitational force, the teacher should keep using this label in all free body diagrams. This will prevent learners from getting confused and not knowing which labels to use.
- When drawing free body diagrams the following should be emphasised:
  - The use of arrow heads to indicate direction;
  - Correct labeling;
  - Forces making contact with the dot; and
  - Relative magnitudes of the forces.
- When calculating work done, learners need to be taught to substitute the magnitude of the force and the magnitude of the displacement, which are positive values, into $W = F \Delta x \cos\theta$.
- Learners should also be taught that work is a scalar quantity and that a negative answer for work cannot be interpreted as a direction. A negative answer for work merely means that energy is removed from the object and thus its kinetic energy will decrease.
- The work energy theorem is given as $W_{net} = \Delta K$. The formula $W_{net} = \Delta K + \Delta U$ is not the work-energy theorem.
- When solving a problem using the work-energy theorem, the following steps are handy:
  - Draw free body diagram (Question 5.2);
  - State the work energy theorem i.e. $W_{net} = \Delta K$;

- Calculate the work done by each force acting on the object and then add them to obtain the net work;
- Equate to ΔK; and
- Solve the problem;

QUESTION 6: DOPPLER EFFECT

(i) COMMON ERRORS AND MISCONCEPTIONS

Question 6.1

Cognitive demand: Level 1. This question was well answered. Some learners could not spell *Doppler*.

Question 6.2

Cognitive demand: Level 3. This question was well answered. The following mistakes were observed:

- Substituting the frequency of the source for the frequency of the listener (possibly due to rote learning from previous papers);
- Incorrect use of signs in the formula;
- Incorrect substitution and lack of mathematical skills to calculate correctly; and
- Poor knowledge of symbols used in the formula.

Question 6.3

Cognitive demand: Level 2. This question was well answered.

Question 6.4

Cognitive demand: Level 2/3. The majority of learners gave the correct answer, but many failed to give a correct reason. Common incorrect or vague reasons were:

- The driver is in the train;
- The driver is moving with the train – no mention of relative motion or velocity; and
- The driver moves at the same speed as the train (instead of 'same velocity' as the train).

(ii) SUGGESTIONS FOR IMPROVEMENT

- It should be emphasised that the Doppler shift is noticeable only when there is relative motion between the source and the observer and learners should be taught to be clear when giving explanations/reasons. For example, many thought that if they say *the train driver is moving with the train,* it means *they are moving at the same velocity*. Use of the correct scientific language should be encouraged.
- Encourage teachers to take note of comments made in the 2010 report on this section.

- Language seems to be a problem for some learners; hence they gave a vague explanation for their response to Question 6.4 while others did not respond at all. Mathematical manipulation was poor.

QUESTION 7: LIGHT AND WAVES

(i) COMMON ERRORS AND MISCONCEPTIONS

Question 7.1

Cognitive demand: Level 1. Many learners did not know what monochromatic light was and forfeited two valuable marks. Common vague/incorrect answers were:

- Light of constant frequency/wavelength;
- Light of the same frequency/wavelength;
- Light of unique frequency/wavelength; and
- A white light with different colours.

Question 7.2

Cognitive demand: Level 2. This question was poorly answered. Common mistakes were:

- Writing the question as a statement ;
- Phrasing an investigative question which elicited a YES or a NO response – the relationship between the variables thus did not come out clearly; and
- Not using the correct variables in the question.

Question 7.3

Cognitive demand: Level 2. This question was not well answered. Learners had difficulties in stating the controlled variables. Many gave the slit width as answer.

Question 7.4

Cognitive demand: Level 3. Most learners gave the correct answer but could not give a correct explanation. Many of those that explained their answer did not explicitly state the relationship between slit width and degree of diffraction.

Question 7.5

Cognitive demand: Level 3. This question was well answered. Common mistakes were:

- Substituting a with 9,8 instead of the slit width – a was used as an acceleration!
- Mixing values of λ and a;
- Calculating the value of θ as. $\sin^{-1}$;
- Rounding off to one decimal place; and

- Using *m* in the formula as a mass.

(ii) SUGGESTIONS FOR IMPROVEMENT

- Conduct practical investigations.
- The use of scientific language should be emphasised in class, homework tasks and tests. This would help learners to obtain better marks. The majority of learners failed to give scientifically correct explanations.
- Learners need to be given more opportunities to develop the ability to anwer investigative questions.

  The following two steps should be considered when formulating an investigative question:

  - Identify the dependent and independent variables: The independent variable is the variable that the investigator changes i.e. *the slit width* in this case. The dependent variable is the variable that will depend on and varies as the independent variable is changed i.e. *the broadness of the central band* in this case.
  - Ask a question about the relationship between the dependent and independent variables. A relationship implies that the question must be asked about the change in the dependent variable as a result of changes made to the independent variable. A good test whether it is a relationship, is to answer the formulated question. Usually, if the answer can be 'yes' or 'no', it is not a relationship.

Examples:

An incorrect response to Question 7.2:

Will the broadness of the central band increase when the slit width increases? (The answer is 'no'.)

A correct response to Question 7.2:

How will the broadness of the central band change when the slit width increases? (Answer: The broadness will decrease with increasing slit width.)

Tips:

To be on the safe side, start the question with *how*.

Include the word increases/decreases/differ/change when relating the two variables.

QUESTION 8: ELECTROSTATICS

(i) COMMON ERRORS AND MISCONCEPTIONS

Question 8.1

Cognitive demand: Level 2. This question was not well answered. Some confused the direction of electron flow with the direction of the electric field. The majority of learners did not know that electrons will flow from a negatively to a positively charged object.

Question 8.2

Cognitive demand: Level 3/4. This question was poorly answered. Common mistakes were:

- Giving the new charge on the sphere i.e. the first step in this question, as the answer (no calculation of the net charge gained or lost);
- Not converting nano–coulombs to coulombs;
- Incorrect addition and subtraction of negative numbers;
- Subtracting the final charge from the initial charge instead of the initial from the final to obtain the change in charge; and
- Using Coulomb's law or F = qE to answer this question.

Question 8.3

Cognitive demand: Level 3. This question was poorly answered. The majority used the value of the final charge on each sphere to calculate the number of electrons transferred. Learners did not understand the difference between the final charge on the spheres and the charge transferred. Many gave the number of electrons as a negative number, i.e. -2,81 x 10^{10} electrons. The number of electrons transferred should be positive.

Question 8.4

Cognitive demand: Level 4. This question was poorly answered. Many did not even attempt this question. Common mistakes were:

- Substituting the original charges given in the paper instead of the charge calculated in Question 8.2;
- Writing an expression for Coulomb's law using three charges (F = $\frac{kQ_1Q_2Q_3}{r^2}$);
- Incorrect mathematical manipulations; and
- Interpreting the direction of the net force wrongly or no interpretation of the direction of force at all.

(ii) SUGGESTIONS FOR IMPROVEMENT

- Grade 12 teachers should revise this section thoroughly in the Grade 12 year. In some schools this section was never done in Grade 11. Learners should be given enough electrostatics exercises from previous exam papers as homework in the Grade 12 year. Content training in this section will help in the teaching of this section.
- There is a need to work together with the mathematics teachers and discuss the problems experienced or mistakes made by learners with regard to mathematical manipulations.

QUESTION 9: OHM'S LAW

(i) COMMON ERRORS AND MISCONCEPTIONS

Question 9.1

Cognitive demand: Level 2

This question was poorly answered. Many learners could not identify the dependent variable correctly.

Question 9.2.1

Cognitive demand: Level 3. The majority could not interpret the scale of the graph and thus gave wrong co-ordinates. Values beyond the points (4,0; 0,64) were often used. This clearly showed that learners did not understand Ohm's Law and its interpretation.

Question 9.2.2

Cognitive demand: Level 2. Learners only stated Ohm's Law, without given a reason why there was a deviation in the graph. Many learners wrote temperature decreases (they failed to interpret what the gradient of the graph after deviation meant).

Question 9.3

Cognitive demand: Level 3.

This question was poorly answered.

- Many learners failed to answer the first part of this question and used the formula V=IR and values from the graph to calculate the resistance. They did not know that the gradient of the graph can be used to calculate resistance.
- Others calculated the gradient where Ohm's Law is not obeyed.
- Learners were not aware that the same co-ordinates determined in Question 9.2.1 could be used to calculate the gradient of the graph.
- Some learners failed to see that $R = \frac{1}{\text{gradient}}$ and therefore could not calculate the resistance of the conductor from the value of the gradient in the preceding calculation.

(ii) SUGGESTIONS FOR IMPROVEMENT

- Teachers must do revision of Grade 11 work, starting as early as January of the Grade 12 year. Questions on Grade 11 work must be included in Grade 12 tests from the beginning of the Grade 12 year.
- Teachers should ensure that learners know how to use their calculators. Sometimes it may be necessary to write the steps for performing a specific calculation on the board to ensure that all learners understand what to do.

QUESTION 10: CIRCUIT CALCULATIONS

(i) COMMON ERRORS AND MISCONCEPTIONS

Question 10.1

Cognitive demand: Level 2. This question was well answered. For some, reading data from the graph was a problem. Common mistakes were:

- Emf = 12 (no unit);
- Emf = I(R +r);
- Emf = 12 Ω / 12 emf; and
- Emf = 9,6 V.

Question 10.2.1

Cognitive demand: Level 3. This question was poorly answered. Learners did not know what information to use in the equation V = IR. A common mistake was the use of a wrong formula, e.g. Q = CV (using C = current; V = voltage). The majority of learners cannot differentiate between R (external resistance) and r (internal resistance) in calculations.

Question 10.2.1

Cognitive demand: Level 3. This question was poorly answered. Learners did not know the difference between emf and terminal potential difference. Internal resistance is poorly understood. The manipulation of the formula emf = I(R + r) was also poorly done.

Question 10.3

Cognitive demand: Level 3/4.This question was extremely poorly answered. Common mistakes were:

- Failure to copy the formula correctly from the data sheet, especially $\frac{1}{R} = \frac{1}{r_1} + \frac{1}{r_2}$;
- Assuming that all the light bulbs were identical, and simply splitting the current into their respective ratios;
- Ignoring the internal resistance of the battery; and
- Calculating only R_{ext} and R_{total} – no further calculations were done.

Question 10.4

Cognitive demand: Level 4. This question was extremely poorly answered. Learners lack the skill to explain their understanding of electric circuits. However, the top learners managed to explain this answer very well. A common mistake was the assumption that the internal resistance changed.

(ii) SUGGESTIONS FOR IMPROVEMENT

- Do practical work on electric circuits.

- Teachers should inform learners that a 5 mark question involves slightly more than a single substitution into a formula.
- The following needs to be explained properly to learners:
  - The formula or principle emf = IR + Ir;
  - The formula $V_{terminal} = IR$; and
  - The meaning of emf, and 'lost volts' (Ir).
- It is necessary to revise Grade 11 work and give learners practice in basic series and parallel circuit problems as well as the manipulation of the basic formulae involved.
- Include exercises that involve multi-step calculations or analyses.
- The concept of internal resistance is not well understood by some teachers and learners. Use available materials to understand this section. Further materials could be developed and workshops conducted to ensure that all teachers understand this section.

QUESTION 11: ELECTRICITY AND MAGNETISM

(i) COMMON ERRORS AND MISCONCEPTIONS

Question 11.1.1

Cognitive demand: Level 1. This question was poorly answered. Learners cannot distinguish between a motor and a generator.

Question 11.1.2

Cognitive demand: Level 1. The responses of learners show the same shortcoming as in Question 11.1.1.

Question 11.1.3

Cognitive demand: Level 1. This question was very poorly answered. In a number of cases, learners gave the right- and left-hand rules as principles of operation.

Question 11.1.4

Cognitive demand: Level 1. The responses of learners showed the same shortcomings as in

Question 11.1.3

Question 11.2

Cognitive demand: Level 2. This question was poorly answered. Learners lacked the ability to express themselves. The concept of 'parallel' was confused with words like '*is in line with'* or '*is in the same direction as'* or '*is horizontal to'*. Many also used the term 'magnetic force' instead of 'magnetic field' in their explanations. Another common incorrect answer was: *The magnetic field does not cut through the coil.*

Question 11.3

Cognitive demand: Level 3.

This question was well attempted, but many learners had difficulty in reading the graphs. Often formulae were incorrectly copied from the data sheet. Subscripts are important in these formulae and cannot be omitted. Learners that performed poorly showed an inability to interpret the graph. V_{max} is given on the graph. Learners showed a lack of understanding of subscripts in V_{rms} and V_{max}. This indicates a lack of basic knowledge of AC.

(ii) SUGGESTIONS FOR IMPROVEMENT

Data sheets must be used in class when answering homework exercises. Learners tend to confuse the different formulae for AC given on the data sheet.

QUESTION 12: PHOTOELECTRIC EFFECT

(i) COMMON ERRORS AND MISCONCEPTIONS

Question 12.1

Cognitive demand: Level 1. This question was well answered. Some learners did not know how to spell *photoelectric effect.* Common incorrect answers were: *photoelectrons; photoelectricity; photons*

Question 12.2

Cognitive demand: Level 1. This question was poorly answered. Some learners confused W_0 with W_{net} i.e. the work-energy theorem.

Question 12.3

Cognitive demand: Level 3. This question was poorly answered. Common incorrect answers/methods were:

- Not using the wave equation c = fλ to solve the problem, but taking a longer route by equating hf and $\frac{h}{\lambda}$;
- Calculating either W_o, f_o or E instead of the frequency of the light;
- Incorrect conversion from nm to m;
- Using W instead of W_o as symbol for work function;
- Substituting h and c incorrectly;
- Using the equation $W_o = hf_o$ instead of E = hf;
- Using a capital F as symbol for frequency; and
- Incorrect rounding-off.

Question 12.4

Cognitive demand: Level 3.

This question was poorly answered. Learners had difficulty in identifying the variables in the equation $E = W_o + E_k$. Other common mistakes were:

- Using only half of the formula to calculate kinetic energy;
- Calculating the speed of electrons instead of K;
- Using a small letter j as unit for joule; and
- Confusing W_o with K or E of a photon.

Question 12.5.1

Cognitive demand: Level 2. This question was not answered as well as expected. Learners were very confused about intensity, frequency, wavelength and what affects the kinetic energy of the photoelectrons emitted.

Question 12.5.2

Cognitive demand: Level 2. This question was not answered as well as expected. Learners were very confused about intensity, frequency, wavelength and what affects the number of photoelectrons emitted.

Question 12.6.1

Cognitive demand: Level 1. This question was well answered. Learners definitely know which type of radiation is responsible for damage to the skin.

Question 12.6.2

Cognitive demand: Level 1

This question was well answered. Some learners had difficulty identifying the property of an electromagnetic wave responsible for damage to the skin.

(ii) SUGGESTIONS FOR IMPROVEMENT

- Conduct practical work on this section.
- Emphasis should be placed on the terminology related to the photoelectric effect, conversion of units and use of correct units.
- Teachers should ensure learners use the data sheet for daily activities – this will help them to become familiar with its use.

PAPER 2 (CHEMISTRY)

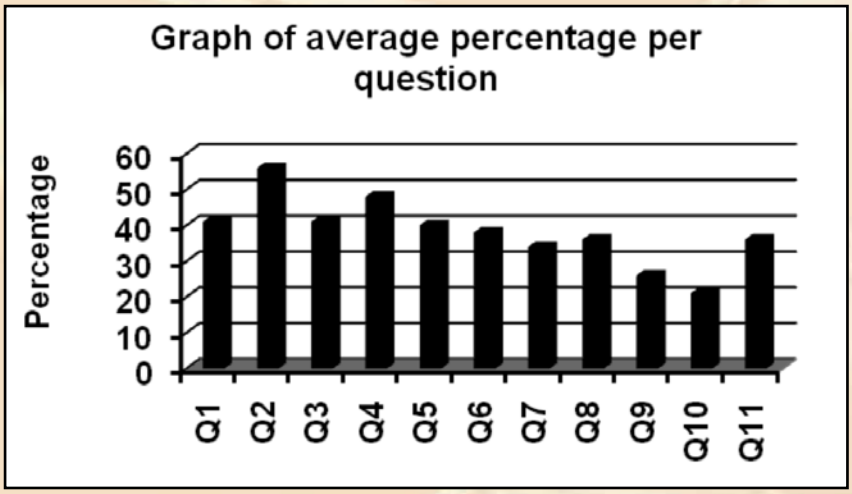
A. GENERAL OVERVIEW OF LEARNER PERFORMANCE

Although learner performance improved from the previous three years, the majority of learners performed below expectation and many failed this paper. Learners did not perform well even in level one and two questions.

The basics should be taught correctly starting in grade 8. Science is a way of thinking and arguing that requires a lot of knowledge, and takes years and practice to grow and develop in the minds of learners. Learners must also develop a study culture. They have to practice and study to obtain the necessary knowledge and skills. Doing homework studying and learning the basics will ensure that the majority of learners obtain the necessary knowledge to pass this subject.

Language is still a major challenge and some learners failed to clearly express themselves in answering explanation type questions. Teachers and officials of the department need to ensure that learners get sufficient practice in answering questions in the LOLT, in both written work and oral work, using a variety of contexts and problems.

Averages per question from a sample are shown in the graph below. This trend that was observed in all provinces gives an indication of which questions in the paper were well answered and which ones were poorly answered.



Q1	One-word answer to a statement – all content
Q2	MCQs – all content
Q3	Organic Chemistry – nomenclature
Q4	Organic Chemistry – physical properties
Q5	Organic Chemistry – reactions
Q6	Rate of reaction
Q7	Chemical equilibrium
Q8	Galvanic cells
Q9	Electrolytic cells
Q10	Chlor-alkali industry
Q11	Fertilisers
Q12	Photoelectric effect

The majority of learners lacked basic subject knowledge. This is evident from the poor performance in Question 1, a pure recall question. Many learners are still failing the level 1 and 2 questions. This is a clear indication of a lack of effective teaching and learning in certain schools. The extremely poor performance in Question 10 overall is a concern. It appears that the only chlor-alkali cell prescribed in the Grade 12 syllabus probably was not adequately taught and learnt in the majority of schools.

On a positive note, the very high marks obtained by many learners, is a clear indication that there is effective teaching and learning taking place in many schools. There are teachers and learners, although in the minority, who are committed and who are doing what is expected of them.

B. ANALYSIS OF LEARNER PERFORMANCE IN INDIVIDUAL QUESTIONS

QUESTION 1: ONE WORD ANSWERS

(i) COMMON ERRORS AND MISCONCEPTIONS

Questions 1.1 and 1.2 were fairly well answered while Question 1.3 was the best answered one-word item. Questions 1.4 and 1.5 were poorly answered.

Question 1.1

The majority of learners did not know that an *alkane* with a *halogen* substituent is a *haloalkane*. Common incorrect answers were *halogens* and *alkanes*.

Question 1.2

A common incorrect answer was '*hydrogencarbons'*. This term was derived by learners from the two terms, *hydrogen* and *carbon,* given on the paper. Another incorrect answer that was often given was *hydrogen carbon bonds.* Other common incorrect answers were: *carbon hydrogen and hydrogen carbonate.*

Question 1.3

Although the first answer of two given by a learner is normally marked, answers given to this question could not be marked in such a way. For example, many learners gave *equilibrium constant* as the answer and forfeited the mark. *Equilibrium constant* has a different meaning from *equilibrium* alone. Common incorrect answers were: *equilibrium constant, equilibrium rate, static equilibrium and constant equilibrium*

Question 1.4

It is not the first time that this question has appeared. Learners did not know or could not recall that C*ryolite is* an important substance used during refining of aluminium. Many did not even attempt to answer this recall question. Furthermore many learners did not understand the *aluminium cell* that forms part of the prescribed *electrolytic cells*. Common incorrect answers were: *bauxite; aluminiumcryolite; aluminium oxide.*

Question 1.5

This question was poorly answered. Learners did not know the term *cell capacity*, a term that often appeared in previous papers. The majority of learners, even well performing learners, confused *capacity* with *capacitance and capacitor.* Not knowing the difference between *cell capacity* and *capacitance* is a problem of both first and second language speakers, and is owing to insufficient time spent on studying these terms. Learners should be given more practical activities in order to assist them in understanding the concepts. Understanding assists in remembering. Common incorrect answers were: *capacitor, capacitance, cell potential, emf and potential difference*.

(ii) SUGGESTIONS FOR IMPROVEMENT

The only way to ensure that learners study the basics, is through frequent informal testing, a practice that is often neglected in schools. This should be done on a daily basis, sometimes orally and sometimes as a short test that can be written in homework books and marked by the learners themselves. Learning of such terms happens through regular repetition. Regular written work would also help with spelling of terms.

QUESTION 2: MULTIPLE CHOICE

(i) COMMON ERRORS AND MISCONCEPTIONS

Questions 2.8 was the best answered whereas question 2.3 was the worst answered question. Questions 2.1, 2.2, 2.6 and 2.10 were fairly well answered and Questions 2.4, 2.5, 2.7 and 2.9 were poorly answered.

Question 2.1

Cognitive demand: Level 1. Learners who answered this question incorrectly mainly gave *C*, the general formula of alkenes, as the answer. This too was a recall question.

Question 2.2

Cognitive demand: Level 1. Learners who answered this question incorrectly mainly gave *A* (aldehydes) as answer. The question asked which homologous series does not have a carbonyl group. It seems as if learners misread the question or else only focused on the structure of the carbonyl group, given in the paper, to make a selection.

Question 2.3

Cognitive demand: Level 2. The most common incorrect answer was *D*.

Question 2.4

Cognitive demand: Level 3. Even well performing learners found this question difficult. Although it is graded as a level 3 question, it is a basic application of Le Chatelier's principle. Learners who understood this principle should have been in a position to answer the question correctly. It seems as if the common ion effect is not dealt with at school or is perhaps just mentioned without doing any examples. *A* and *B* were the most common incorrect answers given.

Question 2.5

Cognitive demand: Level 3. Learners struggled to identify the curve that represented the reaction with the highest rate. There was a perception that the curve with the highest peak (*A*) represents the reaction with the highest rate. Learners did not know that *D* represents the reaction with the most particles with higher and sufficient kinetic energy and thus the reaction that will take place at the fastest rate. Others gave *C* as the correct answer (the line represented the minimum kinetic energy needed was thus ignored).

Question 2.6

Cognitive demand: Level 2. The most common incorrect answer was *A* – learners thought that the heat of reaction will change if a catalyst is added.

Question 2.7

Cognitive demand: Level 2. Grade 12 learners do not know that metals form positive ions. Many thought that metals form negative ions and gave D as an answer. Some even gave B as answer. This shows that many Grade 12 learners do not know that *reduction* is a *gain of electrons* and not a *loss of electrons*. This is a clear indication of a lack of basic knowledge.

Question 2.8

Cognitive demand: Level 1. Learners did not know the terms 'guano', 'bone meal', etc. The majority gave *B* as the answer. Learners thus answered that guano could not be used as fertilizer. Learners did not know that nitrogen gas (N_2) is the one that cannot be used as fertiliser. Through nitrogen fixation it is changed into a form (nitrate and ammonium ions) which makes it possible for plants to absorb nitrogen. Nitrogen fixation is supposed to be taught in Grade 10. It must be mentioned that the N gas (trade name for anhydrous ammonia) that farmers use as fertiliser is ammonia gas and NOT nitrogen gas.

Question 2.9

Cognitive demand: Level 2. The most common incorrect answer was *D i.e.* electrons are transferred from Ag to Zn. Learners did not understand how to use the Table of Standard Reduction Potentials to determine the oxidation and reduction half-reactions correctly.

Question 2.10

Cognitive demand: Level 2. Learners who answered this question incorrectly mainly gave *D* as answer. Oxidation numbers are taught in grade 11 and learners should know that the oxidation number of copper in the given compound is +2. It also seemed as if learners did not know what an oxidation number is. Choosing +4 (answer D) gives the impression that learners thought that the subscript (four) of the sulphate is an oxidation number.

(ii) SUGGESTIONS FOR IMPROVEMENT

- Learners should be exposed to multiple choice questions in class tests. Multiple choice questions appearing in the examination papers of the past three years are not very difficult and are within the reach of all learners if they know their work.
- Learners should be taught how to approach multiple-choice questions. If the answer is not immediately obvious, teachers should go through the steps of eliminating obviously incorrect answers.
- Teachers need to do more practical work and to demonstrate, for example, the common ion effect.
- More time needs to be spent on chemical systems and chemical change as these areas are still proving to be areas of weakness.
- Teachers need to teach according to the examination guideline and not leave out any sections of the prescribed content.
- More time needs to be spent on balancing redox reactions and working with the Table of Standard Reduction Potentials.

QUESTION 3: ORGANIC CHEMISTRY

(i) COMMON ERRORS AND MISCONCEPTIONS

Question 3.1.1

Cognitive demand: Level 2. The question was well answered. However, many confused the ketone and the aldehyde and opted for *A* instead of *D*.

Question 3.1.2

Cognitive demand: Level 2. The question was moderately well answered. Learners who answered this question incorrectly mainly gave *B*, i.e. *prop-1-yne*, as answer. It thus appeared as if those learners did not know that *structural isomers* must have the same number of atoms of the same type.

Question 3.2.1

Cognitive demand: Level 3. The most common incorrect answer, apart from numerous ridiculous answers, was *2-methylpentanal*. Learners thus did not know that the functional group of an aldehyde is always on the first carbon atom and that counting of carbon atoms should start at that carbon atom. Further, as the functional group is always on the first carbon atom, it does not receive a number in the IUPAC name. Many learners wrote *4-methylpentan-1-al*. The correct IUPAC name is *4-methylpentanal.*

Question 3.2.2

Cognitive demand: Level 3. *Prop-1-yne* should be taught as introduction to alkynes, making this question a pure recall question. Many learners gave *prop-2-yne* as the answer. These learners were seemingly not aware that counting starts from the end of the molecule closest to the double bond and that the number of the carbon atom that precedes the double bond is used in the IUPAC name. In some cases, learners gave as the answer, the name of the homologous series (alkynes) to which the compound belongs instead of the IUPAC name. Learners who recognized that the molecule has three carbon atoms, sometimes forfeit a mark due to the use of *propan* instead of *prop* e.g. *propanyne* or *propan-1-yne* or *1-propanyne*. Other common incorrect answers were: *prop-1-ene; propene, propyl*, *propeyne and propayne.*

Question 3.3

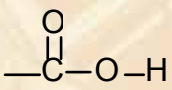
Cognitive demand: Level 3. The question was poorly answered by the majority Learners did not know that *carbon dioxide* and *water* are the products during complete combustion of alkanes. Common incorrect answers were: *butane + butene, carbon and oxygen.*

Question 3.4.1

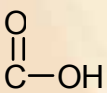
Cognitive demand: Level 2. Spelling of the word *ester* was a problem. Common incorrectly spelt answers were *esther, estha, esta* or even *easter*.

Question 3.4.2

Cognitive demand: Level 1. This recall question was not well answered. When writing a structural formula of a functional group, ALL bonds i.e. four, should be shown for the carbon atom. The correct structural formula that should be taught for the functional group of carboxylic acids is:



Many learners gave the following structural formula as the answer:



This answer is incorrect due to carbon not having four bonds. A number of learners indicated five bonds around the carbon atom, while others wrote the structural formula of any carboxylic acid of their choice as answer. Learners could thus not distinguish between the functional group and an example of a carboxylic acid.

Question 3.4.3

Cognitive demand: Level 2. The question was moderately well answered. Some learners gave the homologous series, i.e. *carboxylic acids*, as answer. Many wrote the IUPAC name of a carboxylic acid, but with the wrong number of carbon atoms in the chain, e.g. *ethanoic acid*. Many learners identified side chains and gave names such as *methybutanoic acid* or *ethylbutanoic acid*. Another incorrect answer was *butanoate acid.*

Question 3.4.4

Cognitive demand: Level 3. The question was poorly answered. Many learners who were able to write the correct functional group of an ester, failed to add the correct number of carbon atoms on both sides of the functional group. Common mistakes were:

- Giving the structural formula of *butyl ethanoate* instead of that of *ethyl butanoate;*
- Omission of H atoms – one mark was forfeited in cases where all bonds were shown, but one or more hydrogen atoms were omitted;
- Using a combination of structural and condensed formulae; and
- Giving structural formulae of other esters such as *methyl methanoate* and *methyl ethanoate.*

(ii) SUGGESTIONS FOR IMPROVEMENT

- Rules for giving IUPAC names should be emphasised. Hyphens are used between numbers and words. Commas are used between numbers. Apart from IUPAC names of esters, an IUPAC name is written as one word and hyphens are not used between words.
- Learners should be exposed to writing of structural formulae and IUPAC names through the year on a regular basis. Organic chemistry is a section that must be thoroughly studied and practised to obtain good marks.
- Learners must be taught that, when naming organic compounds, counting of carbon atoms in a molecule starts at the end closer to the functional group.

QUESTION 4: ORGANIC CHEMISTRY

(i) COMMON ERRORS AND MISCONCEPTIONS

Question 4.1

Cognitive demand: Level 1. The question was one of the best answered questions in the paper. The majority of learners knew the definition of an isomer.

Question 4.2

Cognitive demand: Level 2. Identifying variables is still a problem for some learners. Many learners identified the

dependent (Question 4.2.1) and independent variables (Question 4.2.2) correctly, but failed to identify the controlled variable (Question 4.2.3) correctly. Most common mistakes were:

- Swopping of the dependent and independent variables;
- Giving *temperature* as the controlled variable – the dependent variable is *boiling point* which is a temperature; and
- Giving *mass* or *chain length* as the controlled variable.

Question 4.3

Cognitive demand: Level 2. Many learners knew that saturated compounds have single bonds and that unsaturated compounds have double or triple bonds, but they identified the hydrocarbons incorrectly as unsaturated and thus forfeited 3 marks. Some only referred to the compounds' being *alkanes* as an explanation and did not refer to the *absence of multiple bonds* or the fact that *the compounds have only carbon-carbon single bonds*. One mark was forfeited in such cases. Learners from several centres also had the misconception that a saturated compound is one that contains only carbon and hydrogen atoms. Such learners gave this as reason for identifying the compounds as saturated.

Question 4.4.1

Cognitive demand: Level 3. The question was well answered. The most common incorrect answer was *C*.

Question 4.4.2

Cognitive demand: Level 3. The question was well answered. Spelling of *pentane* was a problem for several candidates (*pantane* was given as the answer). Sometimes it was difficult to distinguish whether the answer was *pentane (the correct answer)* or *pentene.* Furthermore, the IUPAC name is not *1-pentane,* but just *pentane*.

Question 4.5.1

Cognitive demand: Level 3. The question was poorly answered. Many learners drew a bent structure thinking that the bending of the structure of pentane will give a branched alkane. Others gave the structural formula of pentane as the answer.

Question 4.5.2

Cognitive demand: Level 3. The question was poorly answered. The majority of candidates were not able to communicate in a sensible way the relationship between *branching*, *intermolecular forces* and the *energy needed to overcome these forces.* Many learners forfeited marks due to incorrect or vague statements, or statements that did not make sense at all. Many learners incorrectly related higher intermolecular forces to branching. Other common mistakes were:

<u>Structure</u>

- The molecule is (smaller instead of saying it has a smaller surface area);
- Shorter structure;
- Longer chain length; and
- Straight chain.

Intermolecular forces

- Weak hydrogen bonds;
- Van der Waals' forces without mentioning that the forces are weaker than in A and B; and
- Weak Van der Waals' forces between carbon and hydrogen atoms (they thus did not know that Van der Waals' forces are intermolecular forces and that intermolecular forces are responsible for differences in boiling points).

Energy

- The compound has low/high energy levels;
- The compound has high/low energy (instead of *needs the least energy needed to overcome intermolecular forces*); and
- The energy of the alkane is low/high.

Question 4.6

Cognitive demand: Level 2. Many learners thought that the compound with the highest boiling point also has the highest vapour pressure. In cases where learners managed to give the correct answer (C), they could not give the correct reason. The question specifically instructed candidates to refer to the data in the table. The only data in the table were boiling points. Therefore only reasons in terms of boiling point were accepted. Learners had to link the answer with the fact that *C* has the lowest boiling point. Some made vague statements about the relationship between vapour pressure and boiling point, but did not mention the reason, i.e. that *C* has the lowest boiling point. Many learners referred to branching and intermolecular forces as a reason. Common incorrect or vague reasons were:

- Vapour pressure is inversely proportional to boiling point, which is an incorrect statement;
- Vapour pressure decreases with increase in boiling point – a correct, but vague statement; and
- C has the weakest intermolecular forces – a correct statement, but makes no reference to the data in the table.

(ii) SUGGESTIONS FOR IMPROVEMENT

- Teaching of practical skills is still a problem in many schools. Learners should be exposed to the identification of variables on a regular basis. This is a skill that learners must acquire before reaching Grade 10.
- Language remains a huge problem when answering explanation-type questions. Learners should be taught how to answer questions such as Question 4.5.2. Proper sequencing of ideas is important. For example: Firstly, a compound has a branched structure; secondly, intermolecular forces will then be weaker and lastly more energy will be needed to overcome these intermolecular forces. Learners must get enough practice in answering such questions. Statements such as "*molecules have high/low energy levels",* do not make sense. It should be: more/less energy is needed to overcome intermolecular forces.
- Learners do not know the difference between intermolecular forces and intermolecular bonds. Some do not know that hydrogen bonds are the strongest intermolecular forces and are not of the same order of magnitude as other intermolecular forces.

QUESTION 5: ORGANIC

(i) COMMON ERRORS AND MISCONCEPTIONS

Question 5.1

Cognitive demand: Level 2. Although this question was moderately well answered, many learners got the answers mixed up. Many learners could not differentiate between addition, substitution and elimination reactions. Some learners even answered 'endothermic' or 'exothermic' here because they did not understand the question and they did not recognise it as an organic reaction question. Common mistakes were:

- Giving *hydrolysis* as a type of addition reaction; and
- Giving *dehalogenation*instead of *dehydrohalogenation* as answer to Question 5.1.3.

Question 5.2

Cognitive demand: Level 3. Many learners are still not able to write a chemical equation. Equally, instead of a forward arrow was often used. Many learners still gave the reactants and products listed from top to bottom as chemical equation. Many only wrote the structural formula of the product. A Grade 12 leaner should know what a chemical equation is, because this is a basic concept in Chemistry.

Common mistakes in answering this question were:

- Use of condensed structural formulae instead of structural formulae;
- Addition of the –OH group to the first instead of the second carbon atom – indicating that they do not know the that the hydrogen atoms always add to the carbon atom containing the most hydrogen atoms;
- Too many hydrogen atoms bonded to a carbon atom in the structure of the alkene;
- Adding extra products/reactants to the equation; and
- Omitting the forward arrow between reactants and products.

Question 5.3

Cognitive demand: Level 3. Many variations for propan-2-ol (e.g. propa-2-nol, 2propanol, prop-2-ol) were given, indicating that learners did not get enough exercise in the writing of IUPAC names.

Question 5.4

Cognitive demand: Level 2. The question was poorly answered. The fact that many learners gave the standard conditions of a galvanic cell as answer indicated that they had not learnt the conditions needed for different purposes and types of reactions with insight and understanding. The conditions for hydrolysis are given in the examination guidelines and learners need to understand the reasoning behind the conditions that are given.

(ii) SUGGESTIONS FOR IMPROVEMENT

- Learners should be given more exercises involving flow diagrams;

- More emphasis must be placed on the addition of HX and H_2O to unsymmetrical alkenes; and
- The conditions for hydrolysis of alkyl halides in the presence of a base should be emphasized.

QUESTION 6: RATES OF REACTIONS

(i) COMMON ERRORS AND MISCONCEPTIONS

Question 6.1

Cognitive demand: Level 2. The performance in this question was poor. Learners did not know the names and functions of laboratory apparatus. Most of the learners thought that one can measure the volume of the gas formed with a thermometer. Other answers were: *test tube, gas cylinder, gas tube, pipette, delivery tube,* etc. The spelling of syringe varied from the correct spelling to sringe to cerinch. Many Afrikaans-speaking learners used the word 'inspuiting' (i.e. an injection) instead of 'spuit', the Afrikaans word for syringe. Some learners gave *gasmeter* as the answer. Although such an instrument exists, it cannot be used in the particular experiment and cannot collect the gas as implied in the question. Gas meters measure the volume of fuel gases such as natural gas and propane as the gas flows through the meter in residential, commercial and industrial buildings.

Question 6.2

Cognitive demand: Level 2. The question was moderately well answered. However, some learners do not know how to read a graph. This is another practical skill that should be practised. Although the unit was given on the graph, many forfeited a mark for either omitting the unit or giving the wrong unit.

Question 6.3

Cognitive demand: Level 2. The question was poorly answered. Many learners thought that the rate of the reaction increases from 40 s to 70 s. They even justified this incorrect answer by stating that the volume increases from 48 cm^3 to 58 cm^3 during this time. *Remains the same* was also a common incorrect answer. Many of those who gave the correct answer (i.e. *decreases*) could not give a correct explanation. It seems as if the majority of those who answered correctly had taken a guess because they failed to give a correct explanation.

Reaction rate is represented by the gradient of the graph. Therefore, in the explanation learners had to refer to the gradient of the graph. Many gave vague explanations without referring to the gradient. Learners gave statements such as *The graph becomes flatter* or *The graph becomes more horizontal / lower* as an explanation.

Question 6.4

Cognitive demand: Level 2. The question was moderately well answered. The majority of learners who answered this question incorrectly, thought that the copper(II) oxide decomposed the hydrogen peroxide. The phrase was copied from the question paper. Learners therefore could not interpret the given chemical equation.

Question 6.5

Cognitive demand: Level 3. The question was not well answered. Most learners identified water as one of the substances, but failed to identify the copper(II) oxide. Common incorrect answers were:

- H_2O_2 and Cu (no marks) or O_2 and H_2 (no marks);

- H_2O and H_2O_2 (one mark) or H_2O and Cu(one mark); and
- Copying the equation given in the paper into their answer books without any explanation accompanying it.

Question 6.6

Cognitive demand: Level 3/4. The question was poorly answered. The majority answered in terms of the reaction rate of the lump that will be slower than that of the powder without referring to the exposed surface area.

Very few learners could give a full explanation. Learners who obtained the first mark most of the time forfeited the second mark, often due to omission of the phrase 'per (unit) time' or the term 'effective'. Reaction rate depends on the number of effective collisions per unit time and not just on the number of collisions or the number of collisions per unit time.

Question 6.7

Cognitive demand: Level 3. The question was poorly answered. Learners were expected to interpret the given equation and then make a deduction from the information given in the question. Common incorrect answers were:

- Hydrogen peroxide kills bacteria without reference to the oxygen released;
- Hydrogen peroxide contains oxygen;
- Oxygen is needed for good breath; and
- Oxygen is needed for humans to breathe.

(ii) SUGGESTIONS FOR IMPROVEMENT

- Learners should be exposed to laboratory apparatus. Previous papers had diagrams where a syringe or a burette was used to measure the volume of a gas. The poor answering of Question 6.1 causes one to believe that learners were never exposed to laboratory apparatus and also did not have the opportunity to answer similar questions in previous papers. Those questions should be used as theoretical practical tasks to expose learners to different techniques that are not always possible in a particular school laboratory.
- Graph reading: All Grade 12 learners should be given opportunities to read values from a graph and make deductions using the gradient of a graph.

QUESTION 7: CHEMICAL EQUILIBRIUM

(i) COMMON ERRORS AND MISCONCEPTIONS

Question 7.1.1

Cognitive demand: Level 1. The question was recall. Many learners had no idea what the definition was and wrote the definition for a chemical equilibrium. Another common incorrect answer was: *When there is a forward reaction, there will also be a reverse reaction.*

Many learners did not mention that the reaction is in *equilibrium* and forfeited the mark.

Question 7.1.2

Cognitive demand: Level 3. The question was poorly answered. The majority reasoned that pressure will have no effect. In cases where learners gave the correct answer (i.e. decreases), they could not give a full explanation. Many wrote that the reverse reaction would be favoured (for one mark), but failed to explain why in terms of the mole of gas as given in the balanced equation. Very few were able to give a correct answer as well as a complete correct explanation. Common mistakes were:

- The rate of the reverse reaction will increase and thus the reverse reaction will be favoured;
- An increase in pressure results in a decrease in volume and thus more hydrogen gas will be formed;
- Giving the relationship between pressure and volume of gases but not what the effect was on the equilibrium system;
- No reference to the change in the number of moles of gas; and
- Because the temperature of 1000 °C was given, learners explained the influence of temperature and not pressure on the system.

Question 7.1.3

Cognitive demand: Level 2. Learners did not know that a higher temperature increases the rate and also the yield of an endothermic reaction. Many identified the link between temperature and rate of the reaction, but they did not make the link between the temperature and equilibrium. They also did not make mention of the number of collisions per unit time but merely stated that the number of collisions will increase at higher temperature.

Question 7.2.1

Cognitive demand: Level 3/4. Kc calculations remain difficult for the majority of candidates. Common mistakes were:

- Writing the K_c expression as $K_c = \frac{[products]}{[reactants]}$. This is a wrong expression leading to misconceptions.
- Often learners who used this expression had as the next step: $K_c = \frac{[CO]+[H_2O]}{[H_2]+[CO_2]}$ or even $K_c = \frac{[CO+H_2O]}{[H_2+CO_2]}$.
- Using one as the change in number of moles instead of the 0,2mol – the perception is that the ratio given in the balanced equations must be used as such.
- Omitting the CO (g) in the table as well as in the K_c expression. Learners did not cope well with this reaction where two products were given. It seems that learners only work with chemical reactions forming one product in their schools. Many learners did not include both products in their table and in their Kc expression. Many learners reasoned that there is no CO (g) present and did the calculation without using it. In such cases they used the following K_c expression:
- $K_c = \frac{[H_2O]}{[H_2][CO_2]}$
- Assuming that the initial moles of H_2 and CO_2 were equal i.e. 0,3 mol, and then proving that $K_c = 4$. A maximum of 5 out of the 8 marks could be obtained in such cases.
- Using curved brackets instead of square brackets in the K_c expression.

Question 7.2.2

Cognitive demand: Level 3. Most learners obtained one mark in this question i.e. they answered *exothermic*. However, the majority failed to give a correct explanation. It thus seemed as if the majority took a guess since there was a 50% chance of being correct. Learners did not know how to interpret the value of K_c and the influence that temperature has on it. Inclusion of two options on the memorandum helped learners, but, despite that, many only obtained the mark for *exothermic*. Some learners had a misconception regarding exothermic and endothermic reactions; they wrote *exothermic* but said that it is because *electrons are being transferred*.

(ii) SUGGESTIONS FOR IMPROVEMENT

- When teaching K_c calculations, more emphasis should be placed on the writing of the expression for the equilibrium constant. Teaching of these calculations should start by introducing numerous exercises in which learners can get acquainted with the writing of K_c expressions. Often, teachers spent too little time on the basics and go into higher order calculations too quickly. Furthermore, two to three K_c calculations taken from previous papers are not sufficient to ensure that learners understand how to do such calculations.
- Learners should practise examples of K_c, using different reactions such as homogeneous and heterogenous reactions with more than one reactant and product. The learners should also be given exercises that use reactions where the ratio is not 1:1 in order for the learner to practice this skill. Teachers should not teach the mol/concentration table as a recipe but rather as a tool to make the answering of the question simpler.

QUESTION 8: ELECTROCHEMICAL CELLS

(i) COMMON ERRORS AND MISCONCEPTIONS

Question 8.1

Cognitive demand: Level 1. This was a straightforward recall question. Learners did not study the basics. The correct answer was *chemical energy to electrical energy*. Common incorrect answers were:

- Mechanical energy to electrical energy;
- Chemical energy (no mark could be given if only one of the energies involved was mentioned);
- Galvanic cell;
- Electrical to chemical energy – the energy conversion for a electrolytic cell; and
- Kinetic energy to chemical energy.

Question 8.2

Cognitive demand: Level 1. Another recall question. The poor answering of this question shows that learners did not study the basics. The main function of the salt bridge in a galvanic cell is to maintain electrical neutrality. A common misconception is that learners think ions move through the salt bridge from the one half-cell to the other half-cell. Ions move from the salt bridge into the half-cells to ensure that no built-up of charge takes place at the electrodes. Common incorrect answers were:

- Maintains neutrality of the cell (should be *electrical neutrality*);

- Completes the cell / current (instead of *completes the circuit*);
- Connects the half-cells;
- Transfer Cu^{2+} ions to Pb^{2+} ions and Pb^{2+} ions to Cu^{2+} ions;
- Allows ions to move from the anode to the cathode or from the cathode to the anode;
- Transfers electrons;
- Separates the two electrolytes; and
- Transports charge.

Question 8.3

Cognitive demand: Level 3. The question was poorly answered. The majority of learners did not know how to use the Table of Standard Reduction potentials to determine the half-reaction that takes place at the anode. If well taught, this could have been a very easy question. All the symbols of elements and ions were given on the paper. Learners only had to select the half-reactions containing these ions from the table. Common mistakes were:

- Writing the correct half-reaction with a double arrow – one mark was forfeited;
- Giving either $Cu^{2+} + 2e \rightarrow Cu$ or $Cu \rightarrow Cu^{2+} + 2e$ as the half-reaction taking place at the anode;
- Writing the correct half-reaction, but omitting the + between Pb^{2+} and the $2e^{-}$;
- Use of incorrect symbols for lead e.g. pb or Pd (the symbols of both Pb and Cu were given in the paper); and
- Copying the correct half-reaction from the table without changing it to be an oxidation half-reaction.

Question 8.4

Cognitive demand: Level 3. Again learners failed to use the Table of Standard Reduction potentials to determine the direction in which electrons will flow in the external circuit.

Question 8.5

Cognitive demand: Level 3. The question was poorly answered. Learners again failed to use the Table of Standard Reduction potentials to determine the correct reactants and products in this reaction. Common mistakes were:

- Writing the correct chemical formulae in the cell reaction, but omitting the + sign between the reactants and between the products: $PbCu^{2+} \rightarrow Pb^{2+}Cu$
- Giving the cell notation instead of the cell reaction;
- Writing the correct reactants and products, but using a double line as for a salt bridge or a single line between reactants and products instead of an arrow;
- Using Cu^{+} instead of Cu^{2+} (Cu^{2+} was given in the paper);
- $Pb^{2+} + Cu \rightarrow Pb + Cu^{2+}$

- Adding the two correct half-reactions without cancelling the $2e^-$ on both sides of the equation; and
- Calculating the cell potential of the cell (thus the same answer was given as in Question 8.7).

Question 8.6

Cognitive demand: Level 2. The question was well answered. However, it must be mentioned that learners had a 50% chance to guess the correct answer. Some still answered it incorrectly and thus do not know the difference between endothermic and exothermic reactions.

Question 8.7

Cognitive demand: Level 3. Learners found this calculation very easy and the majority obtained their only marks for Question 8 here. Common mistakes were:

- Using the value 0,16 V ($Cu^{2+} + e^- \rightarrow Cu^+$) as $E_{reduction}$ instead of 0,34 V;
- Omitting the unit at the final answer; and
- Using n = cV as formula to calculate the cell potential.

Question 8.8

Cognitive demand: Level 3/4.The question was poorly answered. Learners should know that a four-mark question needs more than just one line as an answer. Those who identified temperature and concentration as the conditions responsible for the deviation in results, failed to give the values for standard temperature (25 °C) and concentration (1 $mol \cdot dm^{-3}$) for galvanic cells. The majority gave answers in terms of pressure or faulty meters/apparatus or a blocked salt bridge.

(ii) SUGGESTIONS FOR IMPROVEMENT

- The use of the Table of Standard Reduction Potentials must be thoroughly explained and practised with learners.
- Teachers must make sure that they fully understand how to use the table. Many teachers still think that a strong reducing agent should be a weak oxidising agent. For example, Pb is a stronger reducing agent than Cu, but Pb is not a weak oxidising agent. It is not an oxidising agent at all (to be an oxidising agent Pb should be able to gain electrons). The Pb^{2+} ions can be an oxidising agent. It is thus not surprising that learners struggle with questions that require the use of the Table of Standard Reduction Potentials.

QUESTION 9: ELECTROLYTIC CELLS

(i) COMMON ERRORS AND MISCONCEPTIONS

Learners seemed to be unfamiliar with electrolytic cells. This is one of the prescribed electrolytic cells and should therefore have been an easy question if it had been effectively taught and learnt.

Question 9.1

Cognitive demand: Level 1. This was a recall question, but it was poorly answered. Many learners did not know definitions. The following terms are important when defining an electrolyte: *ions in solution* or *a solution that conducts electricity*. A good definition, containing both phrases, is therefore as follows: *A substance/liquid/solution that conducts electricity*

through the movement of free ions. Common incorrect answers were:

- A substance/liquid that conducts electricity;
- A substance that has ions;
- A chemical substance in which electrodes are placed to obtain a chemical reaction; and
- A substance/liquid/solution in which electrical energy is transferred to chemical energy.

Question 9.2.1

Cognitive demand: Level 2. The question was poorly answered. Instead of using the $C\ell_2/C\ell^-$ half-reaction in this answer, learners answered in terms of the Cu/Cu^{2+} half-reaction. Common wrong answers were:

- $Cu^{2+} + 2e^- \rightarrow Cu$;
- $C\ell_2 + 2e^- \rightarrow 2C\ell^-$;
- Using double arrows in the half-reaction; and
- Using wrong symbols, e.g. CL instead of $C\ell$.

Question 9.2.2

Cognitive demand: Level 2. The question was poorly answered. Common wrong answers were:

- $Cu^{2+} + e^- \rightarrow Cu^+$;
- $C\ell_2 + 2e^- \rightarrow 2C\ell^-$;
- $2C\ell^- \rightarrow C\ell_2 + 2e^-$;
- $Cu \rightarrow Cu^{2+} + 2e^-$;
- Using double arrows in the half-reaction; and
- Using wrong symbols, e.g. CU instead of Cu.

Question 9.3

Cognitive demand: Level 3. Some learners gave the correct answer (Q), but failed to give a correct reason. Common wrong reasons were:

- Q is reduced (Q is a carbon rod and will not be reduced. The Cu^{2+} ions will be reduced);
- The carbon/copper rod gains electrons. (Q is a carbon rod and will not gain electrons; the Cu^{2+} ions gain electrons);
- Q is an oxidising agent;
- Electrons are lost and thus reduction takes place (it seems as if learners think that reduction implies to get smaller and therefore electrons are lost); and

- The cathode is always on the right and the anode on the left.

Question 9.4.1

Cognitive demand: Level 4. The question was very poorly answered. When comparing the relative strengths of the two reducing agents, the answer should be as follows: Copper is a stronger reducing agent than chloride ions and thus copper will be oxidised. Common mistakes were:

- Comparing copper as reducing agent with chlorine instead of chloride ions; and
- Giving general statements without comparing copper and chloride ions e.g. reducing agents have a high strength because they undergo oxidation and gain electrons.

Question 9.4.2

Cognitive demand: Level 3. The question was well answered.

(ii) SUGGESTIONS FOR IMPROVEMENT

- Learners find electrolysis more difficult than expected. More time should be spent to explain electrolytic cells. Explanations in terms of the relative strengths of reducing/oxidising agents (e.g. Question 9.4.1) appear year after year in papers. Teachers should teach learners how to answer such questions because learners perform poorly in such questions.

QUESTION 10: CHLOR-ALKALI CELL

(i) COMMON ERRORS AND MISCONCEPTIONS

Question 10.1

Cognitive demand: Level 1. This was a recall question that had appeared several times in previous papers. It was poorly answered (evidence that some learners had not studied). Common incorrect answers were:

- The membrane allows positive electrons to pass;
- The membrane allows electrons to flow;
- The membrane separates the two chambers/solutions; and
- The membrane maintains electrical neutrality.

Question 10.2

Cognitive demand: Level 3. The poor performance in this question might be due to the fact that the positive electrode was shown on the right-hand side of the cell in the paper. Textbooks usually show it on the left. Therefore learners do not understand this cell, but simply memorised the diagram with labels. Many learners wrote that *X* is the positive electrode and obtained no marks. In cases where learners identified *Y* correctly as the positive electrode, they failed to give an explanation. Many wrote that *Y* is the positive electrode because it is the anode. Being the anode is not enough to explain how one has arrived at the answer. Only explanations in terms of where brine enters the cell or in terms of oxidation or in terms of the charge on chloride ions that remain in the *Y* compartment were accepted.

Question 10.3

Cognitive demand: Level 2. Because the positive and negative electrodes in the cell were not indicated on the left and right hand side of the diagram respectively as in text books, learners swopped the answers of Question 10.3.1 (H_2) and 10.3.2 ($C\ell_2$). The poor performance once again shows that learners had not prepared this section of the syllabus and did not understand electrolytic cells. Most common mistakes were:

- Swopping the answers of Question 10.3.1 and 10.3.2;
- Giving sodium chloride or brine or sodium hydroxyl as answer to Question 10.3.3;
- Giving the formula of sodium hydroxide as NAOH or NaOH;and
- Giving the formula of chlorine as CL_2 or CL or Cℓ.

Question 10.4

Cognitive demand: Level 3. The question was poorly answered. The majority of learners could not write the cell reaction and used wrong reactants and products in the equation. Many learners, who used the correct reactants and products, swopped the reactants and products, probably because the cell was given with the positive electrode on the right hand side.

Question 10.5

Cognitive demand: Level 3/4. The question was poorly answered. The majority of learners wrote that the cell releases carbon dioxide into the atmosphere or that chlorine gas is a greenhouse gas and obtained no marks. The only accepted answer was in terms of the electricity/energy use of the cell that results in the emission of carbon dioxide gas into the atmosphere. The mark for carbon dioxide was given only if preceded by the energy consumption of the cell. The mention of carbon dioxide to obtain the second mark was essential because the question already referred to the greenhouse effect. To state that energy generation releases greenhouse gases is too general (and given in the paper) to obtain the second mark. Carbon dioxide is also the gas that is mainly responsible for the enhanced greenhouse effect. $SO_2(g)$, also released during burning of coal, is responsible for acid rain and not for the greenhouse effect as such.

(ii) SUGGESTIONS FOR IMPROVEMENT

Electrolytic cells are a challenge to learners and teachers. The chlor-alkali cell should be taught when electrolytic cells are taught and not as a separate section. This will also prevent teachers from omitting the chlor-alkali cell due to lack of time.

QUESTION 11: FERTILIZERS

(i) COMMON ERRORS AND MISCONCEPTIONS

Question 11.1.1

Cognitive demand: Level 1. Learners who answered this question incorrectly did not know their work. The most common incorrect answers were:

- Haber process;

- Fractional distillation; and
- Contact process.

Question 11.1.2

Cognitive demand: Level 2. Writing of this equation is almost a recall. The name of one reactant and the formula of the other reactant were given. The formula of the product was also given. Despite that, learners got the reactants as well as products wrong.

Question 11.2

Cognitive demand: Level 2. The majority of learners were not familiar with the catalytic oxidation of ammonia and could not answer this question correctly

Question 11.3

Cognitive demand: Level 2. The poor answering of this question was again an indication that learners had not prepared well. An equation was given for step *C* of the Ostwald process and the oxygen was left out. All they had to do was complete the equation by filling in the oxygen and then balancing the equation. The majority were unable to answer this question correctly. Many who knew that the missing reactant is O_2 could not balance the equation correctly.

Question 11.4

Cognitive demand: Level 3. This question was poorly answered. Learners were unable to calculate the mass of nitrogen present in a bag of fertiliser. The majority of learners thought that the mass of nitrogen in the bag can be calculated without using the 3 out of 9 parts as indicated on the bag. Examples of such misconceptions are illustrated below. In some cases, a correct answer was obtained, but this was due to the choice of numbers in the question. Common answers resulting from either misconceptions or lack of knowledge were:

- $\frac{3}{30}$ x 100 = 10%
- $\frac{10}{100}$ x 50 = 5 kg (the correct answer was obtained using a wrong argument);
- 50 x 3 = 150 kg;
- $\frac{50}{3}$ x $\frac{30}{100}$ = 5 kg (the correct answer was obtained using a wrong argument);
- Using the equation n = $\frac{m}{M}$;
- Seeing the hyphens in 3 – 1 – 5 as minus sign and thus subtracted in calculations.

Question 11.5

Cognitive demand: Level 2. One mark was given for the cause (e.g. fish dies due to lack of oxygen) and then 1 mark for the effect (e.g. not enough food for humans). Many learners gave answers in terms of illnesses/diseases (an effect) and obtained only 1 of the 2 marks.

Although excess of nitrates in water that causes blue baby syndrome was accepted for two marks, it must be mentioned that this answer is not a negative impact of eutrophication. Excess nitrates in water lead to eutrophication, and not the other way round.

(ii) SUGGESTIONS FOR IMPROVEMENT

- Fertilisers should be discussed in class and informal tests written to ensure that learners understand and learn the concepts. Many teachers give this topic to learners as self-study or as the research project. No follow-up teaching is done.
- Revision of names and chemical formulae should be done on a regular basis.
- Learners must be given more questions where they can write and balance equations.
- More questions making use of flow diagrams should be extracted from previous papers to expose learners to such questions.
- Teachers should emphasise that learners have to give the cause and effect when answering questions on the impact of fertilisers/eutrophication.

6. Conclusion

There is a noticeable improvement in the quality of responses presented by learners in the 2011 NSC examinations compared to previous NSC examinations in a majority of subjects. This certainly confirms that interventions are beginning to pay off and that there is improvement in teaching and learning in most schools. This can be attributed to the fact that teachers are more familiar with the assessment requirements of the curriculum, have a better understanding of the subject content, and are more able to teach some of the new topics, in the fourth year of implementation of the NCS.

Schools, districts and PEDs are encouraged to continue to strive to ensure that quality learning and teaching occurs in every classroom. Teachers, school principals, circuit and district managers need to ensure that basic concepts are well taught and understood by learners from Grade 1 and at every grade of the schooling system, as these foundational competencies make advanced learning possible. Schools and districts should assist candidates to prepare adequately for examinations. Underperformance at all levels of the schooling system needs to be continually monitored and remedied.

It is hoped that all subject advisors, teachers, and those involved in the preparation of Grade 12 candidates will make use of this report in planning intervention programmes for 2012. The Department of Basic Education and the PEDs will monitor the utilisation of this report and its impact on teaching and learning.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