Benchmarking Analysis:

The National Senior Certificate (Republic of South Africa)

UK NARIC

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Executive Summary

In 2009 the Independent Examinations Board (IEB) commissioned UK NARIC to undertake a benchmarking study of the new National Senior Certificate (NSC) in the Republic of South Africa. The focus of the study has addressed two key areas, namely to provide an analysis of the state developed qualification design features; secondly, to review the IEB testing and assessment mechanisms at NSC level. Thus, the report considers both how the qualification has been designed, and also then how the IEB conducts its testing.

Since 1994 the South African education system has undergone a series of dramatic reform and changes, reflecting the social and cultural developments taking place within the nation as a whole. As a part of these fundamental changes, the South African National Department of Education – now referred to as the National Department of Basic Education (DoBE) – developed the National Senior Certificate (NSC), introduced in 2006 at Grade 10, with the first cohort of Grade 12 papers written in 2008. The introduction of the NSC coincided with the replacement of Matriculation in the Senior Certificate. The NSC represents the exit qualification from senior secondary education, and for successful candidates also provides access onto higher education.

NSC examination is conducted at the end of Grade 12, and students are tested by the national department or the Independent Examinations Board, and such other assessment bodies as have been accredited by Umalusi, the independent national body that provides quality assurance.

The two-fold purpose of this study results in an evaluation of the rigor and robustness of the NSC qualification, considering the key features of the qualification construction and design, and how the qualification is intended to work 'in theory'. The report has also considered how the qualification operates 'in practice', from delivery at school level through to assessment. This aspect of testing has been viewed through the lens of IEB practice and procedures, although the outcomes of this report are intended to be indicative of the state of the NSC in its entirety.

Against the backdrop of development and change within South Africa, it has also been important to consider the context within which the educational advances have been made. To this end, UK NARIC has consulted a wide range of stakeholders, incorporating Umalusi, the providers of NSC quality assurance, Higher Education South Africa, the Department of Basic Education and experts and advisors at the IEB.

This report has found that substantial and extensive development work had taken place with the NSC in the post-1994 period, with a prolific output of materials produced both by the provincial departments, national departments and also by the Independent Examinations Board.

In particular, the report notes the importance and value associated with the development and application of the Subject Assessment Guidelines, both national department and IEB, which facilitate the delivery of the National Curriculum Statement aims and clarify examinable content at Grade 12.

The report is satisfied that the features of the NSC indicate a qualification with an underlying level that is both robust and fit for the purposes of examining senior secondary school levels. In terms of the qualification's comparability, the report concludes that the National Senior Certificate at Grade 12 is broadly comparable to the GCE AS-level. For those candidates who undertake the IEB Advanced Programme in Mathematics, the report is satisfied that the additional content is more reflective of the requirements of the GCE A level. Furthermore, it is noted that there are considerations to develop an advanced paper for English Home Language; it could be surmised that an advanced paper could further enhance the comparability of the subject to GCE A level standard.

Whilst the report finds broad comparability with the GCE AS-level standard, it also highlights there are variances in level and content from one subject to another. Although this does not alter the fundamental findings of the report, close scrutiny of subject by subject analysis is recommended to determine a more exact level of comparability between the individual NSC and GCE subjects. This is exemplified by the organisation of NSC Physical Sciences which is necessarily compared with GCE Physics and Chemistry, since there is no Physical Sciences counterpart.

During the course of this study, a number of key issues were either raised by stakeholders within South Africa, or were uncovered by the research work. On the basis of these findings, the report makes a number of recommendations aimed at improving the success of the NSC as a national qualification, and acting to consolidate its status within South Africa. In principle, the key recommendations can be summarised as follows:

Firstly, further work is required to ensure that the 'general level' required at the point of exit is broadly consistent from one subject to the next. This recommendation does not discount the invaluable developmental work that has already driven the NSC forward, from the realisation of the National Curriculum Statement in 2003 to the application of Learning Programme Guidelines and Subject Assessment Guidelines in 2006 and 2008. Anecdotal evidence from stakeholders suggested that this fine-tuning work is a work in progress; likewise, greater clarity and understanding of the NCS requirements has already been achieved.

Secondly, the absence of a qualification broadly comparable to the GCSE in England, Wales and Northern Ireland is problematic. In its conclusions, this report emphasises the importance of providing recognition of educational achievement on a fundamental level. The GCSE represents the building block in the development of an individual's education. Subject to improvements in the provision of foundation education, and satisfactory individual achievement in English Language, subject attainment at the end of Grade 10 could then be considered comparable to the GCSE standard.

Specific improvements would be needed to ensure a more satisfactory crossover of content between Grade R to 9, and Grade 10. The importance of formally recognised achievement by the end of Grade 10 should not be underestimated and would be representative of the negotiation of a minimum threshold of standards. The need for a benchmark at this level does not necessarily suggest an obligatory exit point at Grade 10 but underlines the benefits of identifying a distinction between the standard at foundation education level and at senior secondary level.

This leads onto a third observation – the notable shortfall between NSC participation and Grade 12 NSC pass grades. Currently, statistical analysis suggests that only one-third of students starting Grade 10 are subsequently promoted to Grade 12, a factor that immediately highlights two critical issues: firstly, recognition of achievement up to Grade 12 needs to be formally recognised; secondly, it is imperative that progression and pass grades improve and that drop-out rates diminish. This will not only improve the success of the NSC but will also increase its relevance to the young South African population.

Finally, there is a clear need to ensure that the provision of well-qualified teachers is available throughout the whole of South Africa. This could focus both on the up-skilling of current teachers and on increasing the volume of readily available skilled teachers. Teacher training considerations should focus on a commitment to a specific B.Ed teacher training programme, incorporated alongside a drive to increase the numbers of skilled teachers currently working, with the aim of gradually raising the standard of delivery. The national department's Foundations in Learning document, and the Student's Guide could be central to attaining these goals. An improvement of the educational provision from Grades R to 9 would further facilitate the increase in NSC success rates, whilst serving to strengthen the links between achievement at Grade 9 and the start of NSC at Grade 10.

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UK NARIC, ECCTIS Ltd
Oriel House, Oriel Road
Cheltenham, Gloucestershire
United Kingdom
GL50 1XP

Email: chris.lyons@naric.org.uk
Telephone: 0871 330 8341 Fax: 0871 330 7005

1 Scope

The purpose of this report is to provide an analysis of the National Senior Certificate (NSC) the recently introduced senior secondary education exit qualification in South Africa. This analysis incorporates a comparison with a counterpart benchmark qualification, the GCE A level in England, Wales and Northern Ireland. This report refers to the way in which Edexcel delivers its assessment of the GCE A level. In a report that is largely qualitative in its analysis and deductions, reference is also made to the context of change and development within which the NSC has emerged.

Consequently, the report focuses on the qualification structure, considering the requirements governing the qualification's aims, content and means of assessment. Finally, the report considers how the qualification operates in practice, and focuses on how the Independent Examinations Board (IEB) delivers the assessment of NSC performances and provides guidance for those schools who write its examination papers.

This study has produced two reports; an initial interim report completed in December 2009 provided an overview of the relevant NSC materials and documents from both the national department and the IEB, whilst identifying areas of consideration and discussion for the full report. This document, the main benchmarking report, brings together the analysis of this documentation, providing a qualitative judgement of the NSC as tested through the IEB. In order to achieve this aim, the report has also sought to consider broader opinion and judgement of the qualification from educational stakeholders in South Africa.

Central to this report is the analysis of the content and structure of the NSC and the GCE A level. This is achieved through scrutinising the respective aims, curricula, and assessment structures of both qualifications. To facilitate this approach, consideration has been given to the following areas:

- Qualification content, as indicated through course specifications or syllabi
- Assessment of subject knowledge, and the rigours of the examination process
- Learning outcomes

In addition, the historical context within which the NSC has been developed is also discussed.

The report comprises the following sections:

Section 2 outlines the methodological process through which the benchmarking exercise is undertaken

Section 3 provides an overview of the South Africa education system, offering a brief history of key developments, identifying important policy decisions and documentation and describing some of the key stakeholders involved in this process. Specifically, this focused on the development of the NSC and outlines some of its key features.

Section 4 provides an overview of the education system in England, Wales, and Northern Ireland.

Section 5 presents the individual NSC subjects as specified by the national department documents and through the development of the National Curriculum. This also considers how the aims, content and learning outcomes of both the NSC and the GCE A level compare.

Section 6 reviews the assessment processes for both NSC and GCE, considering examination format and test requirements.

Section 7 summarises the main findings derived from sections 3 to 6; this offers some broad qualitative judgements of the standard of the NSC qualification, and includes observations and recommendations arising from the research.

2 Methodology

UK NARIC has developed a methodological process for mapping international qualifications, whereby the content, mode and outcomes of international programmes in specific subject areas can be compared to a given benchmark. The methodology combines general UK NARIC evaluation methodology and criteria with a more in-depth review of the subject specific content and outcomes.

This methodology can be tailored to meet the specific requirements of different projects. For the purposes of this project the National Senior Certificate is analysed in terms of its aims, content, assessment procedures and learning outcomes. In addition it is compared with the respective features of a counterpart senior secondary exit qualification, the GCE A level in England, Wales and Northern Ireland. This qualification has been identified as a recognised, international benchmark qualification which is appropriate for comparison work for the purposes of this exercise.

This report will discuss and analyse the provision of the following NSC subjects:

- Life Sciences
- Physical Sciences
- Mathematics
- Mathematical Literacy
- English Home Language
- Geography

These subjects will be considered in relation to the requirements and specifications laid out in the National Curriculum Statements from the national department. With regard to the manner in which these qualifications are delivered and assessed, the report will focus on the assessment practices adopted by the Independent Examinations Board (IEB). To this extent, the report will also consider the provision of IEB Advanced Programme Mathematics alongside its analysis of Mathematics. It should be noted that the Advanced Programme is not formally recognised as an official NSC subject at present; moreover it is an additional subject the IEB has developed to stretch highly competent and interested mathematics students.

The organisation of subjects within South Africa also poses some issues for identifying appropriate counterpart subjects from the GCE qualification. Indeed this is indicative of differences in the respective countries' approaches to subject and examination organisation and provision. Thus, the following GCE subjects have been selected for comparison:

- Biology (for comparison with IEB Life Sciences)
- Chemistry and Physics (for comparison with IEB Physical Sciences)
- Mathematics (for comparison with IEB Mathematics and Advanced Programme Mathematics)
- English Language and Literature (for comparison with English Home Language)

- Geography

With regard to Mathematical Literacy, there is no obvious or evidence equivalent provided at GCE A level. In this instance the subject shall be analysed within the context of other IEB subjects.

2.1 Sources of Information

The first stage of the benchmarking project is to access the details of the course programmes which may be contained in a variety of documents and through a variety of different sources. The compilation of data would involve searching information relating to the course aims, content, assessment methods and learning outcomes. In addition it would also look to identify the grade reporting system in place and the associated level descriptors. A list of the key sources compiled to conduct this study is included in the bibliography section.

2.2 Identifying Core Qualification Components

In order to carry out a benchmarking process effectively it is important to identify the information that is most relevant and appropriate from each qualification. Such information should provide a clear indication of the key components that define a qualification and also allow for the comparison of the features with those present in other qualifications. By discussing the key, common qualification components the notion that a generic form of qualification exists can be developed. This approach seeks to isolate the 'core' elements central to the design of a 'typical' qualification and in turn facilitates comparative work including benchmarking analyses.

This methodology proposes the qualitative analysis and benchmarking of a qualification on the basis of four core features:

- Qualification purpose
- Programme content and breadth of study
- Learning outcomes
- Assessment methods

The qualification purpose shall be identified through the reviewing the aims and objectives of the subject specifications. Subsequently the qualification's purpose should affect the programme of study, both in terms of its content and also the extent to which the subject matter is covered. This leads onto assessment processes; in other words, how is the subject content tested, what formats are adopted, how rigorous and thorough is the testing system. Finally, consideration of the purpose, content and assessment processes should inform the content of the learning outcomes, namely the competences a candidate would be expected to possess upon the successful completion of the course.

It is also important to note that this report will also consider the backdrop against which the NSC qualification has been developed in South Africa. Whilst the GCE A level is a long established qualification, that has evolved and changed through many decades, the NSC is a newly introduced senior school qualification. In this respect it is deemed necessary to consider the context within which the NSC has emerged, reflecting the social, political and educational influences that have shaped the formation of the qualification.

Materials for both the NSC and the GCE A level have been sourced directly from both countries. NSC information is derived both from government related documents and policies and also from the IEB. Information relating to the GCE A level has been taken from Edexcel, one of the prominent examination bodies in England, Wales and Northern Ireland. This information is listed in the bibliography, and some of the more important documents have been included in the appendix. In addition, most information is also available online.

2.3 Learning Outcomes

Learning outcome is a term used to identify the skills a candidate is expected to demonstrate upon successful completion of the qualification. In this project, learning outcomes will be used to highlight qualification coverage and provide an indication of candidate competency and ability at each level. This will allow for the mapping of outcomes from one qualification to the next.

Learning outcomes indicate the achievable competences expected of every student on course completion, and thus should reflect the purpose, aims and content of the course programme. In addition they should define the broad areas covered by curriculum content and thus should reflect the areas that a student has covered during a course.

2.4 Analysis of Assessment

The analysis of assessment procedures demonstrates how individual qualifications test the learner's knowledge; this can be achieved through the analysis of the organisation of examination organisation. In addition this analysis should also explore the relationships between knowledge testing, the associated learning outcomes and level descriptors, where possible.

In this section, consideration is given to the assessment and question formats, and the distribution of marks allocated per question type. Marking guides and exemplar answers are used to demonstrate how differing levels of performance are graded in the examinations.

2.5 Summary Findings

The approach that this study adopts is an inherently qualitative one, requiring the objective analysis and judgement of the application of language and meaning to learning outcomes, for example, and also through identifying sufficient standards of assessment and testing. The report concludes with a summary section which provides an overview of the main findings, observations of key points or issues arising and recommendations.

3 South Africa Education System

Section 3 contextualises the South African education system by providing an outline of key developments and changes that have occurred since 1994. This is intended to offer a greater understanding of the progress that has been made in the country by providing broader discussions of the education system as a whole and illustrating how changes have evolved. In turn it is anticipated that this will illustrate the impact of change on the evolution of the NSC. The post-1994 period encompasses a period of great social, cultural and political reform, reflected in the changes taking place not only within the education sector but also throughout South Africa as a whole.

In addition, this section outlines the key stages of NSC development, identifying the fundamental features of the qualification, referring where relevant to appropriate documents and policies. This logically leads into more in-depth discussion and analysis of NSC subjects in section 4.

In turn this section also considers the perspectives of key players in the development, application and interpretation of the NSC. Key stakeholders include the Department of Basic Education, Umalusi, Higher Education South Africa and the Independent Examinations Board. To conclude, there is a brief outline of the education system in England, Wales and Northern Ireland.

3.1 Overview of the South Africa Education System

Since the first democratic elections were held in South Africa 1994, there has been widespread reform in the South African education system. In 1995, legislation was passed for the compulsory education of all children between the ages of seven and fifteen. Previously, a variety of institutions divided along racial lines dealt with the administration of education; this practice ended in 1996 when all state-run school-leaving examinations were provincialised.

During 1995 the South African Qualifications Authority (SAQA) supervised the development and implementation of a National Qualifications Framework (NQF) comprising eight levels. The National Senior Certificate sits at level four of the NQF incorporating the examinations written at the end of Grade 12. Post-school certificates, diplomas, degrees and research are represented by NQF levels five to eight respectively. However, the organisation of the NQF is expected to change to incorporate ten levels under the new NQF dispensation.

Prior to 2008 the provincial educational departments were responsible for administering and developing educational policy. From 2008 onwards the national department assumed overall responsibility for the administration of the development of all education policy.

3.2 The South African Schooling System

Formal school education in South Africa can be referred to through the organisation of the following stages:

- General Education and Training from Grades R to 9
- Further Education and Training from Grades 10 to 12

3.2.1 General Education and Training

General Education and Training (GET) broadly consists of the following stages:

- Foundation phase Grades R to 3
- Intermediate phase Grades 4 to 6
- Senior phase Grades 7 to 9

The GET curriculum is viewed and delivered in relation to eight Learning Areas (LAs). Although the core syllabi are determined by the Minister of Education, the nine provincial authorities are able to adapt the subject syllabi on the proviso that no content is omitted. The eight LAs are as follows:

- Two official languages, one of which must be English or Afrikaans
- Mathematics
- Social Sciences
- Natural Sciences
- Arts and Culture
- Economic Management Sciences
- Technology
- Life Orientation

The GET band incorporates the Reception Grade; during the creation of the curriculum it was originally intended that primary schools would include the provision of the Reception Grade. Under the Early Childhood Development scheme, an additional year of pre-primary education has been gradually phased in. Pre-primary schooling now operates for children from 3 years of age on a voluntary basis, but not as part of the national system.

However, in practice the delivery of the Reception Grade is not delivered by the primary schools, and as a consequence primary schools start at Grade 1 of the curriculum. As a direct result of this primary schools run from Grades 1 to 7, meaning that in practice the Senior phase of the GET band overlaps school attendance at both primary and high school.

During the Foundation Phase, the medium of instruction is the child's first language, though from Intermediate Phase Grades 4 – 6 onwards the vast majority of students are taught in either English or Afrikaans.

Foundation Phase

During the Foundation phase the Learning Areas are delivered through three main learning programmes:

- Numeracy (effectively covering mathematics)
- Literacy (effectively covering language) and
- Life Skills (incorporating all other LAs)

Intermediate Phase

At the Intermediate stage of GET the LAs must be delivered through the provision of a minimum of five learning programmes. Language and Mathematics are required to be

delivered as distinct programmes, whilst schools are permitted to organise the combination of other LAs as they deem appropriate. By the Senior phase there are eight separate learning programmes delivered.

The Senior Phase

The General Education and Training band finishes at Grade 9, at which point students will select their subject options for study during the FET stage. In many schools the process of preparing students for the selection of the FET subjects they intend to study begins during Grade 8. This process often uses Grade 7 reports and/or the results of base line assessment to inform the choices.

3.2.2 Further Education and Training

Further Education and Training (FET) comprises Grades 10, 11 and 12, during which students prepare for the NSC qualification examinations at Grade 12.

3.2.3 The Senior Certificate

Prior to the introduction of the NSC, the Senior Certificate represented the senior secondary exit qualification in South Africa. Pre-reform Senior Certificate grades were split into:

- Higher Grade
- Standard Grade
- Lower Grade, and
- N3 levels

Students generally took six or seven subjects which they elected to study at Higher, Standard or Lower Grade in the Senior Certificate. On completion of Grade 12, students sat for the Senior Certificate examination. The Senior Certificate examinations were divided into six subject areas, and were chosen from the areas identified in the following table.

Senior Certificate Subject options		
Group	**Subjects**	**Grade Level**
A	First and second selected languages (selected from the 11 official languages)	Higher or Standard
B	Mathematics	
C	Natural sciences (physical science, biology or physiology)	
D	Third language, including second language over and above the requirements of Group A	
E	Human sciences (biblical studies, economics, geography, history or Jewish studies)	
F	Accounting, additional mathematics, agricultural science, animal husbandry, art, business economics, computer studies, dance, geography (if not taken in Group E), home economics, speech and drama, technical drawing and technika (four divisions)	**Higher or Standard** (plus subjects only at Standard)

*A minimum aggregate of 720 marks was required for the former Senior Certificate.

In 2006 the Senior Certificate was phased out at Grade 10 level and the NCS was introduced. Subsequently students sat the new NSC for the first time in 2008 representing the culmination of a three year qualification, coinciding with the first year of National Senior Certificate examinations. The NSC is presented comprehensively further into this section of the report, following discussions of the development of the National Curriculum Statements and the subsequent introduction of the NSC.

3.2.4 Matriculation Endorsement

Until 1992, each education authority ran its own system and awarded its own senior or school-leaving certificate but had to adhere to the minimum university admission requirements determined by the Joint Matriculation Board (JMB). The JMB represented the admission interests of the South African universities and conducted the Matriculation examination on their behalf. Candidates from other examining authorities who satisfied the JMB requirements were awarded matriculation exemption endorsements.

The South African Certification Council replaced the JMB as the national certification body in 1992 and the Matriculation Board of the statutory Committee of University Principals, also known as the South African Universities Vice Chancellors Association (SAUVCA) and since 2005 administered by Higher Education South Africa. As from 1992 this body assumed the responsibility for advising the Minister of Education on minimum university entrance requirements. Consequently, the Matriculation Certificate ceased to exist and the Senior Certificate was awarded with or without Matriculation endorsement. In addition, alternative admission onto Higher Education programmes from that point could also be granted through the presentation of a certificate of exemption from the endorsement requirements.

3.3 The National Curriculum Statement Development process

The period of 1998 to 2005 heralded a drive to improve the provision and delivery of education from Grades R to Grades 9, lead by the national department and cascaded via the provincial departments. This included the introduction of Curriculum 2005 in 1998 which embraced an outcomes-based education approach that was highly transformational. The adoption of this outcomes-based approach has been viewed as a counter-reaction to the manner in which the education and examination system had previously been organised. The move towards learning outcomes is seen to counter the previous tendencies towards 'teacher-input practices' in the sense that curriculum changes now regard the teacher's role as one that facilitates the learner through his/her learning process.

Curriculum 2005 was reviewed in 2000 due to widespread concerns that the curriculum needed to be strengthened by streamlining its design features, simplifying its language, aligning curriculum and assessment, and improving teacher orientation and training, learner support materials and provincial support. It was decided that the number of design features in Curriculum 2005 should be reduced from eight to three, providing an emphasis on a number of underpinning features incorporating:

1. Critical outcomes and developmental outcomes
2. Reference and application of learning outcomes
3. Utilisation of grade-specific assessment standards

As part of these fundamental changes it has also been the intention to view each component in the context of how they relate in collocation with the other features. The critical and developmental outcomes inform the construction of the learning outcomes; the learning outcomes highlight key learning areas; assessment standards identify tangible levels of achievement, based on knowledge, skills and values. The revised Curriculum 2005 known as the Revised National Curriculum Statement (RNCS) was published in 2002.

The introduction of the National Curriculum Statement at Grade 10 in 2006 was the first concrete stage towards the phasing in of the NSC, and the consequent phasing out of Matriculation (Senior Certificate). The 2006 cohort of Grade 10 students became the first group to undertake the NSC through Grade 10 in 2006, Grade 11 in 2007 and culminating finally in 2008 with the Grade 12 final examinations. Completion of Grade 12 leads to matriculation and the issuance of the NSC to successful candidates; study from Grades 10 to 12 represents a full cycle of NSC study, from entry to completion.

In 2006 the practice of applying the competence descriptors which appeared in the initial NCS Curriculum Statement 2003, was terminated. The National Protocol for Assessment (NPA) was gazetted in 2005 and it stipulated that recording and reporting should take place against 7 levels of competence – this made the 6 level competence descriptors in the NCS invalid.

The Subject Assessment Guidelines (SAGs) for each subject were also developed in 2005 in preparation for the implementation of the NCS in 2006. At this time, the focus within education returned to the delivery of the Revised National Curriculum from Grade R up to Grade 9. It was acknowledged that improved curriculum guidance was necessary following

feedback that suggested that the curriculum was vague on specific content detail, required greater clarity, and lacked sufficient depth and breadth during the Foundation and Intermediate phases of education.

Attention centred on consultation and developmental work to address these concerns. Whilst the initial focus emphasised the state of foundation and intermediate education, these concerns also entailed implications for the senior phase of education. This was particularly pertinent to the links between intermediate and senior education, specifically at the cross-over of Grade 9, to Grade 10. A number of policy documents relating to GET were completed in this time, including most notably the publication of the "The Teacher Guide for the Development of Learning Programmes and Learning Area Assessment Guidelines".

Recognition was also made of the need to address the following areas:

1. Assessment protocol: standardised guidance towards assessment and associated values; this lead to the development and publication of Learning Programme Guidelines (LPGs) providing explicit indications of the curriculum content, outlining what should be taught and learnt;
2. Subject Assessment Guidelines (SAGs); in addition to this the national department published examination syllabi which outlined the subject areas to be tested, although this would not necessarily cover the whole curriculum content; i.e. what will be examined - this was not necessary everything stipulated in the curriculum content;
3. Challenges presented by policy and the reality of delivery

Once the National Protocol for Assessment was gazetted in 2005 the LPGs and SAGs were developed for FET and the NCS. The LPGs addressed the needs identified, focusing on teacher education and provision, addressing 'how' the curriculum could be satisfactorily delivered and reviewing the teaching processes and framework. In addition, Learning Area Guidelines (LAGs) and SAGs described exactly how assessment was to be conducted. This information includes the number and nature of portfolio pieces comprising the School Based Assessment and the nature of external assessment at the two exit points of Grade 9 and Grade 12.

In addition to the ongoing development work, the provincial departments undertook a challenging 'tour of the provinces' to promote and encourage a more consistent and streamlined application of the National Curriculum. The tour addressed curriculum delivery from Grade R to 12, promoted the NPA, the LPGs, LAGs and SAGs.

3.4 The Implementation of the National Curriculum Statement

The National Curriculum Statement is passed as national education policy by legislation within South Africa and dictates the Assessment Standards that must be achieved for each grade in all schools. The NPA, which is policy for all schools, provides a broad framework for recording and reporting assessment across all schools. However the Subject Assessment Guidelines are not passed by law and this allows the IEB to have its own assessment approaches to the NCS within the framework of national policy. This includes an assessment syllabus for Grade 12 which describes precisely what students must know and be able to do to succeed at Grade 12 level in the IEB. The LPGs are also not policy so independent

schools that write the IEB examinations are able to develop their own teaching and learning programmes to the policy frameworks of the NCS and NPA.

3.4.1 The NCS Key Documentation – Learning Programme Guidelines (LPGs)

These documents are issued by the national department for each individual subject and provide guidance for teachers; they address the organisation and delivery of subject specific plans for each of the three years of NSC study, namely Grades 10, 11 and 12. They incorporate the use of work schedules/year plans, and aim to facilitate the integration, sequencing and pace of delivery of subject content across each Grade year. Consequently, teachers are provided with a framework within which to construct their year planners and deliver the national curriculum.

3.4.2 The NCS Key Documentation – Subject Assessment Guidelines (SAGs)

Subject Assessment Guidelines (SAGs) are provided by both the national department and the IEB; the two sets of SAGs differ in the sense that they both reflect the different approaches to assessing the NSC adopted by the respective examination systems.

IEB SAGs contain an assessment syllabus for Grade 12, providing guidance on the subject content that is required by the Assessment Standards. The assessment syllabus describes what candidates must know and demonstrate an ability to do in order to meet the demands of the NCS as viewed through the IEB approach to testing the NCS demands. In addition the IEB SAGs focus solely on assessment during Grade 12, the final year of study and exit point for the NSC qualification. By contrast, the national department SAGs incorporates requirements at Grades 10 and 11 too.

Some IEB SAGs also include advice for recommended practice that will help ensure success at Grade 12. The national department and IEB SAGs also differ in their descriptions of the portfolio tasks, requirements for school-based assessment, explanations and details of the number of pages, the nature of the papers, weighting of the learning outcomes and cognitive levels.

There is , however, broad comparability in the organisation and presentation of content and materials in the respective SAGs, even if the detail contained in the respective SAGs is indicative of the differing IEB and national department approaches. Both sets of SAGs provide detailed descriptions of external assessment requirements for Grade 12 and the school-based assessment requirements for Grade 12. Assessment requirements may differ between the national department and the IEB. However, the number of formal tasks and/or portfolio pieces required at Grade 12 to demonstrate evidence of competence are the same.

In summary, the national department SAGs outline detailed guidance relating to assessment at Grades 10 and 11 and external assessment at Grade 12. The IEB SAGs focus on the assessment requirements at Grade 12, the exit point for all NSC candidates.

3.4.3 Languages and the National Curriculum Statement

South Africa is a linguistically diverse nation evidenced by the status of eleven officially recognised languages which are in turn acknowledged in the National Curriculum and by the National Senior Certificate. The multitudinous presence of languages points also to the rich socio-cultural tapestry that characterises the South African nation.

There is a rich social, cultural and linguistic diversity in South Africa reflected through the recognition of 11 official languages. These are:

- English
- Afrikaans
- isiNdebele
- Sepedi
- SeSotho
- SiSwati
- Xitsonga
- Setswana
- Tshivenda
- isiXhosa
- isiZulu

Of these languages, isiXhosa and isiZulu are are the largest indigenous language groups. In theory, any official language may be used in the delivery of teaching, and this is most commonly the case in the first four grades of schooling. Currently the medium of instruction in the majority of classrooms in South Africa is either English or Afrikaans.

Language provision is highly prominent throughout the National Curriculum, evident at all stages of educational provision. These understandably entail some logistical concerns for the satisfactory and equal provision of educational standards across the whole country in all languages. Provision for language is required as follows:

- Grades R, 1 – the learning experience is conducted in the mother tongue; in practice, for most students this would be an indigenous language rather than a language of learning and teaching (LOLT), which are English or Afrikaans
- Grade 2 – a second language is introduced to the learning; one of these two languages must be English or Afrikaans, in other words a LOLT, one of the languages of learning and teaching
- From Grade 4 onwards, a minimum of two official languages must be covered – one of which must be a LOLT

In addition to the requirements above, a third language may also be added to the learning process. The language may be introduced at any level of learning, dependent on the school's choice and ability to deliver the specific language.

3.4.4 Education Pre-Grade 10

Grade 9 represents the negotiation of the first major stage in the education system, culminating in the General Education and Training Certificate (GETC). In practice, the influence of social and cultural attitudes means that students are largely discouraged from leaving formal education at this stage. Historical associations dating back to the former apartheid era persist, whereby those students remaining in full-time education until senior exit qualifications were perceived to enjoy a prestigious and privileged education; the

influence of this attitude still prevails, and seems representative of widely-held educational aspirations.

The major concern that currently dominates discussion is the relationship between Grade 9 and the cross-over to NSC at Grade 10. Essentially, this is viewed as a crucial transition point in the educational development of students in South Africa. Empirical and anecdotal evidence suggests there are issues surrounding the consistency of curriculum coverage up to Grade 9. Consequently, not all students cover the prerequisite areas of study necessary to embark upon NSC study at Grade 10. In response the national department is currently reviewing the implementation of the RNCS and NCS to address, amongst other things, the coherence of the curriculum from Grade R – 12 in terms of what students must learn. Central to this review is consideration of the precise standards required at each grade; this needs not only to reflect the achievement of learning outcomes but also requires a clearer expression of the necessary curriculum content.

3.5 The National Senior Certificate

3.5.1 Subject Areas

Learning field	Subjects	
Communication & language studies	Afrikaans English IsiNdebele IsiXhosa IsiZulu Sepedi	Sesotho Setswana SiSwati Tshivenda Xitsonga Other non-official languages
Agricultural science	Agricultural management practices Agricultural sciences	Agricultural Technology
Business, commerce and management studies	Accounting Business studies	Economics
Arts and culture	Dance studies Design Dramatic Arts	Music Visual Arts
Human and social studies	Geography History	Life orientation Religious studies
Manufacturing, Engineering and technology	Civil Technology Electrical Technology	Engineering Graphics & Design Mechanical Technology
Physical, mathematical, computer and life sciences	Computer Applications Technology Information Technology Life sciences	Mathematical Literacy Mathematics Physical sciences
Services	Consumer studies Hospitality studies	Tourism

The new curriculum for the Further Education and Training Phase has reduced the number of subjects from approximately 150 to those subjects listed in the table above. All NSC subjects that are offered are at the same level and correspond more or less with the former Higher Grade level (subjects in the previous system were tiered into Higher and Standard Grade). NSC subjects are grouped into eight learning fields as represented in the table opposite.

3.5.2 NSC Grade Reporting System

In the NCS of 2003, six levels with associated level descriptors were presented, although these were subsequently revised in 2005. The achievement of these levels of performance articulates with a taxonomy of cognitive ability which is described in both the national department and IEB SAGs, although in slightly differing ways. In addition to this, the taxonomies used by the various subjects differ, with Life Sciences using a six level taxonomy based on Bloom's, whilst Mathematics applies four levels based on the Programme for International Student Assessment (PISA) and the Trends in International Mathematics and Science Study (TIMSS) process of evaluation.

According to the taxonomy of cognitive ability, a series of cognitive skills are expressed and highlighted by differing candidate performances viewed in terms of simple and complex cognitive abilities. In the table below, a notional order of the cognitive skills is presented, and linked to the performances typical of each NSC grading level. Although this table is largely simplistic in content, it serves to highlight the organisation of simple cognitive skills, through subject knowledge, comprehension and application of subject knowledge, typical of levels 2, 3 and 4; higher level cognitive skills are viewed through a candidate's ability to analyse, synthesise and evaluate information, and characterise with increasing evidence of competence and ease the performances at levels 5, 6 and 7. In turn this table also reflects the notional sense of progression through the different level bands, with the implication that at subsequently higher levels candidates will be expected to display a satisfactory level of competence of the skills associated with those levels below.

Thus, a candidate awarded a level 7 will satisfactorily demonstrate clear subject knowledge, understanding of that knowledge and an ability to apply the knowledge in a variety of different contexts, both simple and complex. In addition, a level 7 candidate will in turn demonstrate higher order thinking skills of analysis, synthesis and evaluation of subject knowledge to more complex contexts.

In both the national department and IEB SAGs a taxonomy of cognitive ability must be used when designing assessments. The assessments have to be set to a prescribed weighting of these levels. As a consequence a candidate will not be awarded the highest grade attainable, the level 7, without demonstrating an ability to operate competently and comfortably across each of the cognitive levels. At the opposite end of the scale, candidates awarded a level 2 score typify performances that are predominantly limited to the recall of fundamental subject knowledge and facts, evidenced through the completion of routine tasks.

In summary, this focus on and application of cognitive skills in relation to candidate examination performances represents a distinct shift from the approaches adopted under the Senior Certificate whereby content mastery was regarded as the primary indicator, and hence distinguishing feature, of candidate competence.

Rating band	Rating band title	Skill
7	outstanding achievement	Evaluation
6	meritorious achievement	Synthesis
5	substantial achievement	Analysis
4	adequate achievement	Application
3	moderate achievement	Comprehension
2	elementary achievement	Knowledge
1	not achieved	

* source: IEB English Home Language Exemplar paper 1 Analysis Grids 2008

3.5.3 National Senior Certificate Assessment

Assessment of the NSC takes place in Grade 12 where student performances in examinations during this year contribute to their final NSC score. Assessment in all NSC subjects, with the notable exception of Life Orientation, is typically organised as per the table opposite.

National Senior Certificate Assessment Format		
Assessment	**Final Grade %**	**Test requirements**
Internal (School-based assessment)	25%	7 tasks • 2 tests • 2 examinations • 3 other formats permitted
External	75%	• Written examinations (marked provincially) * • Performance Assessment Tasks (in certain subjects carry 25% of the overall final grade)

* the IEB examination papers are marked centrally at a national marking centre

3.5.4 Performance Assessment Tasks

Internal assessment is referred to as school based assessment. The table above indicates that school-based assessment comprises 25% of the final mark. In most subjects the examination comprises the remaining 75%, but for certain subjects of a more practical leaning, for example Tourism, Information Technology, Engineering Graphics and Design, there are Practical Assessment Tasks, or PATs. These usually account for 25% of the final marks and thus in these instances the final examinations contribute 50% of the final grade.

These cover a variety of activities that candidates complete at their schools during the final year of the NSC, Grade 12. They allow the teacher to directly and systematically observe actual learner applied competence. According to the national department, Practical Assessment Tasks must be:

- Set tasks with no scope for deviance
- Administered at school level
- Teacher assessed, with grades forwarded to the marking centres for ‘capturing’

Task format varies with some tasks lasting up to seven hours, whilst other tasks may be conducted over a period of months. In this respect the PAT incorporates the features typical of continuous assessment. Since Practical Assessment Tasks are an integral part of the

SAGs, the IEB and the national department each contain their own design and delivery requirements for PATs, reflecting some similarities but also some clear definite differences between the two examinations.

3.5.5 National Senior Certificate Requirements

In order to qualify for the NSC, candidates must meet the following requirements:

1. They must study the requisite combination of subjects; i.e.
   - One official language at Home Language level
   - Another official language at First Additional or Home Language level
   - Life Orientation
   - Mathematics or Mathematical Literacy
   - Three further elective subjects

2. Three subjects must score at least 40%, rating band 3; this must include:
   - Home Language

3. No other subjects are specified for a pass; three subjects must score at least 30%, rating band 2;

4. Languages:
   - Candidates may include a maximum of two additional languages at Second Additional Language level
   - Candidates may not study more than one language from the two broad groups, namely isiXhosa, isiZulu, SiSwati, and isiNdebele, and Sepedi, Sesotho and Setswana
   - Candidates may not offer Computer Applications Technology and Information Technology together
   - Candidates may not offer Consumer Studies and Hospitality Studies together
   - Candidates may offer more than the minimum number of 7 subjects;
   - There is a language concession for immigrant students

3.5.6 Pass Grade Requirements

The following section outlines the general requirements for passing the NSC, followed by supplementary requirements that may be expected for admission onto Higher Certificate study, entry to Diploma study and finally access to Degree programmes.

1. In order to pass the NSC, a learner must pass:
   - One official language at home language level at 40%
   - Two other subjects at 40%
   - Three subjects at 30%

NB. the following are applicable under point three where reference is made to Higher Education.

2. In order to pass the NSC with entry to Higher Certificate study

2.1 A learner must:

- Pass the NSC (see 3.5.6 (1))
- Meet the language requirement for further study at a South African institution

2.2 Language requirement for entry to further study

- One of the two official languages offered by the learner must be either English or Afrikaans. To meet the language criterion to qualify for entry to study at a tertiary education institution, the learner must pass the official language at the 1st additional level i.e. at 30% or more.

NB: Specific institutional and programme needs may have a specific language requirement or require appropriate combinations of recognised National Senior Certificate subjects and levels of achievement. They also have their own Admission Points Score allocations. Learners must check their results against specific institutional requirements for the course of study they wish to follow.

3. In order to pass the NSC with entry to Diploma study

3.1 A learner must pass:

- One official language at home language level at 40%
- Three other subjects at 40% ; Life Orientation does not qualify for this provision
- Two subjects at 30%; Life Orientation could be one of these two subjects.
- Meet the language requirement for further study at a South African institution (see 2.2)

4. To pass the NSC with entry to Degree studies

4.1 A learner must pass:

- One official language at home language level at 40% or more
- Four subjects from the designated list at 50% or more
- Two subjects at a minimum of 30%
- Meet the language requirement for further study at a South African institution (see 2.2)

4.2. The list of designated subjects which will be in place for three years from 2008 is as follows:

Accounting	Economics
Agricultural Sciences	Engineering Graphics and Design
Business Studies	Geography
Dramatic Arts	History

Consumer Studies

Information Technology

Languages (one language of learning and teaching at a higher education institution and two other recognised language subjects)

Life Sciences

Mathematics

Mathematical Literacy

Music

Physical Sciences

Religion Studies

Visual Arts

NB In respect of Music, it is only the National Senior Certificate Music course that is considered a designated subject. Other music courses (e.g. UNISA Music) are recognised as NSC subjects but are not considered to be 'designated' for the purpose of qualification for degree studies.

3.6 The Examinations Boards

All educational authorities awarding the NSC come under the control of the General and Further Education and Training Qualifications Authority Council known as Umalusi, which acts as the agency for examination standards and quality assurance. In this respect, all examining bodies have the same standing if they are approved by Umalusi. From 2008, the National Curriculum Statement examining boards may develop their own Subject Assessment Guidelines but schools must adhere to the curriculum requirements in their provisioning. The provincial authorities must abide by the Subject Assessment Guidelines issued by the national department.

3.6.1 The Independent Examinations Board

The Independent Examinations Board (IEB) was established in 1993 and was the only independent examining body until 1998. The IEB took over the examining function of the former Joint Matriculation Board in 1993 which was the only authority assessing along non-racial lines. The IEB deals predominantly with the independent schools market, including the post-colonial independent English private schools. However, not all independent schools write the IEB papers: indeed some write the DoBE NSC papers.

Approximately 8,000 students from 160 schools write the IEB examinations, in comparison with the 580,000 students who write the national department NSC examinations. Comparisons of pass grades are clearly more favourable amongst those students who sit the IEB papers, where some 97% of candidates achieve pass grades. By contrast, approximately 60% of candidates sitting the DoBE examinations achieve pass grades. All IEB schools are accredited by Umalusi.

The IEB and the national department, including the nine provincial authorities, enjoy a mutually positive relationship where the links between both parties are viewed to facilitate not only approaches to best practice but also lead to improving the status and successful delivery of the NSC. Thus, the relationship appears to be mutually beneficial, and mutually reliant. Both the national department and the IEB adopt their own idiosyncratic approaches

to assessing the NSC, and the endorsement of Umalusi guarantees that both sets of examinations satisfactorily prepare and test students in compliance with the National Curriculum Statement requirements. The principle concern for Umalusi is to ensure that all papers at appropriate cognitive levels meet the curriculum requirements to the appropriate standards.

In this study the requirements of the National Curriculum Statements are taken directly from the gazetted policy documents with substantial information sourced from the NCS Subject Statements. With regard to the NSC assessment processes, preparatory and informational materials, including references to SAGs and examination materials have been sourced directly from the IEB. It should be noted that Learning Programme Guidelines (LPGs) have been developed by the national department; however, with regard to the IEB, no LPG materials have been published. This allows the schools and teachers that prepare for IEB examinations to develop a learning programme that they believe to be most appropriate, suitable and beneficial.

3.7 Umalusi

The Umalusi Council is responsible for setting and monitoring standards for general and further education and training in South Africa in accordance with the General and Further Education and Training Quality Assurance Act, 2001; the Umalusi Council is appointed by the Minister of Basic Education to ensure the appropriate enactment of this mandate.

This responsibility encompasses the certification of qualifications, including the new National Senior Certificate. In addition, Umalusi also certifies the Senior Certificate, which is due to be phased out for part-time repeaters by 2011, the National Certificate Vocational, the National Senior Certificate (Vocational) and the General Education and Training Certificate focused on adult learning (GETC Adult).

Umalusi:

- Evaluates qualifications and curricula to ensure that they are of the expected standard
- Moderates assessment to ensure that it is fair, valid and reliable
- Conducts research to ensure educational quality
- Accredits educational and assessment providers
- Approves the final results and issues certificates
- Verifies the authenticity of certificates

3.7.1 Umalusi - Organisational Structure

Umalusi's operations are streamed through four distinct units that are overseen by the Chief Operating Officer. These are:

1. Evaluation and Accreditation (E&A)

This unit is responsible for the accreditation of independent schools, as well as the accreditation of examination bodies that examine school qualifications. Thus, Umalusi provides quality assurance of the IEB NSC examinations.

2. Qualifications, Certification and Curriculum (QCC)

This area of Umalusi is responsible for the development of new qualifications and the evaluation of existing qualifications and curricula, as well as for the certification of all school qualifications.

3. Quality Assurance of Assessment (QAA)

This department has detailed systems for quality assuring all aspects of assessment leading to qualifications.

4. Statistical Information and Research (SIR)

This section conducts and commissions research in strategic areas in education and generates research and other reports of national interest.

3.7.2 Umalusi and Schools

One of the key areas in which Umalusi's presence is most noticeably felt is through its provision of quality assurance of educational delivery at the schools. Thus, Umalusi has direct responsibility for over 28,000 state schools and in approximately 2,000 private schools that operate within South Africa. Assurances are guaranteed in a number of differing areas within the schools. Firstly, Umalusi ensures that the quality of assessment in both NSC internal assessment and examinations can be guaranteed and is delivered to the requisite levels, as expressed through the national department's National Curriculum Statement. In addition to this work, Umalusi also monitors and evaluates the quality of the qualification and curriculum provision provided by schools. Finally, Umalusi also directly accredits independent schools. Thus, the role of the quality assurance agency is not only one which oversees and ensures standards, but it is also regarded to be an active and positive agent for progress through the improvement of standards within independent South African schools. Umalusi accredits independent schools while state schools are quality assured by the provincial departments.

In addition to the work that directly impacts on the delivery and assurances of standards in the NSC, Umalusi also oversees both public and private Further Education and Training colleges, the main providers of vocational qualifications in South Africa. Once again this work addresses standards and quality assurance in assessment, the monitoring and evaluation of qualifications and curricula provision, and the accreditation of private FET colleges.

3.7.3 Umalusi and Assessment Bodies

Quality assurance of centralised, national assessment is a substantial component of Umalusi's quality assurance regime. To ensure that assessment is of the required standard Umalusi accredits private assessment bodies and monitors the standards of assessment in the public assessment system of the qualifications it certifies.

Accredited private assessment bodies and the public assessment system are monitored annually for maintenance of standards and improvements. The processes of accreditation and monitoring are guided by a suite of policy documents that contain criteria for accreditation and monitoring. This includes annual reports on the quality of assessment for the National Senior Certificate, as well as the NSC Vocational, the National Certificate Vocational and the GETC for adults.

3.7.4 Umalusi and Accreditation

Umalusi accredits private providers of education and training as well as private assessment bodies. Thus, Umalusi accredits independent schools, private further education and training colleges (FET Colleges), private adult education and training providers and other private assessment bodies that assess the qualifications Umalusi certifies. Umalusi does not accredit public educational providers; regarding public institutions Umalusi monitors and reports on the quality of the qualifications and curricula used and externally monitors the national assessment system.

3.7.5 Quality Assurance and Assessment

Umalusi ensures that the assessments conducted by both the public system and private assessment bodies are administered effectively and efficiently. It also determines that assessment products are of the expected standard and assessment processes are fair, valid and reliable. This is achieved through the evaluation and accreditation of private assessment bodies, and through the monitoring and reporting of the public assessment system. In addition Umalusi conducts an 'Annual Quality Assurance Regime'. This also incorporates how systems have been developed and potentially outlines how they may be improved; the annual examinations are monitored; external moderation, marking and continuous assessment. Finally Umalusi plays a central role in the 'standardisation' process associated with the assessment outcomes.

3.7.6 Quality Assurance at Grades 10 and 11

Examinations at Grades 10 and 11 are set by schools; in some provinces they are set at district or provincial level. Whilst these examinations do not contribute directly to the composition of the final NSC rating band and score, the end of year tests nonetheless act as a device for determining the promotion of candidates into the next year of study. Recent changes in the approach to testing within the state schools sector has seen the development of district as opposed to provincially set examinations. The national department does set exemplar papers from time to time.

The process of moderation overall involves the roles of panels comprising national department and IEB staff who internally moderate their papers prior to further 'assessment' by Umalusi external subject experts. Their role is to determine the standard and rigour of each paper; when the papers are 'approved', they are then signed off, ready to be distributed to the provinces where the local departments organise the running of the examinations. Post-examination moderation and quality assurance then occurs through moderation of the examination marking and the establishment of the standardisation process. This process is conducted by Umalusi for Grade 12 only.

3.7.7 Umalusi Research

Umalusi has conducted substantial research which has sought to provide a greater understanding of the NSC qualification by analysing it in a variety of different contexts from a variety of perspectives. Consequently the NSC has been viewed in relation to international counterparts; it has been placed in comparison with the Senior Certificate; the Senior Certificate has also been reviewed in relation to four qualifications from other African education systems. This study compared the Senior Certificate to the curricula of other African systems, namely from Zambia, Kenya, Malawi, and Botswana. In addition to this

work, studies have also investigated the NSC in terms of the quality assurance of the national examination and its assessment.

Thus, it is clear that Umalusi adopts a thorough approach to assuring that curriculum standards are upheld, whilst also producing work that augments understanding of the NSC as a qualification within and outside of South Africa. The study which analysed the relationship between the NSC and the Senior Certificate exemplifies how Umalusi intends to improve understanding of the NSC in relation to the previous examination system. Indeed, the "2008 Maintaining Standards" report explored the relationships between the NSC and Cambridge International qualifications, the International Baccalaureate and the Namibian Senior Secondary Certificate. This provided an overview of comparisons, curriculum evaluation and examination paper analysis. The curriculum evaluation examined the depth and breadth of curriculum content, whilst the examination analysis referred to the cognitive levels for testing, in effect to determine the 'standard' required of the subject examinations.

The comparison work was conducted by teams comprising curriculum experts, academics, Umalusi moderators and teaching professionals. The reports considered Higher Education South Africa's needs and admissions requirements, and sought to determine the credit-worthiness of the NSC. The comparison with international qualifications was felt to improve the understanding of the NSC. The report broadly concluded that the qualifications demonstrated a similar coverage of subject specifications.

3.8 Higher Education South Africa

Higher Education South Africa (HESA) was formed on 9 May 2005, as the successor to the two statutory representative organisations for universities and technikons, now referred to as 'universities of technology', the South African Universities Vice-Chancellors Association (SAUVCA), statutorily referred to as the Committee of University Principals (CUP) and the Committee of Technikon Principals (CTP). The launch of HESA was in part driven by the restructuring of the higher education sector, which resulted in the establishment of new institutional types, but also by the need for a strong, unified body of leadership. HESA represents all 23 public universities and universities of technology in South Africa; the 23 institutions comprise eleven Universities, six Comprehensives, and six Universities of Technology.

SAUVCA was established as a statutory body for the 21 public universities in South Africa by the Universities Act (Act 61 of 1955). As a statutory body, it made recommendations to the Minister and Director-General of Education on matters referred to it or alternatively on any other issues, which it deemed important for universities. The CTP was a national higher education association established in 1967 in terms of the Advanced Technical Education Act (No. 40 of 1967). It comprised the rectors, principals and Vice-Chancellors of technikons in South Africa.

Higher Education South Africa states its mission and therefore mandate is to "be the unified body of leadership in a transforming, dynamic and diverse system of higher education". One of HESA's primary goals is to strengthen the interface between schools and the FET College sectors. It states on its website that the imperative is partly to widen access and participation in higher education, whilst at the same time facing and responding to the challenges and

opportunities brought about through the introduction of the NSC in 2008. In particular, this has a direct impact on admission standards and the related requirements placed on NSC Grade 12 students applying for entry onto Higher Education.

3.8.1 Admissions Requirements for Further Study

The NSC is designed to qualify holders for further study at first degree level, diploma and higher certificate level. The appropriate entry requirements are presented in the tables below.

For further study at Diploma Level	
1.	One official language at home language level must be passed at 40% or above
2.	Three other subjects must be passed at 40% or more (excluding Life Orientation)
3.	Two further subjects to be passed at 30% or more (1 of these may be Life Orientation)
4.	Meet the language requirement for further study at a South African institution; one of the two languages offered must be English or Afrikaans

For entry into further study at Bachelor Degree level	
1.	One official language at home language level to be passed at 40% or above
2.	Four subjects from the ***designated list of subjects*** at 50% or more*
3.	Two subjects at a minimum of 30%
4.	Meet the language requirement for further study at a South African institution; one of the two languages offered must be English or Afrikaans

The designated list of subjects is determined as follows:

- Accounting
- Agricultural Studies
- Business Studies
- Dramatic Arts
- Economics
- Engineering Graphics and Design
- Geography
- History
- Consumer Studies
- Information Technology
- Languages (one language of learning and teaching at a H.E. institution and two other recognise language subjects
- Life Sciences
- Mathematics
- Mathematical Literacy
- Music
- Physical Sciences
- Religion Studies
- Visual Arts

In 2005 a agreement was reached with regard to admission point scores for candidates entering higher education. The agreement was for Minimum Admission Requirements – different universities do have different methods for calculating the APS and these also differ depending on the qualification the student is applying for. The 2005 agreement also accounted for the possibility of institution- and/or faculty-specific guidelines and requirements for entry.

For example, HESA requires all Mathematics students to have sat papers 1 and 2 as prerequisite for entry into many universities' specific faculties. Mathematics paper 3 is optional given that in some schools, there is an issue with the adequate delivery of tuition for the Mathematics required at this level; this reflects one of the challenges in South Africa, namely the deficit of adequately qualified Mathematics teachers to provide appropriate tuition. This may be problematic for the benchmarking of Mathematics, since it is widely believed that the Mathematics paper 3 is necessarily included to represent the full and comprehensive coverage of the Mathematics curriculum; this is especially important when benchmarking the subject to international counterparts.
In this study, the IEB paper 3 is included in the analysis and comparison sections to reflect this assertion that papers 1, 2 and 3 represent a comprehensive coverage of the subject matter. At the time of compiling this report, it is understood that considerations are being made to incorporate the content of mathematics paper 3 into papers 1 and 2. However, it is not yet clear when this consideration is likely to become reality.

It has been noted that a number of Physics, Chemistry and Mathematics students will often sit foundation or bridging courses during their first year of undergraduate study; this is to ensure that any potential gaps in knowledge are covered. These tend to be the lower achieving students.

In 2007, approximately 85,000 Senior Certificate candidates met the minimum standards required for entry onto undergraduate bachelor degree courses. One year later, in 2008, the number of South African National Senior Certificate candidates that met the stipulations for HE entry had risen by roughly a quarter, to a total of 107,000 students. The statistics for the IEB demonstrate a consistency in those moving on to higher education; the IEB figures remained constant at 79% of the examination cohort from 2007 to 2008.

4 England, Wales, & Northern Ireland Education System

In England, Wales and Northern Ireland, secondary education lasts from the age of 11 to the minimum school-leaving age of 16, though many students continue to age 18. A common curriculum is followed leading to the GCSE examination at the age of 16 which is taken by the majority of pupils. Beyond the GCSE pupils may stay on at school for up to three years or transfer to a further education institution.

There are approximately 5,000 secondary schools in the state sector, comprising:

- Secondary schools for the age range 11 to 18
- Secondary schools catering only for the age range 11 to 16
- Middle schools with pupils moving on to senior secondary level at 12, 13 or 14

4.1.1 Examining Boards

Since 1998, there have been three major examining boards in England offering GCSE, A level and vocational qualifications. These were created following the merger of a number of pre-1998 bodies:

- OCR - composed of Oxford and Cambridge Examinations, RSA, UCLES, MEG
- AQA - composed of AEB, SEG, NEAB and City & Guilds
- Edexcel - composed of London Examinations and BTEC

4.1.2 GCSE

Students may follow courses leading to the GCSE examination in a variety of subject areas, including the introduction of vocationally-oriented courses in recent years. GCSE examinations assess the National Curriculum at Key Stage 4, which represents the two years leading up to the end of compulsory schooling. The National Curriculum was implemented for the core subjects of English, mathematics and science in September 1992 for first examination in 1994; both examination and Curriculum have been modified and adapted over time.

Each examining board designs its own GCSE syllabi, which must conform to criteria defined and monitored by the Qualifications and Curriculum Authority (QCA). The award of a grade is intended to show that a candidate has met the level of knowledge and skill defined in the criteria. GCSE assessment procedures may also include coursework. Credit is given for assignments set and marked by a teacher, which are then subject to external moderation before contributing to the final grade. The grade range available for a pass is A* - G, with A* as the highest possible grade and C the usual cut-off point for progression to A levels.

Tiered papers

‘Tiered' or 'differentiated' papers have been available in most subjects since September 1996. A foundation tier covers grades G to C, and a higher tier covers grades D to A*. Decisions about which paper to take are made towards the end of the GCSE course, and the two-grade overlap between tiers enables teachers to enter each pupil at the suitable level. No grades are awarded above or below the range of the tier. In mathematics there are three tiers of provision, covering grades G to D, E to B, and C to A*.

4.1.3 IGCSE

Some GCSE examining boards still set GCE O level examinations for students in countries overseas. Additionally, UCLES has produced an International GCSE (IGCSE), which largely follows the structure of the domestic GCSE but is set within an international context.

4.2 Options after Secondary Education

Further education (FE) covers all types of study undertaken after the completion of compulsory education. Courses can be studied at schools with 6th forms, separate 6th form colleges or further education colleges. Both academic and vocational courses are offered at this level.

There are over 500 state-maintained further education colleges, of which approximately 120 are former sixth form colleges which were maintained by a local education authority. Some colleges specialise, for example in agriculture, building or art, but the majority provide a wide range of courses.

4.2.1 GCE Advanced Level

The GCE Advanced Level, commonly known as A Level, has been offered in England, Wales and Northern Ireland since the 1950s. Prior to 2000, A Levels were single subject examinations taken by those who chose to continue an academic education beyond GCSE. Students normally sat examinations in three subjects. Since September 2000 students have been able to study A levels alongside the new Key Skills qualification or a vocational qualification.

4.2.2 Advanced Extension Award

Advanced Extension Awards (AEA) were introduced in 2002 in response to the Government report ‘Excellence in Cities’. The AEA aims to stretch the top 10% of A Level students by providing opportunities for them to demonstrate a greater depth of understanding than is permitted within the current A Level structure. The AEA is also intended to assist universities in their admissions procedures by differentiating between the most able candidates.

AEAs do not require any further teaching or additional content. They are designed to highlight the abilities of able students in critical thinking, analysis and creativity. AEAs are assessed through external examinations and are graded as merit or distinction.

4.2.3 International Baccalaureate

The International Baccalaureate (IB) is an internationally recognised two-year pre-university course and examination, broadly based across separate curriculum areas and designed to facilitate the global mobility of students and promote international understanding:

Candidates must study one subject from each of six subject groups. At least three subjects must be studied at higher level (HL), while the remainder of subjects are studied at subsidiary level (SL). The final diploma is graded from 1-7, with 7 as the highest mark and 4 as the pass mark. Single subjects can also be offered, with certificates issued upon successful completion.

The IB is becoming increasingly popular, both in terms of the number of schools and colleges in England that offer this course and also in terms of international students sitting

this award for university entrance. Consequently, in 2003 the QCA undertook a study which aimed to benchmark the IB within the English education system. The report found that in terms of the demands placed upon candidates at the subject level, IB and A Level examinations were broadly comparable. It also found that although the grading systems of the 2 awards were quite different, the standard of attainment required for a pass or a top mark was also broadly comparable.

4.3 GCE A Level

The A level courses have consisted of 2 parts since 2000: Advanced Subsidiary (AS) Level and Advanced (A2) Level. In the first year of the course students are able to take up to four or five subjects at Advanced Subsidiary (AS) level, receiving a qualification for each subject they pass. In the second year it is possible to continue studying three of these subjects in greater depth and if students successfully complete this second course, their AS-level mark will contribute to their final A level pass for that subject.

AS and A2 Levels are broken down into units, allowing greater flexibility by enabling students to be assessed in individual units as they progress through the course, rather than being assessed in a single final examination.

4.3.1 GCE A Level Developments, 2008

A number of key changes and developments have been made to the A Level, which came into effect in September 2008. This has included a reduction of units for some subjects, excluding music, sciences, mathematics and applied courses. It has also incorporated the introduction of ‘stretch and challenge’ at A2 to improve student preparation for higher education and employment.

Assessment has been altered, addressing criticisms that testing may have focused too much on factual knowledge and less on thinking and problem-solving skills. Changes include:

- A broader range of question types to assess a wide range of skills
- Some questions requiring extended answers to give students the opportunity to demonstrate the full breadth and depth of their knowledge and understanding
- Synoptic assessment that will test students’ understanding of the subject as a whole and their ability to make links between different areas of the subject

Content has not been changed significantly for the majority of subjects, but has been redistributed between fewer units. Teachers are now advised to encourage A2 students to develop their thinking and problem-solving skills, and to achieve a holistic understanding of the subject.

Developments have also included the introduction of a new A* grade at A2 Level only. This is to be awarded from 2010 to students who achieve both of the following:

- Overall A grade at A2 level

- 180 out of 200 on the Uniform Mark Scale (UMS)[1] for the combined score of both A2 units

4.3.2 The Extended Project

The extended project will be a separate qualification for A level students to add to their study programme. Students will be able to carry out a project on a topic of their own choosing, which may or may not be linked to their chosen A level subjects. The project will involve planning, research and evaluation, but the end product could be a dissertation, the findings of an investigation or field study, a performance or an artefact. Students will be encouraged to take the extended project as it will develop research and independent learning skills that will be of benefit to them when they progress to higher education and employment.

4.3.3 GCE Advanced Level in Applied Subjects

A new set of GCE A Levels has been developed in applied subjects and has been offered in schools and colleges since September 2005. They are intended to replace the Vocational Certificate of Education (VCE) A Levels. The new applied A Levels consist of AS and A2 Levels and are broken down into units, as follows:

- GCE AS-level - comprises 3 AS units
- GCE AS-level (double award) - comprises 6 AS units
- GCE A level - comprises 6 units (3 AS units plus 3 A2 units)
- GCE A Level (double award) - comprises 12 units (6 AS units plus 6 A2 units)

At present, the new A levels cover 10 broad areas of specialisation:

Applied art and design	Health and social care
Applied business	Leisure studies
Applied ICT	Media: communication & production
Applied science	Performing arts
Engineering	Travel and tourism

4.4 GCE A Level: Programme Design & Learning Outcomes

4.4.1 Revised A levels: Qualification and Subject Criteria

Following a review in 2005, draft qualification and subject criteria for A Levels were developed in collaboration with a variety of stakeholders. After a process of consultation, revision and accreditation the awarding bodies' specifications were available for first teaching from September 2008.

A Level Criteria

To control the quality and standard of AS and A Level qualifications, the regulators of external qualifications have established criteria for specification development by awarding

[1] A single unit of assessment will typically be worth 100 uniform mark scheme (UMS) marks, making a four-unit A level equal to 400 UMS marks and a six-unit A level equal to 600.

bodies. Specifications have to meet the developed criteria to be accredited. GCE AS and A Level qualification criteria set out the structure of these qualifications, their assessment and grading. For subjects offered by more than one awarding body, specific subject criteria are developed to ensure that there is comparability between specifications.

Subject criteria set out the essential knowledge, skills and understanding, and assessment objectives common to all AS and A Level specifications in a given subject. They provide the framework within which the awarding body creates the detail of the specification.

4.4.2 A Level Qualification Criteria

The following table provides the criteria to which all A levels must comply. It derives from the 'General Certificates of Education (GCEs)' section of *The statutory regulation of external qualifications* (QCA/04/1293).

GCE A Level Qualification Criteria	
The titles of GCEs must:	
1.	Correspond to the titles used in the relevant subject criteria published by the regulatory authorities, where such criteria exist
2.	Be sufficiently broad to cover different specifications in the same subject area, if relevant subject criteria are not published by the regulatory authorities
The subject matter of GCEs must:	
3.	Meet the GCE subject criteria published by the regulatory authorities for the subject title, where they exist
4.	Compare in substance and range to the GCE subject criteria published by the regulatory authorities for other subjects, if relevant subject criteria do not exist
5.	For AS qualifications: • provide an appropriate balance of knowledge, skills and understanding to match the first half of a full A level course of study • enable candidates to be assessed normally, by means of two assessment units, which, taken together, will have a total weight of 50 per cent of the A level • include assessment units that will normally be weighted within the range of 15–35 per cent of the full A level. Weightings outside this range may be agreed where appropriate with the regulatory authorities • for double-award specifications, enable candidates to be assessed normally by means of four assessment units, which, taken together, will have a total weight of 50 per cent of the A level double award
6.	For A2 assessments that will be combined with AS assessments to lead to the award of a full A level: • provide an appropriate balance of knowledge, skills and understanding to match the second half of a full A level course of study • enable candidates to be assessed normally, by means of two assessment units, which, taken together, will have a total weight of 50 per cent of the A level • include assessment units that will normally be weighted within the range of 15–35 per cent of the full A level. Weightings outside this range may be agreed where appropriate with the regulatory authorities • for double-award specifications, enable candidates to be assessed normally by means of four assessment units, which, taken together, will have a total weight of 50 per cent of the A level double award
7.	Include optional units only if these • demand additional skills, knowledge and/or understanding • extend the core content within a specialist context and/or introduce links to another subject area
8.	Identify opportunities to generate evidence for the assessment of the nationally specified wider key skills of improving own learning and performance, problem solving, and working with others.

4.4.3 GCE A Level: Assessment Structure

GCE A Level Assessment Criteria	
The assessment arrangements in GCEs must:	
1.	Offer candidates the opportunity to be assessed either (in stages) during the course or at the end of the course
2.	Include an explanation of the relationship between the assessment objectives and the assessment units
3.	Normally include only one component of assessment (internal assessment may involve more than task, while external assessment may, for example, involve listening, reading and writing aspects. In each case, there will be one awarding process per unit)
4.	Ensure that internal assessment is used only where it is the soundest method of assessing specific skills within the assessment objectives, and agree it with the regulatory authorities on a subject-by-subject basis
5.	Ensure that, where internal assessment is included, specifications make clear how reliability and fairness are to be secured, by setting out requirements that ensure the robustness of each stage of the internal assessment, i.e. • setting of tasks • extent of supervision in carrying out of tasks • conditions under which assessment takes place • marking of the assessment and internal standardising procedures • any moderation process
6.	Not exceed a maximum examining time for external assessments of three hours at AS and four hours at A2, unless otherwise agreed in the subject criteria
7.	Show the proportion of marks allocated to each assessment objective (or group of assessment objectives) and to each assessment unit
8.	Show which assessment objectives will include the assessment of written communication
9.	Include sufficient synoptic assessment at A2 to test the candidates' understanding of the connections between the different elements of the subject and their holistic understanding of the subject
10.	Contain sufficient demand at A2 to allow recognition of performance above grade A
11.	Be comparable for all candidates, even where there are optional assessment units or optional examination questions
12.	Where candidates are required to produce written material in English, Welsh and Irish (Gaeilge), require candidates to: • ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear • select and use a form and style of writing appropriate to purpose and to complex subject matter • organise information clearly and coherently, using specialist vocabulary when appropriate
13.	Comply with subject criteria relating to the balance between external and internal assessment, including synoptic assessment where such criteria exist
14.	Allow resits of an assessment unit with the best result counting towards the qualification
15.	Stipulate that results for a unit have a shelf-life limited only by the shelf-life of the relevant specification

4.4.4 Subject Criteria

GCE A Level Subject Criteria	
Subject criteria are intended to:	
1.	Maintain consistent and comparable standards in the same subject across the awarding bodies
2.	Define the relationship between the AS and A level specifications, with the AS a subset of the A level
3.	Maintain the rigour of the A level
4.	Help higher education institutions and employers know what has been studied and assessed

Subject criteria, previously referred to as performance descriptions, set out the typical performance of candidates at the A/B and E/U grade boundaries in AS and A level

examinations, and they relate to the specific assessment objectives for each subject. The work dates back to a Qualifications and Curriculum Authority (QCA) response to an interim report, *Inquiry into A level standards* (September 2002). This report had concluded that A level awarding standards were not clear enough to examiners.

It should be noted that the organisational structure of the QCA has subsequently changed with the development of two new bodies, the Qualifications and Curriculum Development Agency (QCDA) – responsible for setting the curriculum standards within secondary education – and Ofqual – providing quality assurance of the qualifications.

Subject criteria and accompanying exemplification materials are designed to be used by examiners during the awarding process. They form part of a range of materials and technical information that is used to inform awarding decisions. Regulators operate with awarding bodies to recommend grade boundaries. This involves identifying the lowest mark at which a candidate's performance on a particular paper is worth an A rather than a B, and the lowest mark at which candidate performance is worth an E rather than a U.

It is important that the judgments are consistent with previous examinations and between awarding bodies. Examiners use a variety of materials to help achieve consistency, including:

- archive scripts from previous examinations
- statistical evidence
- Subject Criteria and exemplification materials
- shared experience and judgement.

However, subject criteria have their limitations; they should be interpreted in relation to the content outlined in the specification but they are not designed to define that content. They give a general indication of the learning outcomes and levels of attainment likely to be shown by a representative candidate performing at each boundary. In practice most candidates will show uneven profiles across the attainments listed, with strengths in some areas compensated in the award process for weaknesses or omissions elsewhere.

4.4.5 GCE A Level: Grading Scales

GCE A Level Grading Scales Criteria	
The qualification must specify arrangements for grading and reporting of GCEs so that:	
1.	Attainment that is sufficient to lead to the award of a certificate is reported on a five-grade scale from A to E, where A is the highest[2]
2.	Attainment that is insufficient to lead to the award of a certificate is reported as unclassified or U
3.	The grades awarded match performance descriptions published by the regulatory authorities, if available
4.	If relevant performance descriptions published by the regulatory authorities are not available, the grades awarded match performance descriptions for AS and A2 levels at the grade boundaries A/B and E/U submitted by the awarding body and approved by the regulatory authorities

AS double award and A level double award are reported on the following grading scale: AA, AB, BB, BC, CC, CD, DD, DE, EE, EU.

[2] This section is to be revised to reflect new A* developments.

5 The NSC and the GCE

This section provides an overview of the National Curriculum Statement principles and illustrates how its content has informed the development and construction of the National Senior Certificate. Information relating to the subjects covered in this report is subsequently presented, outlining the aims, learning outcomes and content guidelines sourced from the details published in individual National Curriculum Statement subject statements. These documents, released by the Department of Education in 2003, provide an outline of the subject specifications and include:

- Summary of the features of the National Curriculum Statement;
- Individual subject definition, purpose and scope
- Learning outcomes, assessment standards, content and contexts
- Assessment guidelines

The individual NSC subject details are in turn placed in comparison with the corresponding information from the GCE subjects.

5.1 National Curriculum Statement, South Africa

According to the national department, the National Curriculum Statement is based on a number of underlying principles:

- Social transformation
- Outcomes-based education
- High knowledge and high skills
- Integration and applied competence
- Progression
- Articulation and portability
- Human rights, inclusivity, environmental and social justice
- Valuing indigenous knowledge systems
- Credibility, quality and efficiency

5.1.1 Social Transformation

The principle of social transformation is an acknowledgement of the social changes that have taken place in South Africa during the post-apartheid era. This recognises the importance and relevance of equal educational opportunities provisions for all people in South Africa. The principle of social transformation addresses previous imbalances of educational opportunity with the ultimate aim and intention that the national curriculum will eradicate them.

5.1.2 Outcomes-Based Education

The concept of an outcomes-based education system is central to the curriculum in South Africa with the system providing learning outcomes which all students should achieve upon completion of their education. The learning outcomes for Grades 10 – 12, which ultimately culminate in the completion of the National Senior Certificate, are based on critical and developmental outcomes.

5.1.3 Critical Outcomes

The critical outcomes identify key areas within which the learner should be able to demonstrate their competence; these cover the following skills:

- identifying and solving problems and making decisions using critical and creative thinking;
- working effectively with others as members of a team, group, organisation and community;
- organising and managing themselves and their activities responsibly and effectively;
- collecting, analysing, organising and critically evaluating information;
- communicating effectively using visual, symbolic and/or language skills in various modes;
- using science and technology effectively and critically showing responsibility towards the environment and the health of others;
- demonstrating an understanding of the world as a set of related systems by recognising that problem-solving contexts do not exist in isolation.

5.1.4 Developmental Outcomes

The developmental outcomes require learners to be able to:

- reflect on and explore a variety of strategies to learn more effectively;
- participate as responsible citizens in the life of local, national and global communities;
- be culturally and aesthetically sensitive across a range of social contexts;
- explore education and career opportunities;
- develop entrepreneurial opportunities.

5.1.5 High Knowledge and High Skills

The National Curriculum Statement sets out the minimum standards of knowledge and skills required to achieve each grade. The curriculum aims to develop a high level of knowledge and skills which are explicitly related to social justice and individual empowerment.

5.1.6 Integration and Applied Competence

Applied competence integrates practical, foundational and reflective competence, underlining the National Curriculum Statements aims to combine theory, practice and reflection approaches in the learning environment. The notion of integration targets the inclusion of knowledge and skills, within and across subjects and fields of learning.

5.1.7 Progression

Subject statements indicate the progression that is required of students from one grade onto another. This is communicated initially through the identification of skill areas through the use of learning outcomes. In turn, the learning outcomes are related to ‘Assessment Standards’ which express how each outcome statement is evidenced in performances at each of the identified grade levels. Assessment standards are viewed in a similar way to level descriptors, reflecting the minimum level of requirement at each grade score. The use of assessment standards or level descriptors provides a clear indication of the scale of progression from the lowest to highest grades.

5.1.8 Credit, Articulation and Portability

The National Curriculum Statements also make reference to issues of articulation and portability, namely how the qualification relates to others on the National Qualifications Framework. In order to facilitate this process, the NSC apportions a credit value with each NSC subject representing 20 credits, with the exception of Life Orientation, which carries 10 credits.

Finally, the National Curriculum Statement also outlines the promotion of key issues within the democratic South Africa and thus explicitly states its support of human rights, inclusivity, environmental and social justice, the principles of which are enshrined in the Constitution of the Republic of South Africa. In turn, the policy also recognises the rich diversity and culturally varied history of the nation, acknowledging the status of a variety of 'knowledge systems.'

5.1.9 National Curriculum Statement Approaches to Assessment

The National Curriculum Statement Grades 10 – 12 provide guidelines for the variety of ways in which learner performances can be recorded. Additional information is also contained in individual Learning Programme Guidelines, which provide more subject specific guidance. Both documents cover school-based and external assessment processes.

The assessment of student performance is closely linked to the outcomes-based approach of the NSC, and allows teachers and examiners to observe how the student performance relates to the requirements expressed through general learning outcomes which are in turn related to level descriptors, or 'assessment standards'.

The National Curriculum Statements provides substantial guidance for the types of recommended assessment, and outlines four modes:

1. Baseline assessment: informal in nature, establishing what learners already know and are able to do; applied to the beginning of the 'learning cycle' used to inform learning/learner activities
2. Diagnostic assessment: to identify, address and resolve potential learning barriers.
3. Formative assessment: provides learner feedback, monitoring and support the learning process
4. Summative assessment: establishes a judgement of learner competence and performance.

5.1.10 National Curriculum Statement Grades 10 – 12 Rating Scales

The National Curriculum Statements released in 2003 included a six-point scale of achievement for performance grading in the NSC; however, this was altered to a seven-point grading scale, as expressed through in "The National Senior Certificate: A Qualification at Level 4 on the National Qualifications Framework (NQF)", a document released in 2005. This policy document provides general specifications and details relating to the construction of the NSC, outlining particular requirements associated with the qualification. This includes, for example, information regarding the successful completion of the NSC qualification, and also encompasses student promotion details from one grade to the next. The document also includes provisions for the amount of teaching required per subject per week as reflected in

the table below; furthermore, it was amended in 2007 in respect of the promotion requirements.

Time Allocation for NCS subjects at Grades 10 to 12	
Subject	**Time allocation per week (hours)**
Language	4.5
Language 2	4.5
Mathematics/Mathematical Literacy	4.5
Life Orientation	2
Elective Subjects (3x 4 hours)	12
Total	27.5

5.1.11 National Curriculum Statement Subject Competence Descriptions

Subject competence descriptions were developed initially to distinguish between student performances in the six rating band levels originally devised within the NSC programme. However, seven levels are now utilised to report and grade achievement as explained in the paragraph above. The original six-level rating bands can still be sourced in the 2003 National Curriculum Statements as a point of reference. The competence descriptors applied statements relative to the minimum standards required for the recognition of attainment at each rating band, and demonstrated the theoretical notion of progression that differentiates achievement from one level to the next.

5.1.12 National Senior Certificate Promotion

Progress from one grade onto the next is referred to as 'promotion' within the National Curriculum Statement. At Grades 10 and 11, promotion is achieved on the basis of internal assessment only, but should still be based on the conditions stated for the Further Education and Training Certificate. Although performances at Grades 10 and 11 do not contribute to achievement of the NSC award a candidate must have successfully negotiated Grades 10 and 11 and passed those years in order to be permitted to study in the final year, Grade 12. This differs clearly with the approach in the GCE A level where the final examination performances in both years contribute equally to the final grades achieved.

Provision of learning outcomes, assessment standards and subject content and contexts is still made for each year of study, Grades 10, 11 and 12. In the instance of learning outcomes, assessment standards and competence descriptors, there is a clear emphasis on candidate improvement and progress year on year. Ultimately, it is the competence descriptors that relate to Grade 12 that reflect the intended end-point of achievement for NSC students, and consequently analysis in this report will focus more closely on the guidelines and statements associated with Grade 12. This is because Grade 12 is representative of the standard required in order to attain the NSC – there is no formal recognition of achievement at Grades 10 and 11, except that passing each grade permits candidate promotion to the subsequent year of study.

5.2 National Curriculum Statement Subject Specifications

This information contained with the following subsections presents the National Curriculum Statements subject specifications for Life Sciences, Physical Sciences, Mathematics, Mathematical Literacy, English Home Language and Geography. In turn, this subject specific information is related to the corresponding subjects taken from the GCE A level. Both education systems present idiosyncratic methods of organising subjects to the extent that

not every NSC subject has a direct counterpart in the GCE suite of examination subjects. However, it is still possible to provide a useful comparison of subjects as follows:

- NSC Life Sciences and GCE Biology
- NSC Physical Sciences and GCE Chemistry and GCE Physics (2 GCE subjects)
- NSC Mathematics and GCE Mathematics
- NSC Mathematical Literacy has no directly comparable GCE subject
- NSC English Home Language and GCE English Language and Literature
- NSC Geography and GCE Geography

In addition to the above, this report will focus specifically on the learning outcomes, assessment standards and subject specification content relative to Grade 12 of the NSC. The rationale behind this approach is justifiable in the sense that Grade 12 performance alone, both through internal and external examination, contribute to the award of the NSC. Whilst candidates must successfully negotiate both Grades 10 and 11, and pass end of term examinations in order to be promoted and progress to the next grade of study, performances in these grades do not ultimately contribute to a candidate's final NSC rating.

This clearly contrasts with the organisation of the GCE A level, whereby candidate performances are assessed in both years of study, namely at AS and A2 level. Furthermore, the grades achieved in both AS and A2 years are combined to provide the candidate's final grade. Thus, in this respect, each module and subject area covered by the A level is assessed and the scores of these examinations contribute directly to the overall grade attained.

5.3 NSC Life Sciences

5.3.1 Aims and Objectives

The study of the Life Sciences:

- enables learners to explore the concepts essential for understanding basic life processes and the interrelationship and interdependence of components of the living and the physical world.
- enables learners to understand biological, physiological, environmental, technological and social processes that impact on the environment (e.g. food production, distribution and consumption, health promotion, conservation, sustainable living and genetic engineering)

Learners will:

- develop inquiry, problem solving, critical thinking and other skills, and will use them to interpret and use Life Sciences concepts in explaining phenomena.
- be able to apply scientific knowledge in their personal lives and as responsible citizens in ways that will contribute to a healthy lifestyle and the sustainable management of resources.
- develop an understanding of the nature of science, the influence of ethics and biases, and the interrelationship of science, technology, indigenous knowledge, environment and society.

5.3.2 Learning Outcomes

The subject Life Sciences focuses on three competences which form the backbone of the subject learning outcomes. Each learning outcome is subsequently sub-divided into a number of assessment standards (AS) through which the attainment of the learning outcome can be measured.

Learning Outcome 1: Scientific inquiry and problem-solving skills

- AS 1: The learner identifies and questions phenomena and plans an investigation
- AS 2: The learner conducts an investigation by collecting and manipulating data
- AS 3: The learner analyses, synthesises and evaluates data and communicates findings

Learning Outcome 2: Construction and application of Life Sciences knowledge

Knowledge covers - tissues, cells and molecular studies; structures and control of processes in basic life systems; environmental studies; diversity, change and continuity.

- AS 1: The learner accesses knowledge
- AS 2: The learner interprets and makes meaning of knowledge in Life Sciences.
- AS 3: The learner shows understanding of how Life Sciences knowledge is applied in everyday life.

Learning Outcome 3: Life Sciences, technology, environment and society

- AS 1: The learner explores and evaluates the scientific ideas of past and present cultures.
- AS 2: The learner compares and evaluates the uses and development of resources and products and their impact on the environment and society
- AS 3: The learner compares the influence of different beliefs, attitudes and values on scientific knowledge.

Life Sciences Learning Outcomes (Grades 10 -12)
Learning Outcome 1: scientific inquiry and problem-solving skills *The learner is able to confidently explore and investigate phenomena relevant to Life Sciences by using inquiry, problem solving, critical thinking and other skills.*
These involve the use of experimental and data-handling skills; • Experimental skills include following instructions, making observations, measuring trends & recording information. • Data handling skills involve identifying, selecting, organising, presenting, translating, and manipulating data, as well as making inferences, deductions and conclusions from the data gathered. • Learners present reasons for explanations of phenomena; create relationships between experimental processes and results obtained; make predictions and hypotheses regarding phenomena in order to solve bigger problems
Learning Outcome 2: Construction and application of Life Sciences knowledge *The learner is able to access, interpret, construct and use Life Sciences concepts to explain phenomena relevant to Life Sciences.*
This involves the use of inquiry and thinking skills to: • interpret, apply and extend their understanding of concepts, principles, laws, theories and/or models; • by sharing experiences and reaching a common understanding learners make sense of how Life Sciences knowledge applies to everyday life.
Learning Outcome 3: Life Sciences, technology, environment and society *The learner is able to demonstrate an understanding of the nature of science, the influence of ethics and biases in the Life Sciences, and the interrelationship of science, technology, indigenous knowledge, the environment and society.*
This Learning Outcome raises learners' awareness of: • different viewpoints in a multicultural society, encouraging open-mindedness towards all viewpoints; • viewpoints are based on scientific knowledge, beliefs, ethics, attitudes, values and biases, and may change over time due to new information.

These learning outcomes are further developed and expressed through the assessment standards. For more in-depth references these tables are contained in the appendix to this report. The assessment standards provide more specific instances intended to demonstrate how a learner has attained the requirements of a specific learning outcome. For example, with the first learning outcome 'Identifying and questioning phenomena and planning an investigation' a learner is required to evaluate an experimental design. The assessment standards advise that attainment is evident when the learner "checks the accuracy of the air pollution test or survey".

The provision of information relating to the Life Sciences Content is expressed through the content and context tables for each NSC Grade in the National Curriculum Statements. This report has included the information relative to Grade 12, the year in which examination performance contributes to the final grade.

Life Science Content and Context for attainment of assessment standards: Grades 10 – 12	
A	**Tissues, cells and molecular studies**
LO 1: *The learner is able to confidently explore and investigate phenomena relevant to Life Sciences by using inquiry, problem solving, critical thinking and other skills.* • Research in a field of biotechnology (e.g. chemotherapy). • Microscopic skills or other comparative methods and resources. • Investigation of (community) diseases: conduct surveys, collect data (e.g. on fungal, viral, animal and plant diseases, genetic diseases). • Collection of latest research information on diseases (e.g. malaria resistance, TB incidence in South Africa	
LO 2: *The learner is able to access, interpret construct and use Life Sciences concepts to explain phenomena relevant to Life Sciences* • Cell structure - Cell division (mitosis) - Tissues - Related diseases (e.g. cancer) (Grade 10) • Micro-organisms (viruses, bacteria, protists and fungi): ○ diseases (e.g. rust, blight, rabies, HIV/AIDS, cholera, tuberculosis, malaria, thrush); immunity (Grade 11) • DNA, protein synthesis; Chromosomes, meiosis, production of sex cells, diseases (e.g. Down syndrome); Genes, inheritance, genetic diseases (Grade 12)	

LO 3: *The learner is able to demonstrate an understanding of the nature of science, the influence of ethics and bases in the Life Sciences, and the interrelationship of science, technology, indigenous knowledge, the environment and society.*
• Historical developments (e.g. discovery of genes and DNA).
• Ethics and legislation (including):
  ○ tissue culture; cloning; genetic engineering; ethics.
• Indigenous knowledge systems and biotechnology:
  ○ micro-organisms and biotechnology in the food industry (e.g. cheese, beer); traditional technology (e.g. traditional medicines and healers); medical biotechnology (e.g. immunity, antibiotics, hormones like insulin); genetic engineering and its use in medicine and agriculture (e.g. genetically-modified crops); cloning; DNA, fingerprinting and forensics.
• Beliefs, attitudes and values:
  ○ beliefs and attitudes concerning diseases; genetic counselling.	

Life Science Content and Context for attainment of assessment standards: Grades 10 – 12	
C	**Environmental studies**
LO 1: *The learner is able to demonstrate an understanding of the nature of science, the influence of ethics and bases in the Life Sciences, and the interrelationship of science, technology, indigenous knowledge, the environment and society.* • Investigation of human influences on the environment (e.g. introduction of exotic species). • Management and maintenance of natural resources. • Investigation of a local environmental issue, problem solving and decision making (e.g. managing rubbish dumps)	
LO 2: *The learner is able to demonstrate an understanding of the nature of science, the influence of ethics and bases in the Life Sciences, and the interrelationship of science, technology, indigenous knowledge, the environment and society.* • Biospheres, biomes and ecosystems; Living and non-living resources, nutrient cycles and energy flow within an environment (Grade 10) • Human influences on the environment (air, land and water issues); Sustaining our environment; Air, land and water-borne diseases (Grade 11) • Local environmental issues; Effect of pollutants on human physiology and health (e.g. allergies) (Grade 12)	
LO 3: *The learner is able to demonstrate an understanding of the nature of science, the influence of ethics and bases in the*	

Life Sciences, and the interrelationship of science, technology, indigenous knowledge, the environment and society.

- Historical developments: indigenous knowledge systems, biotechnology, environment, legislation, social behaviour & ethics.
- Exploitation vs. sustainability: exploring issues.
- Industrialisation and the impact of industry.
- Management of resources, and the use and abuse of resources (e.g. fossil fuel usage).
- Eco-tourism.
- Air (e.g. ozone, global warming and the greenhouse effect, acid rain and its consequences).
- Waste management.
- Rehabilitation of the environment.
- Land issues (e.g. ownership & use of land, nature & game reserves, agriculture, desertification, (de-)forestation, urban decay).
- Exploring the land issue: politically, legally, economically, ethically, environmentally and other influences

Life Science Content and Context for attainment of assessment standards: Grades 10 – 12

B	**Structures and control of processes in basic life systems**

LO 1: *The learner is able to demonstrate an understanding of the nature of science, the influence of ethics and biases in the Life Sciences, and the interrelationship of science, technology, indigenous knowledge, the environment and society.*

- Structure of systems*:*
  - investigation of kidneys, hearts and eyes through dissections; other comparative techniques using models and charts.
- Experimental investigation (e.g. photosynthesis).
- Designing a model (e.g. anatomy of a system such as the digestive system).
- Microscope work (e.g. alveoli or stomata).
- Conducting research on any of the latest medical practices concerning life processes (e.g. heart transplants, laser surgery).

LO 2: *The learner is able to demonstrate an understanding of the nature of science, the influence of ethics and bases in the Life Sciences, and the interrelationship of science, technology, indigenous knowledge, the environment and society.*

- Energy release; Food production; Human nutrition and related diseases and allergies; Gaseous exchange and related diseases and allergies (Grade 10)
- Support (structural); Transport; Excretion; Nervous and endocrine systems; Related diseases of the above; Medical conditions (e.g. stroke, diabetes, hyperthyroidism) (Grade 11)
- Reproduction and related diseases (Grade 12)

Life Science Content and Context for attainment of assessment standards: Grades 10, 11, 12

D	**Diversity, change and continuity**

LO 1: *The learner is able to demonstrate an understanding of the nature of science, the influence of ethics and bases in the Life Sciences, and the interrelationship of science, technology, indigenous knowledge, the environment and society.*

Grades 10 - 11

- Planning, conducting and investigating plants and animals – a comparison.
- Analysis of given data and findings to evaluate growth and behavioural issues within a population.
- Measurement of population growth using different techniques.
- Collection and analysis of data on specific community diseases that could impact on the population vigour dynamic.
- Analysis and evaluation of any specific human behaviour that could influence population growth.
- Collection and analysis of data on evolutionary trends in a population (e.g. human beings).

LO 2: *The learner is able to demonstrate an understanding of the nature of science, the influence of ethics and bases in the Life Sciences, and the interrelationship of science, technology, indigenous knowledge, the environment and society.*

- Biodiversity of plants and animals and their conservation; Significance and value of biodiversity to ecosystem function and human survival; Threats to biodiversity; Parasitism, diseases (e.g. bilharzias); (Grade 10)
- Population studies (characteristics of populations, population growth, population fluctuation; limiting factors); Social behaviour (predation; competition); Managing populations (Grade 11)
- Origin of species; Evolution theories, mutation, natural selection, macro-evolution and speciation; Fundamental aspects of fossil studies; Cradle of mankind - South Africa?; Biological evidence of the evolution of populations; Popular theories of mass extinction (Grade 12)

LO 3: *The learner is able to demonstrate an understanding of the nature of science, the influence of ethics and bases in the Life Sciences, and the interrelationship of science, technology, indigenous knowledge, the environment and society.*
Grades 10 - 12

- Historical developments: indigenous knowledge systems, biotechnology, environment, legislation, social behaviour & ethics.
- Adaptation and survival.
- Sustainable development.
- History and the nature of science.
- Extinction of species, red data listing and endangered species.
- Fossils records, museums, zoos.
- Population changes over time.
- Beliefs about creation and evolution.
- Changes of knowledge through contested nature and diverse perceptions of evolution.

5.4 NSC Physical Sciences

5.4.1 Aims and Objectives

According to the National Curriculum Statements, South Africa has a legacy in which the poor quality and/or lack of education in certain sectors resulted in limited access to scientific knowledge and the devaluing of indigenous scientific knowledge. Consequently, the delivery of Physical Sciences must ensure increased access to scientific knowledge and scientific literacy. The study of Physical Sciences is aimed at correcting some of these historical limitations by contributing towards the holistic development of learners in the following ways:

- giving learners the ability to work in scientific ways or to apply scientific principles which have proved effective in understanding and dealing with the natural and physical world in which they live;
- stimulating their curiosity, deepening their interest in the natural and physical world in which they live, and guiding them to reflect on the universe;
- developing insights and respect for different scientific perspectives and a sensitivity to cultural beliefs, prejudices and practices in society (this aspect should also include the mobilising of African indigenous scientific knowledge and practices, particularly as these relate to solving social and environmental challenges in Africa);
- developing useful skills and attitudes that will prepare learners for various situations in life, such as self-employment and entrepreneurial ventures; and
- enhancing understanding that the technological applications of the Physical Sciences should be used responsibly towards social, human, environmental and economic development both in South Africa and globally.

Physical Sciences Scope

Physical Sciences focuses on competences in three areas:

1. Scientific inquiry and problem solving in a variety of scientific, technological, socio-economic and environmental contexts;
2. The construction and application of scientific and technological knowledge

There are six core knowledge areas have the following foci as demonstrated by the table below, which also expresses the recommended time for the curriculum coverage of each area of study.

Knowledge area	Type	Time
Matter and Materials	Integrated	25%
Systems	Chemistry	18.75%
Change	Chemistry	18.75%
Mechanics	Physics	12.5%
Waves, sound and light	Physics	12.5%
Electricity and magnetism	Physics	12.5%

3. The nature of science and its relationship to technology, society and the environment.

The specified knowledge areas should be used as contexts to develop competences in learners to enable them to understand the relationships between science and technology, society and environment. Thus, learners in the Physical Sciences need to understand that:

- the scientific enterprise and, in particular, how scientific knowledge develops;
- scientific knowledge is in principle tentative and subject to change as new evidence becomes available;
- knowledge is contested and accepted, and depends on social, religious and political factors;
- other systems of knowledge, such as indigenous knowledge systems, should also be considered;
- the explanatory power and limitations of scientific models and theories need to be evaluated;
- science relates to their everyday lives, to the environment and to a sustainable future;
- the importance of scientific and technological advancements and to evaluate their impact on human lives.

5.4.2 Physical Sciences Learning Outcomes (LO)

LO 1: Practical Scientific Inquiry and Problem-solving Skills

The learner is able to use process skills, critical thinking, scientific reasoning and strategies to investigate and solve problems in a variety of scientific, technological, environmental and everyday contexts

LO 2: Constructing and Applying Scientific Knowledge

The learner is able to state, explain, interpret and evaluate scientific and technological knowledge and can apply it in everyday contexts. Progression in this Learning Outcome is ensured through increasing difficulty of concepts and the nature of contexts.

LO 3: The Nature of Science and its Relationships to Technology, Society and the Environment

The learner is able to identify and critically evaluate scientific knowledge claims and the impact of this knowledge on the quality of socio-economic, environmental and human development.

	Learning outcome 1	Learning Outcome 2	Learning Outcome 3
	Practical Scientific Inquiry and Problem-solving skills	*Constructing and Applying Scientific Knowledge*	*The Nature of Science and its Relationship to Technology, Society and the Environment*
Thrusts of the Assessment Standards	Conducting an investigation	Recalling and stating specified concepts	Evaluating knowledge claims and science's inability to stand in isolation from other fields.
	Interpreting data to draw conclusion Solving problems	Indicating and explaining relationships	Evaluating the impact of science on human development.
	Communicating and presenting information and scientific arguments	Applying scientific knowledge	Evaluating science's impact on the environment and sustainable development

Examples of how the Physical Science learning outcomes can be attained by candidate performance can be referenced in the appendix. This outlines how, for example, under learning outcome 2, 'constructing and applying scientific knowledge' a candidate is required to recall and state specified concepts. This is explained through the exemplification of certain ways in which this learning outcome is then achieved. A summarised table of the learning outcomes for Grade 12 is included below.

5.4.3 Physical Science Learning Outcomes (Grade 12)

LO 1 *practical scientific inquiry and problem-solving skills*
1. Conducting an investigation
• Design, plan and conduct a scientific inquiry to collect data systematically with regard to accuracy, reliability and the need to control variables. *Attainment is evident when the learner, for example,* - designs and carries out an experiment to identify specific variables that affect motion (e.g. an experiment to verify Newton's second law of motion); - uses experimentation to determine some of the properties of organic compounds; - synthesises a common organic compound such as soap.
2. Interpreting data to draw conclusion
• Seek patterns and trends, represent them in different forms, explain the trends, use scientific reasoning to draw and evaluate conclusions, and formulate generalisations. *Attainment is evident when the learner, for example,* - interprets patterns and trends in data in order to analyse and explain the motion of objects; - interprets the information gathered on the use of electrical energy, to identify patterns and trends of power usage during all seasons, day and night, and formulates strategies to conserve energy.
3. Solving problems
• Select and use appropriate problem-solving strategies to solve (unseen) problems. *Attainment is evident when the learner, for example,* - decides what information is needed and what steps must be followed to determine how far away a satellite is, using a laser.
4. Communicating and presenting information and scientific arguments
• Communicate and defend scientific arguments with clarity and precision. *Attainment is evident when the learner, for example,* - formulates and defends scientific arguments for wearing safety belts; - formulates and defends scientific arguments around the compulsory installation of airbags in all means of transport; - presents scientific arguments on the risks and benefits of the combustion of organic products and the manufacturing of synthetic products on human development, society and the environment; - explains the dangers associated with the use of organic solvents and other organic products like combustibility and toxicity, and presents scientific arguments against the use of synthetic organic solvents.

5.4.4 Physical Science Content and Contexts for the Attainment of Assessment Standards

Advice and guidance contained in the National Curriculum Statement for Physical Sciences suggests that it is impossible to study all knowledge and concepts in the Physical Sciences. This presents an interesting dilemma, both in terms of determining delivery of course content

and also in terms of deciding upon assessable content for the final examinations in Grade 12. A detailed table covering two pages has been included in the appendix for the purposes of brevity in this section; this table provides detailed guidance for the individual subject area modules that must be covered.

These can be summarised here as follows:

- Mechanics
- Waves, sound and light
- Electricity and magnetism
- Matter and materials
- Chemical change
- Chemical systems

In comparison with the two GCE A levels in both Physics and Chemistry it is clear that the content for the NSC has to compromise the extent to which its coverage of all modules can be achieved.

5.5 NSC Mathematics

5.5.1 Aims and Objectives

The aims and objectives of the NSC in Mathematics are outlined below. According to the National Curriculum specifications, Mathematics is intended to enable learners to:

1. communicate appropriately by using descriptions in words, graphs, symbols, tables and diagrams;
2. use mathematical process skills to identify, pose and solve problems creatively and critically;
3. organise, interpret and manage authentic activities in substantial mathematical ways
4. responsibility and sensitivity to personal and broader societal concerns;
5. work collaboratively in teams and groups to enhance mathematical understanding;
6. collect, analyse and organise quantitative data to evaluate and critique conclusions;
7. engage responsibly with quantitative arguments relating to local, national and global issues

Learners in the Further Education and Training band who are interested in the subject or who intend to follow a career path requiring Mathematics will, while ensuring that they are mathematically literate, work towards being able to:	
1.	competently use mathematical process skills such as making conjectures, proving assertions and modelling situations;
2.	calculate confidently and competently with and without calculators, and use rational and irrational numbers with understanding;
3.	competently produce useful equivalents for algebraic expressions, and use such equivalents appropriately and with confidence;
4.	use Mathematics to critically investigate and monitor the financial aspects of personal and community life and political decisions;
5.	work with a wide range of patterns and transformations (translations, rotations, reflections) of functions and solve related problems;
6.	describe, represent and analyse shape and space in two and three dimensions using various approaches in geometry (synthetic, analytic transformation) and trigonometry in an interrelated or connected manner;
7.	collect and use data to establish basic statistical and probability models, solve related problems, and critically consider

	representations provided or conclusions reached;
8.	use and understand the principles of differential calculus to determine the rate of change of a range of simple, non-linear functions and to solve simple optimisation problems;
9.	solve problems involving sequences and series in real-life and mathematical situations;
10.	solve non-routine, unseen problems using mathematical principles and processes;
11.	investigate historical aspects of the development and use of Mathematics in various cultures; and
12.	use available technology (the minimum being a modern scientific calculator) in calculations and in the development of models.

5.5.2 Mathematics Learning Outcomes

Learning Outcome 1: Number and Number Relationships	
When solving problems, the learner is able to recognise, describe, represent and work confidently with numbers and their relationships to estimate, calculate and check solutions.	
1.	expand the capacity to represent numbers in a variety of ways and move flexibly between representations;
2.	develop further the ability to estimate and judge the reasonableness of solutions and the ability to give solutions to an appropriate degree of accuracy, depending on the accuracy of measuring instruments and on the context;
3.	calculate confidently and competently, with and without a calculator, guarding against becoming over-dependent on the calculator;
4.	develop the concepts of simple and compound growth and decay;
5.	solve problems related to arithmetic, geometric and other sequences and series, including contextual problems related to hire-purchase, bond repayments and annuities; and
6.	explore real-life and purely mathematical number patterns and problems which develop the ability to generalise, justify and prove.

Learning Outcome 2: Functions and Algebra	
The learner is able to investigate, analyse, describe and represent a wide range of functions and solve related problems. Learners should:	
1.	understand various types of patterns and functions;
2.	investigate the effect of changing parameters on the graphs of functions;
3.	use symbolic forms to represent and analyse mathematical situations and structures; and
4.	use mathematical models and analyse change in both real and abstract contexts.

The mathematical models of situations may be represented in different ways – in words, as a table of values, as a graph, or as a computational procedure (formula or expression). The information needed is mostly acquired in the following ways:

- finding values of the dependent variable (finding function values);
- finding values of the independent variable (solving equations);
- describing and using the behaviour of function values, periodicity;
- considering the increasing and decreasing nature of functions, rates of change, gradient, derivative, maxima and minima;
- finding a function rule (formula); and
- transforming to an equivalent expression (‘manipulation’ of algebraic expressions)

Learning Outcome 3: Space, Shape and Measurement	
The learner is able to describe, represent, analyse and explain properties of shapes in 2-dimensional and 3-dimensional space with justification. The study of space, shape and measurement enables learners to:	
1.	explore relationships, make and test conjectures, and solve problems involving geometric figures and geometric solids;
2.	investigate geometric properties of 2-dimensional and 3-dimensional figures in order to establish, justify and prove conjectures;
3.	link algebraic and geometric concepts through analytic geometry;
4.	link the use of trigonometric relationships and geometric properties to solve problems;

5.	use construction and measurement or dynamic geometry software, for exploration and conjecture;
6.	analyse natural forms, cultural products and processes as representations of shape and space;
7.	investigate the contested nature of geometry throughout history and develop an awareness of other geometries;
8.	use synthetic, transformation or other geometric methods to establish geometric properties; and
9.	connect space, shape and measurement to other Learning Outcomes within Mathematics and where possible to other subjects.
Learning Outcome 4: Data Handling and Probability	
Learners will master further methods of organising, displaying and analysing data.	
Measures of central tendency and spread will be explored.	
A basic appreciation of the difference between data that is normally distributed about a mean and data that is skewed will be developed.	
Learners will become critically aware of the deliberate abuse in the way data can be represented to support a particular viewpoint.	

According to curriculum guidelines, the basic understanding of probability and chance gained at General Education and Training level will be deepened so that, for example, learners can compare the actual odds in winning popular games of chance with the odds offered by gaming houses. A basic understanding of the way the probability of everyday events can be calculated and used in prediction will be developed.

The Grade 12 content and context table for Mathematics has been included in the appendix.

5.5.3 Learning Outcomes in relation to Assessment Standards at Grade 12

The tables below reflect the requirements placed on candidates for the final year of study at Grade 12, and are thus indicative of the level of competence needed to successfully complete this year.

LO 1 *Number and Number Relations*	
1.	Demonstrate an understanding of the definition of a logarithm and any laws needed to solve real-life problems (e.g. growth and decay)
2.	a. Identify and solve problems involving number patterns, including but not limited to arithmetic and geometric sequences and series. b. Correctly interpret sigma notation. c. Prove and correctly select the formula for and calculate the sum of series: *n* _1 = *n i*=1 *n n*(*n*+1) _i = ——— *i*=1 2 *n*_ *i*=1 *a* + (*i* – 1) *d* = *n* –2 [2*a* + (*n* – 1)*d*] *n*_ *i*=1 *a.r i*–1 = *a* — (*rn* —— – 1) —— ***r*** – 1 ; r _ 1 __ i=1a.r i–1 = a —— 1 – r for -1< r <1 d. Correctly interpret recursive formulae: (e.g. Tn+1 = Tn + Tn-1)
3.	a. Calculate the value of n in the formula A = P(1±i)n b. Apply knowledge of geometric series to solving annuity, bond repayment and sinking fund problems, with or without the use of the formulae: *x*[(1+*i*)*n*–1] *F* = ——— and *i* *x*[1–(1+*i*)–*n*] *P* = ——— *I*
4.	Critically analyse investment and loan options and make informed decisions as to the best option(s) (including pyramid and micro-lenders' schemes).
5.	Solve non-routine, unseen problems.

LO 2, *Functions and Algebra*	
1.	a. Demonstrate the ability to work with various types of functions and relations including the inverses listed in the following Assessment Standard. b. Demonstrate knowledge of the formal definition of a function.
2.	a. Investigate and generate graphs of the inverse relations of functions, in particular the inverses of: *y = ax + q; y = ax2; y = ax; a>0* b. Determine which inverses are functions and how the domain of the original function needs to be restricted so that the inverse is also a function.
3.	Identify characteristics as listed below and hence use applicable characteristics to sketch graphs of the inverses of the functions listed above: a. domain and range; b. intercepts with the axes; c. turning points, minima and maxima; d. asymptotes; e. shape and symmetry; f. average gradient (average rate of change); g. intervals on which the function increases/decreases.
4.	Factorise third degree polynomials (including examples which require the factor theorem).
5.	a. Investigate and use instantaneous rate of change of a variable when interpreting models of situations:

i. demonstrating an intuitive understanding of the limit concept in the context of approximating the rate of change or gradient of a function at a point;

ii. establishing the derivatives of the following functions from first principles: f (x) = ; f (x) = ; f (x) = x2; f (x) = x3; f (x) = 1–x; and then generalise to the derivative of f (x) = xn

b. Use the following rules of differentiation:

d — dx

[*f* (*x*)±*g*(*x*)] = *d — dx* [*f* (*x*)]± *d — dx* [*g*(*x*)] *d — dx* [*k.f* (*x*)]= *k d — dx* [*f* (*x*)]

c. Determine the equations of tangents to graphs.

d. Generate sketch graphs of cubic functions using differentiation to determine the stationary points (maxima, minima and points of inflection) and the factor theorem and other techniques to determine the intercepts with the *x*-axis.

e. Solve practical problems involving optimisation and rates of change.

6. Solve linear programming problems by optimising a function in two variables, subject to one or more linear constraints, by establishing optima by means of a search line and further comparing the gradients of the objective function and linear constraint boundary lines.

LO 3: *Space, shape and measurement*

1. a. Accept the following as axioms:

i. results established in earlier grades;

ii. a tangent is perpendicular to the radius, drawn at the point of contact with the circle, and then investigate and prove the theorems of the geometry of circles:

- the line drawn from the centre of a circle, perpendicular to a chord, bisects the chord and its converse;
- the perpendicular bisector of a chord passes through the centre of the circle;
- the angle subtended by an arc at the centre of a circle is double the size of the angle subtended by the same arc at the circle;
- angles subtended by a chord at the circle on the same side of the chord are equal and its converse;
- the opposite angles of a cyclic quadrilateral are supplementary and its converse;
- two tangents drawn to a circle from the same point outside the circle are equal in length;
- the angles between a tangent and a chord, drawn to the point of contact of the chord, are equal to the angles which the chord subtends in the alternate chord segments and its converse.

1. b. Use the theorems listed above to:

i. make and prove or disprove conjectures;

ii. prove riders.

2. Use a two-dimensional Cartesian co-ordinate system to derive and apply:

i. the equation of a circle (any centre);

ii. the equation of a tangent to a circle given a point on the circle.

3. a. Use the compound angle identities to generalise the effect on the co-ordinates of the point (x ; *y*) after rotation about the origin through an angle _.

b. Demonstrate the knowledge that rigid transformations (translations, reflections, rotations and glide reflections) preserve shape and size, and that enlargement preserves shape but not size.

4. Derive and use the following compound angle identities:

i. sin(_ ± _) = sin _ cos _ ± cos _ sin _

ii. cos(_ ± _) = cos _ cos _ _ sin _ sin _

iii. sin 2_ = 2 sin _ cos a

iv. cos 2_ = cos2 _ – sin2 _ = 2 cos2 _ – 1 = 1 – 2 sin2 _

5. Solve problems in two and three dimensions by constructing and interpreting geometric and trigonometric models.

6. Demonstrate a basic understanding of the development and uses of geometry through history and some familiarity with other geometries (e.g. spherical geometry, taxi-cab geometry, and fractals).

LO 4: *Data handling and probability*

1. a. Demonstrate the ability to draw a suitable sample from a population and understand the importance of sample size in predicting the mean and standard deviation of a population.

b. Use available technology to calculate the regression function which best fits a given set of bivariate numerical data.

c. Use available technology to calculate the correlation co-efficient of a set of bivariate numerical data to make relevant deductions.

2. Generalise the fundamental counting principle (successive choices from *m1* then *m2* then *m3* … options create *m1.m2.m3* … different combined options) and solve problems using the fundamental counting principle.

3. a. Identify potential sources of bias, errors in measurement, and potential uses and misuses of statistics and charts and their effects (a critical analysis of misleading graphs and claims made by persons or groups trying to influence the public is implied here)

b. Effectively communicate conclusions and predictions that can be made from the analysis of data.

4. Identify data which is normally distributed about a mean by investigating appropriate histograms and frequency polygons.

5. Use theory learned in this grade in an authentic integrated form of assessment (e.g. in an investigative project).

5.6 NSC Mathematical Literacy

5.6.1 Aims and Objectives

The National Curriculum Statement notes that South Africa has come from a past characterised by very low levels of literacy and numeracy in the adult population. Indeed, international comparisons show that South African learners fare very poorly in mathematical literacy tests when compared to counterparts in other developed and developing countries. Mathematical Literacy has been included in the Further Education and Training curriculum in order to address that issue of numeracy. The curriculum is intended to address and engage real life problems in different contexts, consolidating and extending basic mathematical skills. The aim of the course is for the learner to understand mathematical terminology and to make sense of numerical and spatial information communicated in tables, graphs, diagrams and texts; in doing so, the subject will develop basic mathematical skills.

Scope

Mathematical Literacy helps learners work towards being able to:

Mathematical Literacy enables learners to:	
1.	use numbers with understanding to solve real-life problems in different contexts including the social, personal and financial;
2.	use mathematically-acquired skills to perform with understanding financially-related calculations involving personal, provincial and national budgets;
3.	model relevant situations using suitable functions and graphical representation to solve related problems;
4.	describe, represent and analyse shape and space in two dimensions and three dimensions using geometrical skills;
5.	engage critically with the handling of data (statistics and chance), especially in the manner in which these are encountered in the media and in presenting arguments;
6.	use computational tools competently (a scientific calculator is taken as the minimum).

5.6.2 Mathematical Literacy Learning Outcomes (LO)

1. LO 1: Number and Operations In Context

The learner is able to use knowledge of numbers and their relationships to investigate a range of different contexts which include financial aspects of personal, business and national issues.

2. LO 2: Functional Relationships

The learner is able to recognise, interpret, describe and represent various functional relationships to solve problems in real and simulated contexts.

3. LO 3: Space, Shape and Measurement

The learner is able to measure using appropriate instruments, to estimate and calculate physical quantities, and to interpret, describe and represent properties of and relationships between 2-dimensional shapes and 3-dimensional objects in a variety of orientations and positions.

4. LO 4: Data Handling

The learner is able to collect, summarise, display and analyse data and to apply knowledge of statistics and probability to communicate, justify, predict and critically interrogate findings and draw conclusions.

5.6.3 Learning outcomes in relation to assessment standards Grade 12

LO 1: *Number and Operations in context with Assessment Standards*
1. Correctly apply problem-solving and calculation skills to situations and problems dealt with. *For example*: *work with issues involving proportional representation in voting.*
2. Relate calculated answers correctly and appropriately to the problem situation by: a. interpreting fractional parts of answers in terms of the context; b. reworking a problem if the first answer is not sensible or if the initial conditions change; c. interpreting calculated answers logically in relation to the problem and communicating processes and results.
3. Analyse and critically interpret a wide variety of financial situations mathematically, inclusive of: a. personal and business finances; b. the effects of taxation, inflation and changing interest rates on personal credit, investment and growth options; c. financial and other indicators; d. the effects of currency fluctuations; *e.* critical engagement with debates about socially responsible trade.

LO 2: *Functional Relationships Assessment Standards*
1. Work with numerical data and formulae in a variety of real-life situations, in order to: a. solve design and planning problems; *for example: find optimal values for two discrete variables, subject to two or more linear constraints.* b. investigate situations of compound change. *For example: investigate the rate of depletion of natural resources; investigate the spread of HIV/AIDS and other epidemics; critique articles and reports in the media that are based on graphs or tables.*
2. Draw graphs as required by the situations and problems being investigated. *For example: draw graphs of number of AIDS related deaths and deaths caused by malaria over time, on the same system of axes to describe the extent of the AIDS epidemic.*
3. Critically interpret tables and graphs in the media, inclusive of: a. graphs with negative values on the axes (dependant variable in particular); *b.* more than one graph on a system of axes. *For example: interpret graphs of temperature against time of day during winter over a number of years to investigate claims of global warming; compare graphs of indices such as the consumer price index and business confidence index to graphs of percentage change in those indices over a particular time interval.*

LO 3: *Space, shape and measurement Assessment Standards*
1. Solve problems in 2-dimensional and 3-dimensional contexts by: a. estimating, measuring and calculating (*e.g. regular shapes, irregular shapes and natural objects*) values which involve: lengths and distances; perimeters and areas of polygons; volumes of right prisms, right circular cylinders, cones and spheres; surface areas of right prisms, right circular cylinders, cones and spheres; angle sizes (0˚-360˚); b. making adjustments to calculated values to accommodate measurement errors and inaccuracies due to rounding.
2. Convert units of measurement between different scales and systems as required in dealing with problems. *For example: the dimensions of an imported washing machine are given in inches and must be converted accurately to centimetres for installation purposes; a recipe that is written with imperial measures must be rewritten with accurate metric measures; measures of temperature must be converted between Fahrenheit and Celsius (conversion ratios and formulae given).*
3. Use and interpret scale drawings of plans to: a. represent and identify views, estimate and calculate values according to scale, and build models. *For example: *build a scale model of a school building, based on the plan of the building.*
4. Use grids, including the Cartesian plane and compass directions, in order to: a. determine locations; *b.* describe relative positions. *For example: *understand the use of latitude and longitude in global positioning systems.*
5. Use basic trigonometric ratios (sine, cosine and tangent) and geometric arguments to interpret situations and solve problems about heights, distances, and position including the application of area, sine and cosine rules.
6. Recognise, visualise, describe and compare properties of geometrical plane figures and solids in natural and cultural forms. *For example: use the concepts of proportion and symmetry in describing local artefacts, art and architecture*

LO 4: *Data handling Assessment Standards*
1. Investigate a problem on issues such as those related to: a. social, environmental and political factors; b. people's opinions; c. human rights and inclusivity by: a. using appropriate statistical methods; b. selecting a representative sample from a population with due sensitivity to issues relating to bias; *c.* comparing data from different sources and samples. *For example: challenge learners to compare claims about preferred TV programmes among teenagers with data from schools in their area; compare preferences across grades or gender.*
2. Appropriately choose and interpret the use of methods to summarise and display data in statistical charts and graphs including the use of scatter-plots and intuitively-placed lines of best fit to: a. represent the association between variables (regression analysis not included); b. describe trends (e.g. a positive linear association). *For example: Does a positive correlation between age and height necessarily mean that height is dependent on age? Does a positive correlation between mathematics marks and music marks necessarily mean that facility in mathematics is dependent on musical aptitude? Does a positive correlation between pollution levels and TB infections necessarily mean that pollution causes TB?*
3. Compare different sets of data by calculating and using measures of central tendency and spread, including: a. mean; b. median; c. mode; d. variance (interpretation only); e. standard deviation (interpretation only); f. quartiles; g. percentiles. *For example: compare the increase in the cost of a trolley of groceries to the increase in the consumer price food index, and report the findings in terms of variance and standard deviation of specific items; compare academic results in own school to those in the province in terms of quartiles and percentiles.*
4. Represent and critically analyse data, statistics and probability values in order to draw conclusions on problems investigated and to predict trends. *For example: *compare data about stolen vehicles from providers of tracking devices with data provided by official sources like SAPS, and draw conclusions about the trend in vehicle thefts (types of cars most at risk, areas most at risk).*
5. Critically engage with the use of probability values in making predictions of outcomes in the context of games and real-life situations. *For example: Investigate claims that the probability of winning a game of chance (e.g. a slot machine) improves if it has not produced a winner for some time.*
6. Critically evaluate statistically-based arguments, describe the use and misuse of statistics in society, and make well-justified recommendations.

5.7 NSC English Home Language

5.7.1 Aims and Objectives

The National Curriculum Statement for English Home Language outlines the following objectives, in order that candidates:

- Broaden and deepen language competencies developed, including abstract language skills required for academic learning, and the aesthetic appreciation and enjoyment of texts; learners should be able to use language with confidence;
- Use language appropriately in real-life contexts, taking into account audience, purpose and context;
- Express and justify their own ideas, views and emotions confidently in order to become independent and analytical thinkers;
- Use language and their imagination to represent and explore human experience;
- Use language to access and manage information for learning across the curriculum and in a wide range of other contexts;
- Use language as a tool for critical and creative thinking;
- Express reasoned opinions on ethical issues and values;
- Interact critically with a wide range of texts;
- Recognise the unequal status of different languages and language varieties;

5.7.2 English Home Language Learning Outcomes

1. LO 1: Listening and Speaking

The learner is able to listen and speak for a variety of purposes, audiences and contexts. Learners understand that speaking and listening are social activities that take place in particular contexts and for various purposes and audiences, and that oral genres and registers vary accordingly. They recognise and use appropriate oral genres and registers in a range of formal and informal contexts.

2. LO 2: Reading and Viewing

The learner is able to read and view for understanding and to evaluate critically and respond to a wide range of texts.

3. LO 3: Writing and Presenting

The learner is able to write and present for a wide range of purposes and audiences using conventions and formats appropriate to diverse contexts. The aim is to produce competent, versatile writers who will be able to use their skills to develop appropriate written, visual and multi-media texts for a variety of purposes.

4. LO 4: Language

The learner is able to use language structures and conventions appropriately and effectively. Through interacting with a variety of texts, learners extend their use of vocabulary and correctly apply their understanding of language structures. They develop critical awareness of how values and power relations are embedded in language and how language may influence others.

English Home Language Learning Outcomes (Grade 12)
Learning Outcome 1: Listening and Speaking *The learner is able to listen and speak for a variety of purposes, audiences and contexts.*
a. demonstrate knowledge of different forms of oral communication for social purposes b. demonstrate planning and research skills for oral presentations c. demonstrate the skills of listening to and delivery of fluent and expressive oral presentations d. demonstrate critical awareness of language use in oral situations:
Learning Outcome 2: Reading and Viewing *The learner is able to read and view for understanding and to evaluate critically and respond to a wide range of texts.*
a. demonstrate various reading and viewing strategies for comprehension and appreciation b. evaluate the meaning of a wide range of written, visual, audio, and audio-visual texts c. evaluate how language and images may reflect and shape values and attitudes in texts d. explore and evaluate key features of texts and explain how they contribute to meaning (*not dealt with in isolation)* * transactional & creative texts: * literary texts: *novel, short story, folklore, short essay; poetry; drama & film study;* * visual, audio and multi-media texts: *film study, television and radio drama*
Learning Outcome 3: Writing and Presenting *The learner is able to write and present for a wide range of purposes and audiences using conventions and formats appropriate to diverse contexts.*
a. demonstrate planning skills for writing for a specific purpose, audience and context b. demonstrate the use of advanced writing strategies and techniques for first drafts c. reflect on, analyse, and evaluate own work, considering the opinion of others, and present final product
Learning Outcome 4: Language *The learner is able to use language structures and conventions appropriately and effectively.*
a. identify and explain the meanings of words and use them correctly in a wide range of texts b. use structurally sound sentences in a meaningful and functional manner c. develop critical language awareness

5.7.3 The use of texts for the teaching of language

The National Curriculum Statement explains that 'text' is used to incorporate the widest possible meaning and should include all oral, written, visual, audio, audio-visual and multi-media forms. Schools and teachers are advised to use texts that increase in complexity from Grade 10 through to Grade 12, and thus reflect the progress outlined by the assessment standards. Texts are, therefore, the main source of 'content' and 'context' for the communicative, integrated learning and teaching of languages.

Detailed advice is also provided to demonstrate the extent to which a text can illustrate to learners a broad and diverse range of insights, themes, values, and perspectives that reflect social, cultural and historical references; in addition texts are intended to demonstrate the manner in which language can be explored and exploited.

The National Curriculum guidance encourages an approach that is both text-based and communicative, encompassing through the texts as broad a variety of genres as possible. In short, a wide selection of texts must be integrated into the teaching.

English Home Language: Texts used for the integrated teaching of home language, Grades 10-12	
Literary texts:	Autobiographies; Biographies; Drama; Essays; Film study; Novel; Poetry; Short stories
Other genres	Includes… transactional, reference, creative, visual, audio, audio-visual and multi-media texts.
Transactional texts	Advertisements; Brochures; Dialogues (written); Diary entries; Editorials; E-mail messages; Faxes; Flyers; Forms; Invitations; Letters (formal and informal); Magazine articles and columns; Memoranda; Minutes and agendas; Newspaper articles and columns; Notes; Notices; Obituaries; Pamphlets; Posters; Reports (formal and informal); Reviews; Telegrams
Reference texts	Dictionary; Encyclopaedia; Schedules; Telephone directories; Textbooks; Thesaurus; Timetables; TV guides
Creative texts	Creative texts created by learners; Dialogues; Diaries; Dramatisation; Jokes; Literary texts; Myths, legends and fables; Riddles; Songs; Speeches; Story telling
Visual, audio, audio-visual and multi-media texts	Advertisements; Cartoons; Charts and maps; Comic strips; Dramas; Engravings; Graffiti; Graphs, diagrams, tables; Illustrations; Jokes (illustrated), caricatures; Music videos; Photographs; Radio programmes; Readings of dramas, novels or short stories; Recordings; Signs; Slide shows; Slides; Slogans; Symbols; Texts read aloud; Transparencies; TV programmes and Documentaries

English Home Language: Texts produced during the integrated teaching of home language, Grades 10 – 12 (A selection should be produced in Grades 10 to 12.)	
Transactional texts	Advertisements; Brochures; Curriculum Vitae; Dialogues; Diary entries; Editorials; E-mail messages; Faxes; Filling in forms; Formal and informal letters to the press; Formal letters of application, request, complaint, sympathy, invitation, thanks, congratulations and business letters; Friendly letters; Invitation cards; Magazine articles and columns; Memoranda; Minutes and agendas; Newspaper articles and columns; Obituaries; Pamphlets; Postcards; Reports (formal and informal); Reviews; SMS
Reference and informational texts	Dictionary entries (personalised spelling lists and word definitions); Directions; Instructions; Mind-maps and flow-charts; Notes; Paraphrases; Research projects; Summaries
Creative texts	Narrative, descriptive, reflective, discursive, expository and argumentative compositions; Responses to literature
Oral, visual and multi-media texts	Advertisements; Dialogues; Flyers; Formal and informal speeches; Interviews; Posters; Presentations with graphic / sound effects; Research projects; Slogans
Non-compulsory texts for enrichment	dramatisations, story-telling, radio and television news, radio and television dramas, panel discussions, own short stories/poems/plays, cartoons, comic strips, jokes, signs etc

The organisation and presentation of the specifications for the English Home Language option appears to share many similarities with the respective organisation of the GCE counterpart. Both specifications focus closely on the effect of language choice, text type, and language delivery can all contribute to the impact of the text. Both specifications also focus

on the diversity of language sources that may be called upon and used as examples throughout the duration of the course. In other words, whilst candidates are expected to cover a number of recommended literary texts they are also encouraged to explore language as it is used in day to day life, in a variety of contexts and situations.

5.8 NSC Geography

5.8.1 Aims and Objectives

The NCS the following subject aims and objectives, which correlate directly to identifiable learning outcomes. NSC Geography aims to:

1. Develop tools and skills to research, interpret, analyse and make judgements based on the information gathered, thereby contributing to geographical literacy.
2. Develop knowledge and critical understanding of the changing nature and interrelatedness of human existence and the environment over space and time.
3. Prepare learners to become informed, critical and responsible citizens who can make sound judgements and take appropriate action that will contribute to equitable and sustainable development of human society and the physical environment.

5.8.2 Learning Outcomes

Geography Learning Outcomes (at Grade 12)
1: Geographical Skills and Techniques (practical competence) *The learner is able to demonstrate a range of geographical skills and techniques.* Learners will be expected to use a range of geographical skills and techniques in order to use and manipulate data and information. Furthermore, learners should demonstrate the skills to communicate and present findings/information reliably and accurately.
2: Knowledge and Understanding (foundational competence) *The learner is able to demonstrate knowledge and understanding of processes and spatial patterns dealing with interactions between humans, and between humans and the environment in space and time.* Learners will be expected to demonstrate a fundamental knowledge of physical and human processes and the patterns which result from them, as well as the interactions between humans and the environment on local and a national scale.
3: Application (reflexive competence) *The learner is able to apply geographical skills and knowledge to environmental issues and challenges, recognise values and attitudes, and demonstrate the ability to recommend solutions and strategies.* Learners will be expected to apply acquired knowledge and skills to propose solutions or strategies to manage local or national problems, adapt known/common solutions for different problems and contexts, recognising the values, attitudes and knowledge systems informing the actions of those involved.

5.8.3 Learning Outcomes in relation to Assessment Standards

Learning outcomes are outlined in relation to the Assessment Standards for each of the three years of study of the NSC. However, for the purposes of this report, the emphasis focuses on the outcomes in the final year, Grade 12. The rationale supporting this suggests that if the purpose of Grades 10 and 11 is to promote candidates to Grade 12 in order to write their NSC examinations, that the learning outcomes in the first two grades should logically be assimilated into those for the final Grade.

Geography Learning Outcomes in relation to Assessment Standards Grade 12		
LO 1 Geographical skills and techniques (practical competence)	**LO 2** Knowledge and understanding (foundational competence)	**LO 3** Application (reflexive competence)
Plan a geographical research project of limited extent in a familiar context - Integrate information from a variety of sources. - Compare and contrast information from a variety of sources - Analyse the acquired information in order to answer the initial question - Substantiate findings in written, oral or illustrative form	Explain the influence of processes and associated spatial patterns in a range of places and regions - Account for the similarities and differences in processes and spatial patterns between places and between regions. - Explore possible responses to issues and challenges arising from human and environment - interactions in a local and national context. - Examine different approaches used to sustain the environment that take into account different knowledge systems in a variety of contexts	Apply skills and knowledge to a range of phenomena, issues and challenges at local and national scales - Examine values and attitudes held by individuals and groups associated with processes, spatial patterns and human environment interactions at local and national scales

5.8.4 Geography Content and Context

The skills and techniques required by Grade 12 are initially developed at Grades 10 and 11, with the intention that candidates develop and increase their dexterity year on year. By Grade 12 candidates demonstrate these skills and techniques with increased sophistication and familiarity. At Grades 10 and 11 a broad range of physical and human geographical aspects are covered. In Grade 10, module B encompasses the composition, structure, heating of and moisture in the atmosphere; this is linked to the human impact on the weather, drawing on issues such as the greenhouse effect. By Grade 11 the application of subject matter is extended beyond South Africa and to the continent of Africa as a whole. 'The significance of water masses' covers the water cycle, considers masses of water within Africa and explores the effects that climate change can have on the human environment. The importance of the oceans to the natural world is also explored, whilst the theme of human intervention is given consideration.

Structure and changing landforms, module C at Grade 10, covers elementary aspects of geological features of geography, including internal and external forces shaping and changing the structure of the earth's surfaces. Modules C and D cover human elements, 'People and places' and also 'People and their organisations'; the former considers common factors affecting population growth, distribution and displacement. The latter explores aspects of social responsibility and awareness, and the organisation of people on civic, national, continental and global levels. There is a clear development of human geographical themes from Grade 10 to Grade 11, where global and national level sustainability is given greater emphasis, addressing urban and rural development, and global development including approaches to address the uneven progress in different parts of the world. The subject, 'People and their needs' focuses on resources and energy, their use and management, again considered in the context of sustainability.

Geography Content and Context for attainment of assessment standards		
	Grade 10	**Grade 11**
A	Geographical skills and techniques	Geographical skills and techniques
B	Atmosphere: weather and climate (Context: The World)	The significance of water masses (Context: Africa and the World)
C	The structure and changing landforms of the Earth (Context: The World)	Ecosystems (biotic and abiotic components) (Context: Africa and the World)
D	People and places: population (Context: The World and Africa)	Development and sustainability (Context: Africa and the World)
E	People and their organisations (Context: The World and Africa)	People and their needs (Context: Africa)

Geography Content Frameworks (sourced from the IEB Geography SAG)	
Section A Geographical Skills and Techniques	
Using Atlases • Map use and map skills • Map Projections: Gauss Conformal, Universal Transverse Mercator	• Fieldwork • Geographical Information Systems (GIS) including: Data management; Data manipulation and analysis/spatial analysis; Product generation; Application
Section B Climate and Weather (Context: South Africa and the World)	
• Global air circulation and resultant weather patterns • Changes in energy balance • Mid-latitude cyclones and associated weather patterns (Impact on human activities in South Africa) • Tropical cyclones and associated weather patterns (Impact on human activities; Pre-cautionary strategies and disaster management)	• Subtropical anticyclones and resultant weather over South Africa • Synoptic weather maps and satellite image reading and interpretation • Climates at regional and local scale • Human-made climates (urban climate) • Climate hazards and human responses to these –risk and vulnerability
Section C Fluvial Processes and Landforms (Context: South Africa)	
• Fluvial processes; Flowing water; River profiles; Superimposed and antecedent rivers; Drainage basis: characteristics, drainage patterns, importance and impact of humans	• Topography associated with horizontal, massive igneous and inclined layers • Slopes: types, characteristics and significance for human activity • Mass movements and human responses
Section D People and Place: Rural and Urban Settlement (Context: South Africa and Africa)	
• **Processes and spatial patterns involved in rural and urban settlements** Settlement function, size and situation, density, hierarchy, services and profile Population size, structure and patterns, land-use characteristics, zones and sphere of influence • **Key human-environment interactions in urban settlements** **Settlement issues**: inner city problems, renewal, urban blight, congestion, pollution and land-use conflict, standards of living, political influences Post-modern urban settlements (changing urban centres) Governance of urban settlements (Agenda 21 and local authorities)	• **Key human-environment interactions in rural settlements** **Settlement issues**: rural depopulation, closure of services, ageing of population, political influences Governance of rural settlements (Agenda 21 and local authorities) • **Key sustainability related strategies include**: Urban: new towns, inner city renewal, self-help cities, urban planning, sustainable strategies to manage expanding centres, informal settlements Rural: sustainable strategies to manage dwindling rural settlements, land reform and land redistribution, impact of HIV/Aids and wars (refugees and displace people) on rural settlement patterns
Section E People and their needs (Suggested context: South Africa and the World)	
• **Economic activities** Primary, secondary, tertiary and quaternary economic activities Influence of economic, physical, political and social factors Perceptions of decision-makers on the location of industries and other economic activities Impact of humans on location of economic activities Response of people to environmental and socio-economic activities on people Impact of the change of location of economic activities on people	Importance and challenges of the informal sector in different contexts Influence of globalisation on economies and change Agriculture as an economic activity - special emphasis on southern Africa - food security - risks and vulnerability Transport and trade • **Water as a critical resource in South Africa** Availability of water Distribution and supply of water to South African citizens Sustainable use and management of water

The content for Grade 12 is detailed in the Subject Assessment Guidelines, and reflects the content requirements stated in the National Curriculum Statement and also provides clear and manageable direction towards the content that will ultimately be included and assessed in the examinations. In terms of attaining the NSC, it is this content which is crucial, since it is the content of Grade 12 that features in examinations.

5.9 GCE A Level

5.10 GCE A Level Biology

The A Level aims are indicated below and reflect the needs of people through the applications of biology.

5.10.1 Aims

GCE A Level Biology: Aims	
The aims of the A Level Biology syllabus are to encourage students to:	
	Recognise the value and responsible use of biology in society
	Be aware of advances in technology, including information technology, relevant to biology
	Develop an understanding of scientific method
	Develop essential knowledge and understanding of concepts of biology, and the skills needed for the use of these in new and changing situations
	Show knowledge and understanding of facts, principles and concepts from different areas of biology and to make and use connections between them
	Sustain and develop their enjoyment of, and interest in, biology

GCE A Level Biology: Aims of the Specifications	
The aims of these specifications are to:	
	Develop essential knowledge and understanding of biological facts, concepts and principles together with an appreciation of their significance, and the skills needed for their use in new and changing situations
	Promote an appreciation of the importance of experimental and investigatory work in the study of biology and develop an understanding of the link between theory and experiment and of scientific methods
	Develop an understanding of the connections between facts, principles and concepts from different areas of biology
	Sustain and develop an enjoyment of, and interest in, the study of living organisms
	Recognise the value and responsible use of biology in society
	Promote an appreciation of the development and significance of biology in personal, social, environmental, economic and technological contexts and an awareness of advances in technology, including IT, relevant to biology
	Be complete in themselves and perform a useful educational function for candidates not intending to study biology at a higher level
	Be a suitable preparation for biological studies in higher and other educational establishments and for professional courses which require candidates to have a knowledge of biology when admitted
	Provide opportunities for an understanding of spiritual, moral and cultural issues.

The aims of the GCE in Biology echo an underlying principle of the NSC subjects, particularly science subjects, in that the courses make students aware that the subjects are not to be studied in isolation but should be related, in a wider sense, to the needs of people. This encompasses relevant and important aspects of modern life, including those of a personal, social, environmental, economic and technological nature.

5.10.2 Curriculum Content

GCE A level Biology Curriculum Outline	
Compulsory Section	
The AS knowledge and understanding set out here comprises approximately 60 per cent of the AS specification. The AS and A2 knowledge and understanding combined should comprise approximately 60 per cent of an A level specification.	
AS Content	
1. Biology specifications must ensure that there is an appropriate balance between plant biology, animal biology and microbiology and include an appreciation of the relevance of sustainability to all aspects of scientific developments. **2. Living organisms** including plants, animals and micro-organisms, interact with each other and with the non-living world. The living world can be studied at population, organism, cell and molecular levels. There are fundamental similarities as well as differences between plants, animals and micro-organisms. **3. Biodiversity** - The variety of life, both past and present, is extensive, but the biochemical basis of life is similar for all living things. - Biodiversity refers to the variety and complexity of life and may be considered at different levels. - Biodiversity can be measured, for example within a habitat or at the genetic level. - Classification is a means of organising the variety of life based on relationships between organisms and is built around the concept of species. - Originally classification systems were based on observable features but more recent approaches draw on a wider range of evidence to clarify relationships between organisms. - Adaptations of organisms to their environments can be behavioural or physiological as well as anatomical. - Adaptation and selection are major components of evolution and make a significant contribution to the diversity of living organisms. **4. Exchange and transport** - Organisms need to exchange substances selectively with their environment and this takes place at exchange surfaces.	**4. Exchange and transport** - Factors such as size or metabolic rate affect the requirements of organisms and this gives rise to adaptations such as specialised exchange surfaces and mass transport systems. - Substances are exchanged by passive or active transport across exchange surfaces. - The structure of the plasma membrane enables control of the passage of substances in and out of cells. **5. Cells** - Organisms usually consist of one or more cells. - Prokaryotic and eukaryotic cells can be distinguished on the basis of their structure and ultrastructure. - In complex multicellular organisms cells are organised into tissues, tissues into organs and organs into systems. - During the cell cycle genetic information is copied and passed to daughter cells. - Daughter cells formed during mitosis have identical copies of genes while cells produced as a result of meiosis are not genetically identical. **6. Biological molecules** - Biological molecules are often polymers and are based on a small number of chemical elements. - In living organisms nucleic acids (DNA and RNA), carbohydrates, proteins, lipids, inorganic ions and water all have important roles and functions related to their properties. - Enzymes are proteins with a mechanism of action and other properties determined by their tertiary structure. - Enzymes catalyse a wide range of intracellular reactions as well as extracellular ones.
A2 Content	
7. Ecosystems - Ecosystems range in size from the very large to the very small. - Energy flows through ecosystems and the efficiency of transfer through different trophic levels can be measured. - Micro-organisms play a key role in recycling chemical elements. - Ecosystems are dynamic systems, usually moving from colonisation to climax communities in a process known as succession. - The dynamic equilibrium of populations is affected by a range of factors.	- Humans are part of the ecological balance and their activities affect it both directly and indirectly. - Sustainability of resources depends on effective management of the conflict between human needs and conservation. **8. Control systems** - Homeostasis is the maintenance of a constant internal environment. - Negative feedback helps maintain an optimal internal state in the context of a dynamic equilibrium. Positive feedback also occurs. - Stimuli, both internal and external, are detected leading to responses.

The Biology A level content is structured in such a way as to demonstrate the progression during the two-year programme, with A2 providing more challenging content that builds on knowledge gained during the AS year. Whilst there are clear correlations between the NSC and the GCE, the specification for the GCE appears to cover slightly larger area of topic matter. In addition to this, it is clear that the majority of the GCE specification is tested through the six examinations that comprise the qualification over the two years of GCE study. By comparison, it is questionable how the NSC could possibly test all of its content specification in two final written examinations at the end of Grade 12. This suggests that the planning of the final examinations must pose examiners with the headache of which material to include and which to omit.

5.10.3 Learning Outcomes

GCE A Level Biology Assessment Objectives (both AS and A Level)	
Knowledge with understanding	
	Recognise, recall and show understanding of specific biological facts, terminology, principles, relationships, concepts and practical techniques
	Draw on existing knowledge to show understanding of the ethical, social, economic, environmental and technological implications and applications of biology
	Select, organise and present relevant information clearly and logically using appropriate vocabulary.
Application of knowledge and understanding, analysis, synthesis and evaluation	
	Describe, explain and interpret phenomena and effects in terms of biological principles and concepts, presenting arguments and ideas clearly and logically, and using specialist vocabulary where appropriate
	Interpret and translate, from one form into another, data presented as continuous prose, or in tables, diagrams, drawings and graphs
	Apply biological principles and concepts in solving problems in unfamiliar situations, including those which relate to the ethical, social, economic and technological implications and applications of biology
	Assess the validity of biological information, experiments, inferences and statements.
Experiment and investigation	
	Devise and plan experimental activities, selecting appropriate techniques
	Demonstrate safe and skilful practical techniques
	Make observations and measurements with appropriate precision and record these methodically
	Interpret, explain, evaluate and communicate the results of their experimental activities using biological knowledge and understanding and employing appropriate specialist vocabulary
Synthesis of knowledge, understanding and skills	
	Bring together principles and concepts from different areas of biology and apply them in a particular context, expressing ideas clearly and logically and using appropriate specialist vocabulary
	Use biological skills in contexts which bring together different areas of biology

There are some clear similarities between the NSC learning outcomes, and the GCE A level outcomes listed above. The NSC covers scientific inquiry and problem solving skills,

construction and application of Life Sciences knowledge and also Life Sciences, technology, environment and society. GCE Biology covers:

- Knowledge with understanding
- Application of knowledge and understanding, analysis, synthesis and evaluation
- Experiment and investigation
- Synthesis of knowledge, understanding and skills

Furthermore, the fourth set of learning outcomes, "synthesis of knowledge, understanding and skills" is a combination of the first three outcomes. These assessment outcomes are outlined in a similar fashion for all A Level subjects.

5.11 GCE A Level Chemistry

5.11.1 Aims

GCE A Level Chemistry: Aims	
The aims of the A Level Chemistry syllabus are to encourage students to:	
1.	Stimulate and sustain students' interest in and enjoyment of chemistry
2.	Enable students to gain a knowledge and understanding of chemistry appropriate to these levels and to appreciate the interlinking patterns which are a distinguishing feature of the subject
3.	Show the interrelationship between the development of the subject and its application (social, economic, environmental and technological) and recognise the value of chemistry to society and how it may be used responsibly
4.	Develop skills in laboratory procedures and techniques and carry these out with due regard for safety, and assess the uses and limitations of the procedures
5.	Foster imaginative and critical thinking as well as the acquisition of knowledge, together with an appreciation of the intellectual discipline which the subject provides
6.	Develop students' ability to understand the link between theory and experiment
7.	Provide opportunities for students to bring together knowledge of how different areas of chemistry relate to each other
8.	Aid awareness of how advances in information technology and instrumentation are used in chemistry
9.	Provide an appropriate course for: • those who will end their study of the subject at one of these stages • laying a secure foundation for those who will continue their studies in this or related subjects

GCE A Level Chemistry: Aims of the Specifications	
The specification contains the following broad objectives:	
	Developing and using practical techniques to investigate chemistry
	Observing and using trends in the behaviour of substances
	Solving chemical problems using mathematical techniques
	Solving chemical problems using concepts
	Studying the application of chemistry in selected fields, together with their social and economic aspects.

5.11.2 Chemistry Curriculum Content

GCE A level Chemistry Curriculum Outline

The AS knowledge and understanding set out here comprises approximately 60 per cent of the AS specification. The AS and A2 knowledge and understanding combined should comprise approximately 60 per cent of an A level specification. For ease of access, the AS and A2 content has been presented together. Chemistry specifications must ensure an appreciation of the relevance of sustainability to all scientific developments.

Formulae, equations and amounts of substance
- Empirical and molecular formulae.
- Balanced chemical equations (full and ionic).
- The Avogadro constant and the amount of substance (mole).
- Relative atomic mass and relative isotopic mass.
- Calculation of reacting masses, mole concentrations, volumes of gases, per cent yields and atom economies.
- Simple acid–base titrations.
- Non-structured titration calculations, based solely on experimental results

Atomic structure
- Structure and electronic configuration of atoms (up to Z = 36) in terms of main energy levels and *s, p* and *d* orbitals.
- Ions and isotopes. Use of mass spectrometry in determining relative atomic mass and relative abundance of isotopes

Bonding and structure
- Interpretation of ionic and covalent bonding in terms of electron arrangements. Examples of simple covalent, giant covalent, ionic and metallic structures.
- Permanent and induced dipole–dipole interactions between molecules, including hydrogen bonding. Electronegativity and its application to bond type. Interpretation of the physical properties of materials in terms of structure and bonding.
- Shapes of simple molecules and ions with up to six outer pairs of electrons (any combination of bonding pairs and lone pairs). Interpretation in terms of electron pair repulsion theory.

Energetics
- Enthalpy changes, including standard enthalpy changes of reaction, formation and
- combustion. Average bond enthalpies.
- Use of Hess's law to calculate enthalpy changes.
- Use of energetics, including entropy, to predict the feasibility of reactions

Kinetics
- A qualitative understanding of collision theory. Activation energy and its relationship to the qualitative effect of temperature changes on rate of reaction.
- The role of catalysts in providing alternative routes of lower activation energy.
- Determination and use of rate equations of the form: *Rate = k[A]m[B]n*, where *m* and *n* are integers. Using orders of reactions where appropriate, which may give information about a rate-determining/limiting step.

Equilibria
- The dynamic nature of equilibria. For homogeneous reactions, the qualitative effects of temperature, pressure and concentration changes on the position of equilibrium.
- Equilibrium constants, *Kc*. Calculation of *Kc* and reacting quantities
- The effect of temperature changes on *Kc*
- The Bronsted–Lowry theory of acid–base reactions.
- The ionic product of water, *Kw*; pH and its calculation for strong acids and strong bases
- Dissociation constants of weak acids, *Ka*. Calculation of pH for weak acids. Buffer solutions and their applications

Redox
- Oxidation states and their calculation.
- Oxidation and reduction as electron transfer, applied to reactions of *s, p* and *d* block elements.
- Electrode potentials and their applications

Inorganic chemistry and the periodic table
- The organisation of elements according to their proton number and electronic
- structures. Classification of elements into *s, p* and *d* blocks.
- The characteristic reactions of the elements and compounds of a metallic group and a non-metallic group. Trends in properties of elements and compounds within these groups
- Trends in properties of elements across a period including:
  melting point; ionisation energy.
- The transition metals as *d* block elements forming one or more stable ions that have incompletely filled *d* orbitals. At least two transition metals, chosen from titanium to copper, to illustrate
  - the existence of more than one oxidation state for each element in its compounds
  - the formation of coloured ions in solution and simple precipitation reactions of these
  - reactions with ligands to form complexes and reactions involving ligand substitution
  - the catalytic behaviour of the elements and their compounds

Organic chemistry
- Functional groups. Structural isomers and stereoisomers (limited to geometric (E–Z) isomerism as a result of restricted rotation about a carbon–carbon double bond and optical isomerism as a result of chirality in molecules with a single chiral centre).
- Reactions classified as addition, elimination, substitution, oxidation, reduction, hydrolysis, addition polymerisation and condensation polymerisation.
- Mechanisms classified as radical substitution, electrophilic addition, nucleophilic substitution, electrophilic substitution and nucleophilic addition.
- Single and double covalent bonds, bond polarity and bond enthalpy as factors influencing reactivity, illustrated by reference to appropriate reactions.
- The structure of, and the bonding in, benzene
- Organic synthesis, including characteristic reactions of alkanes, alkenes,
- halogenoalkanes, alcohols, arenes, aldehydes, ketones, carboxylic acids, esters, amines, amino acids and amides.
- Modern analytical techniques
- The use of mass spectrometry, infrared spectroscopy, nuclear magnetic resonance spectroscopy and chromatography in analysis, including techniques for the elucidation of structure.

The Chemistry syllabus above provides a detailed specification of the compulsory elements of the course and emphasises theoretical and mathematical components of chemical knowledge.

5.11.3 Learning Outcomes

GCE A Level Chemistry Assessment Objectives (both AS and A Level)	
	Knowledge with understanding
	recognise, recall and show understanding of specific chemical facts, terminology, principles, concepts and practical techniques
	draw on existing knowledge to show understanding of the responsible use of chemistry in society
	select, organise and present relevant information clearly and logically, using specialist vocabulary where appropriate
	Application of knowledge and understanding, analysis, synthesis and evaluation
	describe, explain and interpret phenomena and effects in terms of chemical principles and concepts, presenting arguments and ideas clearly and logically, using specialist vocabulary where appropriate
	interpret and translate, from one form into another, data presented as continuous prose or in tables, diagrams and graphs
	carry out relevant calculations
	apply chemical principles and concepts to unfamiliar situations, including those related to the responsible use of chemistry in society
	assess the validity of chemical information, experiments, inferences and statements
	Experiment and investigation
	devise and plan experimental and investigative activities, selecting appropriate techniques
	demonstrate safe and skilful practical techniques
	make observations and measurements with appropriate precision and record these methodically
	interpret, explain, evaluate and communicate the results of their experimental and investigative activities clearly and logically using chemical knowledge and understanding, and using appropriate specialist vocabulary
	Synthesis of knowledge, understanding and skills
	bring together knowledge, principles and concepts from different areas of chemistry, including experiment and investigation, and apply them in a particular context, expressing ideas clearly and logically and using appropriate specialist vocabulary
	use chemical skills in contexts which bring together different areas of the subject

Knowledge, understanding and skills are closely linked. The assessment objectives 1, 2 and 3 are the same for both the AS and A2 parts of the course. Assessment objective 4 applies only to the A2 part of the Advanced GCE. As with A level Biology, the Chemistry syllabus refers to assessment objectives rather than learning outcomes to describe the student expectations. The points follow a similar template pattern to those used for Biology, with the four main categories and sub-points tailored to Chemistry.

5.12 GCE A Level Physics

5.12.1 Aims

The GCE Physics aims are reflective of the respective aims for other GCE Biology and Chemistry. The aims discuss the broad-based skills that a student will acquire during the

programme, whereas the objectives stress the position of the qualification in the structure of national education and demonstrate progression possibilities open to successful students.

GCE A Level Physics: Aims	
The aims of the A Level physics syllabus are to encourage students to:	
	Develop essential knowledge and understanding in physics and, where appropriate, the applications of physics, and the skills needed for the use of this in new and changing situations
	Develop an understanding of the link between theory and experiment
	Appreciate how physics has developed and is used in present day society
	Show the importance of physics as a human endeavour which interacts with social, philosophical, economic and industrial matters
	Sustain and develop their enjoyment of, and interest in, physics
	Recognise the quantitative nature of physics and understand how mathematical expressions
	Relate to physical principles
The Advanced GCE physics specifically aims to encourage students to:	
	Bring together knowledge of ways in which different areas of physics relate to each other
	Study how scientific models develop

5.12.2 Physics Curriculum Content

GCE A level Physics Curriculum Outline	
Compulsory Section	
The AS knowledge and understanding set out here comprises approximately 60 per cent of the AS specification. The AS and A2 knowledge and understanding combined should comprise approximately 60 per cent of an A level specification.	
AS Content	
1. Mechanics **Vectors** Resolution into two components at right angles; addition rule for two vectors; calculations limited to two perpendicular vectors **Kinematics** Graphical representation of uniform accelerated motion; use of kinematic equations in one dimension with constant velocity or acceleration; interpretation of speed and displacement graphs for motion **Dynamics** Use of F = ma when mass is constant; one- and two-dimensional motion under constant force; independent effect of perpendicular components with non-uniform acceleration **Energy** Calculation of work done for constant forces, including force not along the line of motion; calculation of exchanges between gravitational potential energy and kinetic energy **2. Electric circuits** **Current** Electric current as rate of flow of charge, I = Δq/Δt **DC circuits** Conservation of charge and energy in simple circuits; relationships between currents, voltages and resistances in series and parallel circuits; potential divider circuits **Emf and potential difference** Definition of emf and concept of internal resistance potential difference in terms of energy transfer **Resistance** Definition; Resistivity; Ohm's law as a special case power dissipated **Capacitance** Definition; energy of a capacitor; quantitative treatment of discharge curves	**3. Waves** Qualitative treatment of polarisation and diffraction; path difference, phase and coherence; graphical treatment of superposition and standing waves **4. Quantum and nuclear physics** **Photons** Photon model to explain observable phenomena; evidence supporting the photon model **Particles** Evidence supporting the quantum model for particles; a study of particle diffraction would provide suitable depth of treatment **Nuclear decay** Connections between nature, penetration and range of ionising particles; evidence for existence of nucleus; activity of radioactive sources; modelling with constant decay probability leading to exponential decay; idea of half life; nuclear changes in decay **Nuclear energy** E = mc2 applied to nuclear processes; appreciation that E = mc2 applies to all energy changes; simple calculations relating mass difference to energy change; descriptions of fission and fusion processes. **5. Fields** **Force fields** Concept and definition; gravitational force and field for point (or spherical) masses; electric force and field for point (or spherical) charges in a vacuum; uniform electric field; similarities and differences between electric and gravitational fields **B-fields** Force on a straight wire and force on a moving charge in a uniform field with field perpendicular to current or motion **Flux and electromagnetic induction** Concept and definition; Faraday's and Lenz's laws; emf as equal to rate of change of magnetic flux and simple calculations

GCE A level Physics Curriculum Outline	
A2 Content	
1. Mechanics Momentum (A2 Content) Definition, equation; principle of conservation of momentum; calculations for one-dimensional problems Circular motion (A2 Content) Application of F = ma = mv2/r to motion in a circle at constant speed Oscillations (A2 Content) Simple harmonic motion; quantitative treatment, limited to $a = -(2\pi f)^2 x$ and the solution $x = A \cos 2\pi ft$; velocity as gradient of displacement–time graph qualitative treatment of free and forced vibrations, damping and resonance	**2. Matter (A2 Content)** **Molecular kinetic theory** Ideal gases; pV = NkT Absolute zero; effect of temperature on average molecular kinetic energy; energy of an ideal gas **Internal energy** Idea of internal energy; energy required for temperature change = $mc\Delta\theta$

The GCE Physics specification highlights the subject areas to be covered by either (or both) AS or A2 students and is highly content-specific, although this specification indicates approximately 60 per cent of the overall course content.

5.12.3 GCE A Level Physics Learning Outcomes

The organisation of the GCE A level science subject learning outcomes is identical for Biology, Chemistry and Physics in the sense that four key areas are identified as listed in the table. The final outcome, "Synthesis of knowledge, understanding and skills" is relevant to the second year of study. This reflects the demands of the synoptic assessment paper which encourages the application of specific subject knowledge to more open-ended questions, problems and situations. There is less evidence of synoptic assessment as expressed through the learning outcomes and as evidenced in the examination practices.

It is clear, however, that the NSC and the GCE organise the learning outcomes for Physical Sciences, and Chemistry and Physics, in a broadly similar fashion. The NSC covers practical skills in learning outcome 1, application of knowledge in outcome 2 and considerations of science, technology, society and the environment in the third outcome. These are encompassed by the first three learning outcomes for both GCE Chemistry and Physics.

GCE A Level Physics Assessment Objectives (both AS and A Level)	
	Knowledge with understanding
	Recognise, recall and show understanding of specific physical facts, terminology, principles, relationships, concepts and practical techniques
	Draw on existing knowledge to show understanding of the ethical, social, economic, environmental and technological implications and applications of physics
	Select, organise and present relevant information clearly and logically, using specialist vocabulary where appropriate
	Application of knowledge and understanding, analysis, synthesis and evaluation
	Describe, explain and interpret phenomena and effects in terms of physical principles and concepts, presenting arguments and ideas clearly and logically, using specialist vocabulary where appropriate
	Interpret and translate, from one form to another, data presented as continuous prose or in tables, diagrams and graphs
	Carry out relevant calculations
	Apply physical principles and concepts to unfamiliar situations including those which relate to the ethical, social, economic and technological implications and applications of physics

	Assess the validity of physical information, experiments, inferences and statements
	Experiment and investigation
	Devise and plan experimental activities, selecting appropriate techniques
	Demonstrate safe and skilful practical techniques
	Make observations and measurements with appropriate precision and record these methodically
	Interpret, explain, and evaluate the results of experimental activities, using knowledge and understanding of physics and to communicate this information clearly and logically in appropriate forms, for example: prose, tables and graphs, using appropriate specialist vocabulary
	Synthesis of knowledge, understanding and skills
	Bring together principles and concepts from different areas of physics and apply them in a particular context, expressing ideas clearly and logically and using appropriate specialist vocabulary
	Use the skills of physics in contexts which bring together different areas of the subject

5.13 GCE A Level Mathematics

5.13.1 Aims

The Mathematics aims place the required skills in to a broader context of A level achievement; there is clear encouragement for mathematical skills to be applied to real world situations.

GCE A Level Mathematics: Aims	
The aims of the A Level Mathematics syllabus are to encourage students to:	
1.	Develop their understanding of mathematics and mathematical processes in a way that promotes confidence and fosters enjoyment
2.	Develop abilities to reason logically and recognise incorrect reasoning, to generalise and to construct mathematics proofs
3.	Extend their range of mathematical skills and techniques and to use them in more difficult, unstructured problems
4.	Develop an understanding of coherence and progression in mathematics and of how different areas of mathematics can be connected
5.	Recognise how a situation may be represented mathematically and understand the relationship between 'real world' problems and standard and other mathematical models and how these can be refined and improved
6.	Use mathematics as an effective means of communication
7.	Read and comprehend mathematical arguments and articles concerning applications of mathematics
8.	Acquire the skills needed to use technology such as calculators and computers effectively, recognise when such use may be inappropriate and be aware of limitations
9.	Develop an awareness of the relevance of mathematics to other fields of study, to the world of work and to society in general
10.	Take increasing responsibility for their own learning and the evaluation of their own mathematical development.

5.13.2 Curriculum Content

The GCE A Level in Mathematics should be viewed as an inherently sequential subject; thus, there is a progression of material through all levels at which the subject is studied. The core content for AS is a subset of the core content for A2; progression in the subject will extend in a natural way beyond AS and A2, into Further Mathematics or into related courses

in higher education. The GCE criteria build on the knowledge, understanding and skills established in GCSE Mathematics.

GCE A level Mathematics Curriculum Outline	
Compulsory Section	
	Knowledge, Understanding and Skills **<u>Proof</u>** - AS and A level specifications in Mathematics should require: - Construction and presentation of mathematical arguments through appropriate use of logical deduction and precise statements involving correct use of symbols and appropriate connecting language. - Correct understanding and use of mathematical language and grammar in respect of terms such as 'equals', 'identically equals', 'therefore', 'because', 'implies', 'is implied by', 'necessary', 'sufficient', and notation such as =>, <= and ⇔. In addition, A level specifications in Mathematics should require: - Methods of proof, including proof by contradiction and disproof by counter-example.
AS Core Content	
	Algebra and functions - Laws of indices for all rational exponents - Use and manipulation of surds - Quadratic functions and their graphs. The discriminant of a quadratic function. Completing the square. Solution of quadratic equations. - Simultaneous equations: analytical solution by substitution, e.g. of one linear and one quadratic equation - Solution of linear and quadratic inequalities - Algebraic manipulation of polynomials, including expanding brackets and collecting like terms, factorisation and simple algebraic division; use of the Factor Theorem and the Remainder Theorem - Graphs of functions; sketching curves defined by simple equations. Geometrical interpretation of algebraic solution of equations. Use of intersection points of graphs of functions to solve equations. - Knowledge of the effect of simple transformations on the graph of y = f(x) as represented by y = af(x), y = f(x) + a, y = f(x + a), y = f(ax);
	Coordinate geometry in the (x,y) plane - Equation of a straight line, including the forms y - y1 = m(x - x1) and ax + by + c = 0 . Conditions for two straight lines to be parallel or perpendicular to each other. - Co-ordinate geometry of the circle using the equation of a circle in the form (x − a)squared + (y − b)squared = squared , and including use of the following circle properties: - the angle in a semicircle is a right angle - the perpendicular from the centre to a chord bisects the chord - the perpendicularity of radius and tangent
	Sequences and series - Sequences, including those given by a formula for the nth term and those generated by a simple relation of the form xn+1 = f(xn). - Arithmetic series, including the formula for the sum of the first n natural numbers. - The sum of a finite geometric series; the sum to infinity of a convergent geometric series, including the use of |r| < 1 - Binomial expansion of (1+ x)n for positive integer n. The notations n! and (n/r)
	Trigonometry - The sine and cosine rules, and the area of a triangle in the form ½ ab sin C - Radian measure, including use for arc length and area of sector - Sine, cosine and tangent functions. Their graphs, symmetries and periodicity - Knowledge and use of tan θ = sin θ / cos θ, and sin 2θ + cos 2θ = 1 - Solution of simple trigonometric equations in a given interval.
	Exponentials and logarithms - y = ax and its graph; - Laws of logarithms: - log ax + log ay = log a(xy) - log ax – log ay = log a(x/y) - k log ax = log a(x to the power of k) - The solution of equations of the form ax = b
	Differentiation - The derivative of f(x) as the gradient of the tangent to the graph of y = f (x) at a point; the gradient of the tangent as a limit; interpretation as a rate of change; second order derivatives - Differentiation of xn, and related sums and differences - Applications of differentiation to gradients, tangents and normals, maxima and minima and stationary points, increasing and decreasing functions
	Integration - Indefinite integration as the reverse of differentiation - Integration of xn - Approximation of area under a curve using the trapezium rule. Interpretation of the definite integral as the area under a curve. Evaluation of definite integrals
A2 Core Content	
	Algebra and functions - Simplification of rational expressions including factorising and cancelling, and algebraic division - Definition of a function. Domain and range of functions. Composition of functions.

GCE A level Mathematics Curriculum Outline
- Inverse functions and their graphs. - The modulus function - Combinations of these transformations - Rational functions. Partial fractions (denominators not more complicated than repeated linear terms)
Coordinate geometry in the (x,y) plane - Parametric equations of curves and conversion between Cartesian and parametric forms
Sequences and series - Binomial series for any rational n.
Trigonometry - Knowledge of secant, cosecant and cotangent and of arcsin, arccos and arctan. - Their relationships to sine, cosine and tangent. Understanding of their graphs and appropriate restricted domains. - Knowledge and use of sec 2θ = 1+ tan 2θ and cosec2θ = 1+ cot 2θ - Knowledge and use of double angle formulae; use of formulae for sin(A ± B) , cos(A ± B) and tan(A ± B) and of expressions for a cosθ + bsinθ in the equivalent forms of r cos(θ ±α) or r sin(θ ±α)
Exponentials and logarithms - The function e to the power of x and its graph - The function ln x and its graph; ln x as the inverse function of e to the power of x - Exponential growth and decay
Differentiation - Differentiation of e to the power of x, ln x , sinx, cosx, tanx and their sums and differences. - Differentiation using the product rule, the quotient rule, the chain rule and by the use of dy/dx = 1/ (dx/dy) - Differentiation of simple functions defined implicitly or parametrically. - Formation of simple differential equations.
Integration - Integration of e to the power of x, 1/x, sinx, cosx. - Evaluation of volume of revolution. - Simple cases of integration by substitution and integration by parts. These methods as the reverse processes of the chain and product rules respectively. - Simple cases of integration using partial fractions. - Analytical solution of simple first order differential equations with separable variables.
Numerical methods - Location of roots of f(x) = 0 by considering changes of sign of f(x) in an interval of x in which f(x) is continuous - Approximate solution of equations using simple iterative methods, including recurrence relations of the form xn+1 = f(xn) - Numerical integration of functions
Vectors - Vectors in two and three dimensions - Magnitude of a vector - Algebraic operations of vector addition and multiplication by scalars, and their geometrical interpretations - Position vectors. The distance between two points. Vector equations of lines - The scalar product. Its use for calculating the angle between two lines

The GCE Mathematics specification is highly content-specific, pinpointing the precise types of calculation/technique a student would be expected to learn, understand and apply. It indicates the sequential progression in Maths content from the AS to A2 years. The specification also provides the basic syllabus for the A level exams, from which awarding bodies can add further optional elements, such as statistics.

Analysis of the content of the respective Mathematics programmes provides for a better understanding of the NSC and GCE specification demands and requirements. It is notable that the NSC programme does not cover all of the subject areas of the GCE A level, including integration, differentiation, vectors and matrices, as demonstrated in the content specification for the NSC and as stated in the curriculum outline for the GCE A level above.

With regard to learning outcomes, and learning outcomes viewed through the lens of assessment objectives, some subject-related differences emerge. The organisation of the NSC mathematics learning outcomes refers to subject specific areas of mathematical knowledge and application, namely through ‘number and number relations’, ‘functions and algebra’, ‘shape, space and measurement’ and ‘data handling and probability’. By contrast, the GCE assessment objectives focus on generic aims, including “recall, select and use of

knowledge of mathematical facts, concepts and techniques" and "recall, select and use knowledge of standard mathematical models to represent situations in the real world".

5.13.3 Assessment Objectives

The assessment objectives and the associated weightings for AS and A2 Level are the same. Knowledge, understanding and skills are closely linked. Specifications require that candidates demonstrate the assessment objectives in the context of the content and skills prescribed.

GCE A Level Mathematics Assessment Objectives	
	Recall, select and use their knowledge of mathematical facts, concepts and techniques in a variety of contexts (minimum weighting 30%)
	Construct rigorous mathematical arguments and proofs through use of precise statements, logical deduction and inference and by the manipulation of mathematical expressions, including the construction of extended arguments or handling substantial problems presented in unstructured form (minimum weighting 30%)
	Recall, select and use their knowledge of standard mathematical models to represent situations in the real world; recognise and understand given representations involving standard models; present and interpret results from such models in terms of the original situation, including discussion of the assumptions made and refinement of such models (minimum weighting 10%)
	Comprehend translations of common realistic contexts into mathematics; use the results of calculations to make predications, or comment on the context; and, where appropriate, read critically and comprehend longer mathematical arguments or examples of applications (minimum weighting 5%)
	Use contemporary calculator technology and other permitted resources (such as formulae booklets or statistical tables) accurately and efficiently; understand when not to use such technology, and its limitations. (minimum weighting 5%)

The assessment objectives are given minimum weightings in all specifications as indicated in the table. The maximum weighting for any objective should not exceed the minimum weighting by more than 10 per cent of the overall credit; for example AO1 is weighted between 30 per cent and 40 per cent.

A Level Maths is largely dependent upon external examination, with the internal assessments contributing only 20% of the final mark, despite the fact that the internal assessments of the six units are each over an hour long. The concentration of attention on the final mark is again indicative of Maths as a subject, in that it remains the most traditional in terms of its assessment regime. There is nonetheless scope for also introducing synoptic assessment techniques into Maths, which currently contribute 20% of the final mark. As the assessment method is used to draw together knowledge from various elements of the programme, it is most often applied to situations where a student is building upon prior knowledge, possibly from the AS year.

5.14 GCE A Level English Language and Literature

The aims of the Edexcel Advanced Subsidiary and Advanced GCE in English Language and Literature are to encourage students to develop their interest and enjoyment in English as they:

- use integrated linguistic and literary approaches in their reading and interpretation of texts
- engage creatively and independently with a wide range of spoken, written and multimodal texts, exploring the relationships between texts
- undertake independent and sustained studies to develop their skills as producers and interpreters of language

5.14.1 Aims

GCE A Level English Language and Literature: Aims of the Specifications
AS/A2 Knowledge and understanding
AS and A2 specification requires students to undertake a programme of study to show knowledge & understanding of:
a range of spoken and written texts from different times, including at least two substantial texts from one of the genres of prose fiction, poetry and drama and at least one other substantial written text
some of the key constituents of language and how they function in combination to make meaning in spoken and written English
how variations in language, form and context shape and change meanings in speech and writing
some of the ways in which individual texts are interpreted by different readers or listeners
some analytical and creative approaches to the critical study of texts, drawing on linguistic and literary methodologies and concepts.
In addition for A2 the specifications should require students to show knowledge and understanding of:
a wider range of spoken and written texts from different times, including at least two further texts from a genre (prose fiction,poetry, drama) not studied at Advanced Subsidiary, and at least one other substantial written text
the significance of contextual factors in the production and reception of texts
how to apply linguistic and literary methodologies and concepts to inform their responses to and interpretations of texts

5.14.2 Learning Outcomes

GCE A Level English Language and Literature Learning Outcomes
AS/A2 Knowledge and understanding
Students will be able to:
apply integrated linguistic and literary methods and concepts in the study of spoken, written and multimodal texts
vary strategies for reading and listening according to text type and purpose for study
compare and contrast texts, exploring relationships between them
use English appropriately, accurately and creatively for a variety of audiences and purposes
use a range of techniques to produce texts for different audiences and purposes, informed by wide reading and listening
make accurate reference to texts and sources
In addition, at A2 students are required to show judgement and independence as they are able to:
synthesise and reflect on their knowledge and understanding of linguistic and literary concepts and methods in the study of spoken and written texts
make creative connections between elements of the course as a whole
sustain informed, critical judgements about issues raised in an integrated approach to textual analysis
devise, draft, edit and evaluate the effectiveness of their own texts, informed by their integrated studies
make appropriate use of the conventions of writing in advanced studies in English, including references to quotations and sources.

5.15 GCE A Level Geography

5.15.1 Aims

A level Geography aims are expressed in a broad fashion within materials published by the regulatory authorities and in more detail by awarding bodies. The Edexcel specifications summarise the anticipated acquisition of skills by a prospective student through the duration of the course. There is little that reflects the specific knowledge expectations in the subject, rather the overarching themes that would arise as the programme progresses.

Course objectives are separated into AS and A2 years of study, indicating the year-on-year progression. In a notable difference to the NSC, the GCE course objectives are examined at the end of each year and importantly contribute to the final grade. The GCE objectives closely resemble the format typical of learning outcomes. In this respect, the progression and development of skills from AS to A2 is similar to the presentation of progressive learning outcomes, and assessment standards in the NSC materials. At A2 particular emphasis is placed on the identification, analysis and synthesis of knowledge and information.

GCE A Level Geography: Aims of the Specifications	
AS and A level specifications in geography should require students to:	
	Develop knowledge and understanding of selected physical, human and environmental processes that underpin key geographical concepts
	Develop a knowledge and understanding of the key concepts of place, space, diversity, interdependence, people–environment interaction, the processes associated with these, and change over time
	Study at a range of scales and understand the importance of scale as a geographical idea
	Use a range of skills and techniques, including the use of maps and images at different scales necessary for geographical study
	Carry out research, and out-of-classroom work including fieldwork, as appropriate to the topics selected
	Use modern information technologies, including geographical information systems, as appropriate to the content
	Develop understanding of the application and relevance of geography.
In addition for A2 the specifications should require students to:	
	Undertake individual research/investigative work, including fieldwork
	Extend their understanding of geographical ideas, concepts and processes
	Identify and analyse the connections between the different aspects of geography
	Analyse and synthesise geographical information in a variety of forms and from a range of sources
	Consider new ideas and developments about the changing nature of geography in the 21st century
	Critically reflect on and evaluate the potential and limitations of approaches and methods used both in and outside the classroom

5.15.2 Curriculum Content

GCE A level Geography Curriculum Outline	
Compulsory Section	
Unit 1 Physical environments Earth systems Fluvial environments Coastal environments	**Unit 2 Human environments** Population characteristics Settlement patterns Population movements
Unit 3 Either 3a Personal enquiry or 3b Applied geographical skills	
Unit 4 Physical systems, processes and patterns Atmospheric systems Glacial systems Ecosystems	**Unit 5 Human systems, processes and patterns** Economic systems Rural-urban interrelationships Development processes
Unit 6 Synoptic: People and their environments Physical environments influence human activity Human activities modify physical environments Physical and human resources may be exploited, managed and protected Communities and their governance influence geographical interrelationships at a range of scales	

The GCE Geography syllabus is succinctly described in the specification of the subject whilst more detailed areas of learning are left to the awarding body to determine. The Edexcel specification places an equal focus on physical and human geography. Case studies may focus on features of UK geography, although this is not a requirement.

5.15.3 Learning Outcomes

GCE Geography Learning Outcomes
Develop knowledge and understanding of selected physical, human and environmental processes that underpin key geographical concepts
Develop a knowledge and understanding of the key concepts of place, space, diversity, interdependence, people–environment interaction, the processes associated with these, and change over time
Study at a range of scales and understand the importance of scale as a geographical idea
Use a range of skills and techniques, including the use of maps and images at different scales necessary for geographical study
Carry out research, and out-of-classroom work including fieldwork, as appropriate to the topics selected
Use modern information technologies, including geographical information systems, as appropriate to the content
Develop understanding of the application and relevance of geography.
In addition for A2 the specifications should require students to:
Undertake individual research/investigative work, including fieldwork
Extend their understanding of geographical ideas, concepts and processes
Identify and analyse the connections between the different aspects of geography
Analyse and synthesise geographical information in a variety of forms and from a range of sources
Consider new ideas and developments about the changing nature of geography in the 21st century
Critically reflect on and evaluate the potential and limitations of approaches and methods used both in and outside the classroom.

Centralised materials for A level Geography are less specific than in other subject areas. Nonetheless, assessment objectives are similar in nature for the programme, whilst the

manner in which work progresses from AS to A2 is also described. Also, the third skill area here relates more to the application of knowledge here, rather than fourth elsewhere. The GCE A level provides a more extensive number of learning outcomes in comparison with the NSC counterpart. In broad terms the NSC covers geographical skills, knowledge and application, each strand of which is developed further into more specific assessment standards. The GCE covers each of these themes in its learning outcomes; the presence of synoptic assessment in the second year of GCE study also explains the more categorical references to identifying and analysing the connections between different aspects of geography. The GCE also requires candidates to provide a critical analysis of geographical approaches and methods, both in terms of their potential and also their limitations; there is no explicit reference to this in the NSC outcomes.

6 Section 6: Subject Assessment Practices

This section analyses the respective means by which the NSC and the GCE subjects are assessed, determining how student knowledge is examined. Specifically, the information presented in this section compares the IEB methods of assessing the NSC subjects alongside the approaches adopted by Edexcel for examining the GCE A level. Wherever possible, relevant assessment information has been sourced directly from the IEB Subject Assessment Guidelines or SAGs.

The SAGs were introduced by both the national department and the IEB in an attempt to supplement the information contained in the National Curriculum Statements, which were criticised for not providing sufficiently concrete guidelines for NSC subject content coverage. The SAGs provide more substance and clarity, and are intended to state more explicitly the content in terms of breadth and depth that teachers would need to cover in schools, through specifying in turn the areas that the examination boards would then test in their papers. A brief introduction and discussion of the content of the SAG documents is presented before individual subject analysis.

The comparisons consider the variety of testing formats applied, consider examples of past examination papers, and account for the assessable content covered in the final examinations. In addition to this, sample candidate examination answers have been sourced in order to determine the extent to which high and low level performances are recognised by the respective examinations. In some instances it is clear that the IEB SAGs refer directly to the National Curriculum Statements, in which case the relevant information from these has been replicated.

The analysis in this section adopts a similar approach to that utilised in the previous section in that its primary focus relates to assessment information for Grade 12 in South Africa. This is reflective of the fact that performances solely in Grade 12 contribute to a candidate's NSC score, and subsequent qualification or failure. It may also be suggested that this approach is in fact supported by the development and use of SAGs, since these documents focus on the assessable subject content, and facilitate preparation for final Grade 12 examinations.

6.1 The IEB Subject Assessment Guidelines SAGs

The development of the Subject Assessment Guidelines or SAGs has been viewed by many stakeholders as a key development and improvement in the communication of clearer guidelines of the assessable NSC subject content. Anecdotal evidence derived from the in-country visit suggested that many experts claimed that whilst the National Curriculum Statements have their strengths, they do not provide explicit enough specifications for the assessment of individual subject content. Some parties may venture to suggest that the focus on learning outcomes overlooked the need to simultaneously provide solid content guidelines which would enable schools, teachers, learners and examination boards to both meet the requirements of the curriculum.

Thus, in response the examining authorities published their Subject Assessment Guidelines to provide clarification to the content coverage demanded by the National Senior Certificate Subject Statements. The SAGs provide guidelines on how assessment may be approached

for Grades 10 – 12. The DoBE states that the SAGs developed by the national department must be used alongside the Subject Statements, and the Learning Programme Guidelines.

In essence the SAGs outline assessment protocol and specifications. This incorporates all forms of testing, including continuous assessment, daily assessment, programmes of assessment, specifically the assessment required in Grades 10 and 11 and separately, in Grade 12, both in terms of quantity and format. The SAGs also describe external assessment in Grade 12, processes governing the recording and reporting of the programme of assessment, and moderation of the programme of assessment.

The SAG documents are highly detailed indeed, covering specific information and advice addressing the following areas:

- assessment tasks and associated weighting for Grades 10 and 11
- planning the delivery of grade specific topics and the related assessment tasks
- composition of the mid, trial and end of year examinations for Grades 10 and 11, and mid and trial examinations for Grade 12, with attention centred on the core testing of cognitive levels:
    1. lower order level: knowledge, simple recall and reading-off type
    2. middle order level: comprehension and understanding
    3. higher order level: application, analysis, synthesis and evaluation
- expected examination question types, related to the curriculum content
- assessment in Grade 12, specifically the Programme of Assessment, which comprises 25% of the total final grade of all NSC subjects, except Life Orientation

In addition, the SAGs present summarised statements of anticipated competences achievable by the end of each Grade, 10, 11 and 12, thus providing a clear link to the learning outcomes expressed in the curriculum documents. These competence statements help strengthen the understanding of promotion requirements, that is the successful negotiation and completion of one year and subsequent progression to the next. Finally, and importantly, the SAGs present the content framework for the individual subjects in great detail, outlining coverage over Grades 10, 11 and 12.

6.1.1 IEB Subject Assessment Guidelines

In order to facilitate the preparation and successful delivery of subject lessons in the lead up to IEB NSC examinations, the IEB has also developed its own SAGs. The IEB documents act as a preparatory tool for the schools whose students will write IEB papers and provide clearer and more explicit guidelines covering the anticipation of examination content. This covers:

- IEB assessment procedures
- IEB assessment requirements, including the weighting of learning outcomes to cognitive levels
- administrative and support documentation

Anecdotal evidence suggests that the introduction of the Subject Assessment Guidelines has been a widely welcomed addition to the weight of documentation already offered in relation to the National Senior Certificate. Indeed, it is claimed that the SAGs provide clarity

and make more explicit the NCS Subject Statements requirements, in a smaller, accessible document. In the analysis sections contained below, this report sources information from IEB Subject Assessment Guidelines, providing a clear understanding of how the IEB assesses the NSC. The elaboration of the actual assessment syllabus was felt an essential development to facilitate teachers and schools in providing a clear framework within which to prepare students for assessment in their Grade 12 examinations. This information is compared with the assessment practices adopted by the GCE.

6.2 IEB Individual Subject Assessment

6.2.1 NSC Life Sciences

Life Sciences, IEB assessment			
Paper 1	Molecular Studies, Anatomy and Physiology	2 ½ hours	150 marks
Paper 2	Environmental Studies and the Continuity of Life	2 ½ hours	150 marks
Paper 3	Practical Examination	1 ½ hours	50 marks
		Total	[350] converted to 300
		Portfolio	100
			Total 400 marks

The IEB provides information relating to the individual weighting of the examination papers in relation to the Life Sciences learning outcomes. This reflects a heavier weighting towards outcomes two and three in the written papers, whilst learning outcome one, relating to practical skills is predominantly covered by paper 3.

Life Sciences paper 1 presents a series of questions covering different subject related themes, for example reproduction, followed by a sequence of logically related sub-questions that explore and develop the subject theme. Half of the main questions in the paper comprise several sub-questions which carry a variety of marks requiring one sentence to one paragraph responses. Two questions within the paper require a more substantial essay-type in response to reading background information on biologically related issues.

For example, in one question candidates may be required to provide argumentation to state which scientific study they consider to be of greater importance to mankind – the structure of DNA or the mapping of the Human Genome. Thus the examination moves from short length answers which predominantly demonstrate the candidate ability to recall and understand basic subject concepts and principles. Longer, more discursive essays require a candidate to assimilate information, and formulate a response which may call upon their wider understanding of the subject.

Paper 2 provides questions that require more in-depth analysis of data, the presentation of hypothetical situations and case studies. Students are expected to provide analyses of data, criticisms or practical work or experiments, and offer deductions to the likely outcomes from the information provided. Question themes encompass explanations for the extinction of dinosaurs, to more contemporary issues including consideration of the environmental effects and harm caused to humans by air pollution, or lead petrol, for example.

Life Sciences IEB Examination Content

Paper 1
• Tissues, cells and molecular studies (60%)
  ○ DNA, protein synthesis
  ○ Chromosomes, meiosis, production of sex cells, diseases
  ○ Genes, inheritance, genetic diseases
• Structure and control of processes in basic life systems of plants and humans (40%)
  ○ reproduction and related diseases

Paper 2
• Environmental studies (50%)
  ○ Local environmental issues
  ○ Effect of pollutants on human physiology and health
• Diversity change and continuity (50%)
  ○ Origin of species
  ○ Evolution theories, mutation, natural selection, macroevolution and speciation
  ○ Fundamental aspects of fossil studies
  ○ Cradle of mankind – South Africa
  ○ Biological evidence of the evolution of populations
  ○ Popular theories of mass extinction

Paper 3 Content to be covered: Assessment of 8 skill areas: Observational; Measurement; Recording; Manipulative; Procedural; Inference; Investigative; Evaluation of Procedures (addressing Assessment Standards LO1) A context is given in the preamble to the task which includes all the relevant content knowledge that is required for the examination. This paper is set externally and is conducted under examination conditions by all learners on the same day before the start of the main block of examinations. It will be administered by teachers, internally marked and externally moderated. The Practical Examination has two parts. Candidates must • demonstrate both their ability to design an experiment and evaluate an existing experiment (given to them) • perform a simple Experimental Procedure in order to collect, graph, analyse and interpret data. The Practical Examination will not necessarily relate to the Grade 12 content areas. The context is supplied and it is the testing of the skills that is important.

The table above reflects the examination of Life Sciences through two written papers and practical assessment which addresses all of the skills areas attached to learning outcome 1. In addition, the portfolio requirement represents one quarter of the final grade, the details of which are outlined below.

Life Sciences IEB Portfolio Requirements		
Task		**Marks**
a.	Preliminary examination	**20%**
b.	Two standardised tests 60% testing lower order thinking skills; 40% testing higher order thinking skills	2 x 10% = **20 %**
c.	Controlled writing piece/essay testing higher order thinking skills in relation to Biological Knowledge 1 hour (4-600 word essay)	**10%**
d.	Research task/ non-investigative practical 60% testing lower order thinking skills; 40% testing higher order thinking skills	**20%**
e.	Two summative practical tasks test ability to design an experiment and evaluate an existing experiment perform an experimental procedure to collect, graph, analyse and interpret data	2 x 15% = **30%**
	Total	100%

Life Sciences Assessment Syllabus – Grade 12

The IEB syllabus for Grade 12 is taken from the NCS subject statement; the IEB documentation elaborates on subject matter, although the information provided here has

been summarised for practical purposes. Life sciences content in South Africa has stirred a certain degree of controversy with some elements of the syllabus touching upon certain political, religious and social sensitivities. It has been suggested that issues regarded as more controversial are now taught at Grades 10 and 11, or even 12, although they will not be assessed in the final papers.

Life Sciences Assessment Syllabus (Grade 12)	
Content Areas: Tissues, Cells and Molecular Studies (60% of Paper 1)	
DNA/ RNA, Protein synthesis • Location of DNA • Structure of DNA • Transcription of DNA • Translation of DNA	**Chromosomes, meiosis, production of sex cells** • Location of chromosomes, key to cell division • Haploid and diploid nos. of chromosomes • Process of meiosis; plant and animal cells • Importance of meiosis to organisms
Inheritance and genetic diseases • Description of processes involved in the inheritance of characteristics • Examples of genetically inherited diseases	**Genetic Engineering**
Content Area: Structure, Control and Processes in Basic Life Systems of Plants and Humans (40% of Paper 1)	
Human reproduction • Position and functions of organs of male reproductive system • Formation of male sex cells • Position and functions of organs of the female reproductive system • Formation of female sex cells • Female menstrual cycle	**Fertilisation, embryo development and implantation** • Details of menstrual cycle • Details of embryo development • Details of implantation in uterus and development of embryo/ foetus • Birth, pre- and post-natal care **Control of human fertility** • Methods of birth control **Related diseases/ disorders** • Examples of related disorders, causes and treatment
Reproduction in plants • Asexual reproduction • Sexual reproduction	

Life Sciences Assessment Syllabus (Grade 12)	
Content Areas: Environmental Studies (50% of Paper 2)	
Local environmental issues • Outline issues using local environment and community practices • Suggest corrective management actions	**Effect of pollutants on human health** a. Outline a local issue and its effects on human health **b.** Make recommendations to manage the problem
Content Area: Diversity, Change and Continuity (50% OF Paper 2)	
Biological evidence of evolution of populations (fossil studies) • Define fossilisation • Fossils as evidence of ancient life • Interpretation of fossil record **Popular theories of mass extinction of organisms** a. Continental drift b. Extra terrestrial theories **Cradle of mankind – South Africa?** a. Study of anthropology, palaeontology and archaeology - uses in understanding the origin of man b. Possible origins of mankind c. Examples of population movements	**Origin of species** a. Define biological evolution b. Lamarck's theory of evolution by inheritance of acquired characteristics c. Darwin's theory of evolution by natural selection d. Role of mutations at a cellular and molecular level e. Genotypic and phenotypic variations in populations f. Effect of inbreeding and outbreeding in populations of plants, animals (including humans) g. Formation of species at an ecological, reproductive and genetic level h. Macro evolution over time: evidence from fossil record (macroevolution is another name for evolution)

*Basic concepts and knowledge gained in Grades 10 and 11 environmental studies can be applied in this section. Learners should be familiar with the following concepts biome, ecosystem, abiotic and biotic components, cycling of water and carbon

dioxide, food webs, biodiversity and threats to it, global warming, greenhouse effect, acid rain, ozone depletion, management of human effects on the environment, biofuels, deforestation. Learners should also have a basic knowledge of land/ air/ water pollution from Grade 11 so as to address human health problems.

6.2.2 NSC Physical Sciences

Physical Sciences, IEB assessment		
Paper 1 (Physics)	3 hours	150 marks
Paper 2 (Chemistry)	3 hours	150 marks
Portfolio	Continuous Assessment	100 marks
		Total 400 marks

The IEB Physical Sciences SAG states that the focus of the SAG centres on Grade 12 final written examinations for Grade 12, and therefore, does not cover all areas of the curriculum. However, teachers and schools are expected to cover further topics from the National Curriculum Statements that are not examined through informal and/or alternative assessment strategies.

The division of the examinations papers reflects the split in the subject content, namely physics focused testing in paper 1, and chemistry in paper 2, each of which are equally weighted. With regard to cognitive levels, the papers theoretically focus 60% of the questions to lower order skills of knowledge recall and comprehension. The table below illustrates the division of subject assessment for the internal portfolio assessment.

Physical Sciences, IEB Portfolio Requirements	
Task	**Percentage**
a. 2 practical investigations (1 physics, 1 chemistry focus) Balanced investigations to include: Developing a hypothesis; Manipulation of equipment, measurement and observations; Planning and designing; Presentation of data; Analysing, concluding and evaluating; Communicating and presenting information	2 x 20% = 40%
b. Research project	20%
c. 2 controlled tests (physics focus) d. 2 controlled tests (chemistry focus) * mid-year examinations may be used	(2 x 5% = 10%) (2 x 5% = 10%) 20%
e. Preliminary examination	20%
Total	100%

Written papers 1 and 2 of the Physical Sciences examination appears similar in organisation to the Life Sciences paper 1. Paper 1 focuses on Physics and presents candidates with five questions to be covered in three hours, each question pertaining to a specific theme, or area of study. This includes speed and resistance, generating electricity and matter and materials for example. Each question is sub-divided into a series of related questions that mostly require short to medium length answers of two to six marks in value. The sub-questions demonstrate a logical progression of the subject matter, from discussing general principles, to calculating the likely outcome of a related experiment through to positing an hypothesis for a particular experiment.

Physical sciences paper 2 follows a similar structure in addressing questions focused on the chemistry elements of the course content. In a similar fashion to paper 1, questions also incorporate considerations and discussions of the impact that physical science

developments and phenomena can have on society as whole. These require more in-depth discursive responses, requiring a candidate to demonstrate their application of subject knowledge to broader social considerations.

The IEB syllabus for Grade 12 is based on NCS subject statement information; the IEB documentation elaborates on subject matter, although the information provided here has been summarised for practical purposes. The division of content seems to suggest that whilst both subjects are assessed in equal measure, that is in one paper each, the amount of subject matter covered in the physics examination appears to include a greater scope of topic matter than is covered in the chemistry counterpart paper.

Physical Sciences, Grade 12 IEB Examination Content	
Paper 1: Mechanics	
Motion in two dimensions 1. Projectile motion represented in words, diagrams, equations and graphs 2. Conservation of momentum (one direction only) 3. Frames of reference (one dimension only)	**Work, power and energy** 1. When a force exerted on an object causes it to move, work is done on the object (except if the force and displacement are at right angles to each other) 2. The work done by an external force on an object/system equals the change in kinetic energy of the object/system 3. Power (rate at which work is done)
Paper 1: Waves, Sound and Light	
Doppler Effect (source moves relative to the observer) • With sound and ultrasound • With light – red shifts in the universe (evidence for the expanding universe)	**Colour** • Relationship to wavelength and frequency • Pigments, paints • Addition and subtraction of light
2D and 3D wavefronts • Diffraction	• Interference (special kind of superposition) • Shock waves, sonic boom
Paper 1: Electricity and Magnetism	
Electrodynamics • Electric machines (generators, motors) • Alternating current • Electrical circuits (content taught in lower grades)	**Electronics** • Active circuit elements, diode, light emitting diode (LED)
Electromagnetic radiation • Dual (particle/wave) nature of EM radiation • Nature of an EM-wave as mutual induction of oscillating magnetic/electric fields	**Electromagnetic radiation** • EM spectrum • Nature of EM as particle – energy of a photon related to frequency and wavelength • Penetrating ability
Paper 1: Matter and Materials	
Optical phenomena and properties of materials • Transmission and scattering of light	• Photoelectric effect • Emission and absorption spectra
Paper 2: Chemical Change	
Rate and Extent of Reaction • Rates of reaction and factors affecting rate (nature of reacting substances, concentration [pressure for gases], temperature and presence of a catalyst • Measuring rates of reaction • Mechanism of reaction and of catalysis • Chemical equilibrium and factors affecting equilibrium • Equilibrium constant • Application of equilibrium principles	**Electrochemical Reactions** • Electrolytic and galvanic cells • Relation of current and potential to rate and equilibrium • Understanding of the processes and redox reactions taking place in cells • Standard electrode potentials • Writing of equations representing oxidation and reduction half reactions and redox reactions
Paper 2: Chemical Systems	
Chemical industry – resources, needs and the chemical connection • SASOL, fuels, monomers and polymers, polymerisation	• The chloroalkali industry (soap, PVC etc) • The fertiliser industry (N, P, K) • Batteries, torch, car etc
Paper 2: Matter and Materials	

Organic molecules • Organic molecular structures – functional groups, saturated and unsaturated structures, isomers • Systematic naming and formulae, structure physical property relationships • Substitution, addition and elimination reactions	**Mechanical properties** • Hooke's Law, stress-strain, ductile and brittle materials **Organic macromolecules** • Plastics and polymers – thermoplastic and thermoset

6.2.3 NSC Mathematics

Mathematics, IEB assessment			
Examination	Paper 1	3 hours	150
	Paper 2	3 hours	150
Continuous Assessment	Portfolio		100
		Total	400 marks
(optional paper)	Paper 3*	2 hours	100

* reported separately from Mathematics but does not constitute a separate subject

Mathematics presents two compulsory papers and a third optional paper that is awarded a separate grade. The presence of the third optional examination paper is intended to stretch capable and interested candidates further than they would be stretched by the first two papers. Additionally, it should be noted that Higher Education entry requirements onto Mathematics based degrees now specify that candidates must sit all three Mathematics papers.

The theoretical division of learning outcomes and how they are addressed by the individual examination papers is reflected in the tables contained in the appendices. These reveal that paper 1 focuses on learning outcomes 1 and 2, whilst paper 2 addresses outcomes 3 and 4. An optional paper 3 mainly covers learning outcomes 3 and 4.

IEB Mathematics paper 1 covers patterns and sequences, annuities and finance, functions and graphs, algebra and equations, calculus and linear programming. In paper 2, the examination focuses on co-ordinate geometry, transformation, trigonometry and data handling. The optional paper includes recursive sequences, geometry, descriptive statistics and interpretation, probability and Bivariate data.

Mathematics Portfolio

School based assessment (SBA) or CASS comprises 25% of the total assessment for the National Senior certificate. The portfolio is comprised as follows:

Mathematics, IEB Portfolio Requirements for Grade 12		
Descriptions	**Weighting**	**Mark**
2 short items chosen from the selection (45 minutes each)	2 x 10	20
1 long item chosen from the selection (5 hours per task)	30	30
Two tests: Standardised and at least 45 minutes to an hour in duration in controlled environment	2 x 10	20
Grade 12 Preliminary Examination consisting of Paper 1 and Paper 2	2 x 15	30
Total Marks		100

The short item tasks encompass assignments from an impressively varied list including translation tasks, keeping journals, question setting, formulae, 'cheat-sheets', teaching a lesson, providing written explanations, investigations, or skills analysis. These tasks are

conducted under controlled circumstances. The long items include projects, investigations and modelling a real life situation. The standardised tests prescribe the need for examinations to occur in a controlled environment; one test should deal with the first two learning outcomes, the second test addressing learning outcomes 3 and 4.

Mathematics Cognitive Levels (taken from DoE SAGs)

Levels	Explanation of skills to be demonstrated	
Knowledge (25%)	All of the skills will be based on known knowledge.	
	• Algorithms • Estimation; appropriate rounding of numbers • Theorems • Straight recall	• Identifying from data sheet • Simple mathematical facts • Know and use of appropriate vocabulary • Knowledge and use of formulae
Routine Procedures (30%)	All of the skills will be based on known procedures: • Problems are not necessarily unfamiliar and can involve the integration of different LOs • Perform well-known procedures • Simple applications and calculations which must have many steps and may require interpretation from given information • Identifying and manipulating of formulae	
Complex Procedures (30%)	• Problems are mainly unfamiliar and learners are expected to solve by integrating different LOs • Problems do not have a direct route to the solution but involve: ▪ using higher level calculation skills and reasoning to solve problems ▪ mathematical reasoning processes • These problems are not necessarily based on real world contexts and may be abstract requiring fairly complex procedures in finding the solutions.	
Solving Problems (15%)	• Solving non-routine, unseen problems by demonstrating higher level understanding and cognitive processes • Interpreting and extrapolating from solutions obtained by solving problems based in unfamiliar contexts • Using higher level cognitive skills and reasoning to solve non-routine problems • Being able to break down a problem into its constituent parts – identifying what is required to be solved and then using appropriate methods in solving the problem • Non-routine problems be based on real contexts	

6.2.4 IEB Advanced Programme Mathematics

Advanced Programme Mathematics assessment			
Examination	Paper 1	3 hours (300 marks) 75% of final grade	Choice of 2 from 4 questions • Calculus & Algebra (COMPULSORY) 200 marks • Statistics (100 marks) • Finance and Modelling (100 marks) • Matrices and Graph Theory (100 marks)
Continuous Assessment	Programme of Assessment (Grade 12)	25% of final grade	

Advanced Programme Mathematics is not one of the official National Curriculum Subjects. IEB Advanced Programme Mathematics is offered as a further extension of mathematical knowledge and application, and is viewed as an addition to the 'standard' Mathematics papers. The Advanced Programme provides mathematically minded candidates with the opportunity to be challenged and pushed further.

The method of assessment is highlighted in the table above, and demonstrates that testing is conducted via one formal written examination, paper 1, and a continuous assessment element in the form of the portfolio, or 'Programme of Assessment'.

The Advanced Programme Mathematics option covers subject areas that are not dealt with by IEB Mathematics, including those subjects covered in the optional third IEB Mathematics paper. The following modules are included within Advanced Programme Mathematics:

- Module 1: Calculus and Algebra (compulsory subjects covered in the examination)
- Module 2: Statistics
- Module 3: Finance and Modelling
- Module 4: Matrices and Graph Theory

The table below illustrates how the IEB recommends marks from the examination paper should be distributed in relation to the identified core learning outcomes.

Advanced Programme Mathematics, Recommended Mark Distributions			
Subject Area (Learning Outcome 1)	**Mark Distribution**	**Subject Area (Learning Outcome 1)**	**Mark Distribution**
Functions and limits	10-30	Trigonometry	10-30
Differentiation	20-40	Integration	20-40
Drawing functions	20-30	Applications	20-30
Total for learning outcome 1			120-160
Subject Area (Learning Outcome 2)	**Mark Distribution**	**Subject Area (Learning Outcome 2)**	**Mark Distribution**
Real and complex roots	10-20	Exponents and logarithms	20-30
Absolute value	20-30	Induction	10-20
Total for learning outcome 2			60-80
Subject Area (Learning Outcome 3)	**Minimum percentage**	**Subject Area (Learning Outcome 3)**	**Minimum percentage**
Probability	40-60	Descriptive statistics	40-60
Total			100 marks
Subject Area (Learning Outcome 4)	**Minimum percentage**	**Subject Area (Learning Outcome 4)**	**Minimum percentage**
Graph theory	40-60	Matrices	40-60
Total			100 marks
Subject Area (Learning Outcome 5)	**Minimum percentage**	**Subject Area (Learning Outcome 5)**	**Minimum percentage**
Financial models	40-60	Recursive models	40-60
Total			100 marks

Subject areas covered by the learning outcomes 1 and 2 form the compulsory element to the advanced programme paper. In the examination, candidates may one choose one of the three questions which cover each of the final three learning outcomes.

Advanced Programme Mathematics Internal Assessment Portfolio, Grade 12

Advanced Programme Mathematics, IEB Portfolio Requirements for Grade 12		
		Weighting
Project		20
Two Tests (10% each)		20
Two examinations	Mid-year or Grade 11 (Nov)	20
	Preliminary	40
Total Marks		100

In addition, during Grade 12 the Advanced Programme Mathematics internal assessment is conducted through the 'Programme of Assessment'. This is internally set and marked, with external moderation. The Programme of Assessment completes the final 25% of the Advanced Programme Mathematics grade. This is demonstrated in the table above.

Advanced Programme Mathematics has been designed with the aim of accommodating more mathematically inclined students, developing candidate maturity, and encourage candidates to think independently and creatively. The subject is intended to focus more on mathematics at work. This is reflected in the aims of the examination questions, which seek solutions where students have used both understanding and insight. The focus on such skills appears likely to produce more rounded mathematics students for entry onto courses at Higher Education level.

6.2.5 NSC Mathematical Literacy

Mathematical Literacy, IEB assessment			
Examination	Paper 1	3 hours	150
	Paper 2	3 hours	150
Continuous Assessment	Portfolio		100
		Total	400 marks

The National Curriculum Statement dictates that for candidates to be eligible to graduate in the NSC that either Mathematics or Mathematical Literacy must be included as one of the seven subjects studied. Mathematical Literacy is thus indicative of the drive within South Africa to improve national levels of numeracy and mathematical literacy skills. This addresses the perception widely held within the country, and supported by statistical research, that South Africa performs less favourably in comparison with other leading nations in terms of numeracy.

Paper 1 requires candidates to carry out mathematical calculations in response to presented problems, each task comprising two or three marks each. These tasks require the simple application of fundamental mathematical skills. The examination paper also includes practically based tasks, including reading and calculating utility bills; analysing graphical data; identifying sequences and making predictions; reading maps and calculating distance. The first paper thus presents a higher quantity of questions testing general application of mathematical skills and knowledge. There is an emphasis on the candidate providing a clear demonstration of how they reached their conclusions, namely through presenting their calculations clearly.

Paper 2 presents fewer questions. Each question presents a thematic problem or issue in the form of data, graphs, and charts; a series of logically related questions must be addressed, resulting in a thorough analysis of the question topic. Typical themes include analysis of house prices, accounting for economic factors including inflation and growth; detailed analysis of the relationship between electoral and democratic data.

In relation to the GCE A level subjects, there is no comparable counterpart, which makes comparisons with this subject difficult to achieve. However, it is still possible to provide a clear analysis of the subject, and its assessment requirements and procedures. The tables contained in the appendix demonstrate that the four learning outcomes are apportioned an equal share of marks across both papers 1 and 2. These address "Numbers and Operations in Context", "Functional Relationships", "Space, Shape and Measurement" and "Data Handling". It is clear that the examinations thoroughly test these different applications of mathematical knowledge and present questions within practical and real-life situations, including economics, statistical and practical interpretations.

Mathematical Literacy, IEB Portfolio Requirements for Grade 12		
Descriptions	**Weighting**	**Mark**
2 short items chosen from the selection (1-2 hours duration)	2 x 15	30
1 long item chosen from the selection (3-5 hours duration)	1 x 20	20
Two tests: Standardised and at least 45 minutes to an hour in duration in controlled environment	2 x 10	20
Grade 12 Preliminary Examination consisting of Paper 1 and Paper 2	2 x 15	30
Total Marks		100

Mathematical Literacy: Description of the levels in the assessment taxonomy
(taken from the national department Mathematical Literacy SAG January 2007, Appendix 3, p23)

Cognitive Levels	Explanation of skills to be demonstrated
Level 1: Knowing	Tasks at the **knowing** level of the Mathematical Literacy taxonomy require learners to: • calculate using the basic operations including: - algorithms for +, -, ×, and ÷; - appropriate rounding of numbers; - estimation; - calculating a percentage of a given amount; and - measurement. • know and use appropriate vocabulary such as equation, formula, bar graph, pie chart, Cartesian plane, table of values, mean, median and mode. • know and use formulae such as the area of a rectangle, a triangle and a circle where each of the required dimensions is readily available. • read information directly from a table (e.g. the time that bus number 1234 departs from the terminal)
Level 2: Applying routine procedures in familiar contexts	Tasks at the **applying routine procedures in familiar contexts** level of the Mathematical Literacy taxonomy require learners to: • perform well-known procedures in familiar contexts. Learners know what procedure is required from the way the problem is posed. All of the information required to solve the problem is immediately available to the student. • solve equations by means of trial and improvement or algebraic processes. • draw data graphs for provided data. • draw algebraic graphs for given equations. • measure dimensions such as length, weight and time using appropriate measuring instruments

	sensitive to levels of accuracy.
Level 3: Applying multi-step procedures in a variety of contexts	Tasks at the **applying multi-step procedures in a variety of contexts** level of the Mathematical Literacy taxonomy require learners to: • solve problems using well-known procedures. The required procedure is, however, not immediately obvious from the way the problem is posed. Learners will have to decide on the most appropriate procedure to solve the solution to the question and may have to perform one or more preliminary calculations before determining a solution. • select the most appropriate data from options in a table of values to solve a problem. • decide on the best way to represent data to create a particular impression.
Level 4: Reasoning and reflecting	Tasks at the **reasoning and reflecting** level of the Mathematical Literacy taxonomy require learners to: • pose and answer questions about what mathematics they require to solve a problem and then to select and use that mathematical content. • interpret the solution they determine to a problem in the context of the problem and, where necessary to adjust the mathematical solution to make sense in the context. • critique solutions to problems and statements about situations made by others. • generalise patterns observed in situations, make predictions based on these patterns and/or other evidence and determine conditions that will lead to desired outcomes.

6.2.6 NSC English Home Language

English Home Language, IEB assessment			
External Examination	Paper 1	3 hours	100
	Paper 2	3 hours	100
Continuous Assessment	Portfolio		100
	Oral		100
		Total	400 marks

English Home Language is examined over two papers, comprising 50% of the final grade; the other half comes from continuous assessment in the form of a portfolio and oral examinations, both of which are equally weighted. The two tables below outline the requirements of the written papers and indicate the types of tasks involved. Paper 1 addresses learning outcomes 2 and 4 respectively, placing emphasis on the use of language and exploring the effects that language choices have on texts and subsequently on their meaning. Paper 2 focuses more linguistic styles and their appropriate uses, and thus addresses learning outcomes 3, writing and presenting and learning outcome 4.

The paper 1 focuses on testing candidate comprehension skills, through the presentation of a variety of language texts, including cartoons and comic based materials, newspaper and current affairs issues including for example health and anti-smoking materials. Literature is covered in paper 2, where candidates must complete a rigorous mini-essay as well as a more traditional literary essay. Inter-textual question formats are utilised effectively in this examination paper.

For example, candidates may be required to consider an image and a piece of text, prior to providing a response that discusses links between both materials. This question format typically encourages students to provide their own rationale and logic to their argument, and thus teases out the candidate's ability to express an opinion. Inter-textual questions clearly cannot follow a prescriptive answer route since they demand a response that is individual and cannot be related to pre-defined notions or opinion. In comparison with the synoptic testing conducted at GCE A level standard, approaches which encourage more open-ended responses to open-ended questions should be further developed in the NSC examinations.

English Home Language, IEB Examination Requirements	
Paper 1: Response to a text (3 hours – 100 marks)	
1	A **comprehension passage** of between 400 - 600 words in length, depending on the density of the passage. [25]
Texts may include contemporary work (e.g. current newspaper articles, advertisements or cartoons). Functional language and punctuation usage may also feature in this section.	
2	A **summary** which requires abstracting and recasting a passage to show understanding. [10]
The instructions will indicate the formality required and will also determine the appropriate register and format. The summary passage will be different from the comprehension passage.	
3:	**Contextual questions** on… [15]
• an unseen poem: in the section on unseen poetry, there will only be **one** question set on contemporary verse. Candidates could be asked to consider more than one text in a poetry question. This could take the form of an extract from another poem or a visual. • 2 prescribed poems – a choice of **one out of two** prescribed poems will be offered	
4:	A selection of questions from the following: [25]
• propaganda and advertising • classroom and visual material • dictionary skills	
5:	**Editing skills** [10]
e.g. correction of sentences, use of appropriate punctuation, register, synthesis. While there will be a separate editing question, use of appropriate punctuation could also be included in other texts.	

English Home Language, IEB Examination Requirements
Paper 2: Writing (3 hours – 100 marks)
Section A: Literature [60]
Question 1 SHAKESPEARE 30 Candidates will be required to write **one** mini-essay. Candidates will also be required to submit a plan of the essay. This plan should be roughly one side of an A4 page and could take the form of a concept map, paragraphing etc. This question focuses on the ability to state and defend a position in a mini-essay of approximately 350 to 400 words.
Questions 2 and 3 CHOICE OF ONE OF TWO NOVELS [30] There will be a choice of two essays on each novel. Essay topics on each work may incorporate a quotation from the novel, or be rooted in a critic's comment. Essay length, approximately 600 words.
Section B: Transactional Writing [40]
Questions 4 and 5 SHORT PIECES There will be a choice of **four** questions in this section. A written response to **two** given texts or scenarios is required. The contexts may be drawn from life or from the literature studied. The focus of the question is the ability to choose the correct format, style and register for the given context, purpose and audience. The body of each piece should be between 250 and 300 words in length. (2 x 20)

IEB English Home Language Content for Grade 12

English Home Language: Learning Outcomes and Assessment Standards Grade 12
Learning Outcome 1: Listening and Speaking The learner is able to listen and speak for a variety of purposes, audiences and contexts.
Grade 12 We know this when the learner is able to: • demonstrate knowledge of different forms of oral communication for social purposes: • demonstrate planning and research skills for oral presentations: • demonstrate the skills of listening to and delivery of fluent and expressive oral presentations: • demonstrate critical awareness of language use in oral situations:
Learning Outcome 2: Reading and Viewing The learner is able to read and view for understanding and to evaluate critically and respond to a wide range of texts.
Grade 12 We know this when the learner is able to: • demonstrate various reading and viewing strategies for comprehension and appreciation: • evaluate the meaning of a wide range of written, visual, audio, and audio-visual texts: • evaluate how language and images may reflect and shape values and attitudes in texts: • explore and evaluate key features of texts and explain how they contribute to meaning (*these features should never be dealt with in isolation):* * transactional and creative texts; * literary texts (*novel, short story, folklore/folk tale, short essay*): * poetry: * drama: * visual and multi-media texts:
Learning Outcome 3: Writing and Presenting The learner is able to write and present for a wide range of purposes and audiences using conventions and formats appropriate to diverse contexts.

Grade 12 We know this when the learner is able to: • demonstrate planning skills for writing for a specific purpose, audience, and context: • demonstrate the use of advanced writing strategies and techniques for first drafts: • reflect on, analyse, and evaluate own work, considering the opinion of others, and present final product:
Learning Outcome 4: Language The learner is able to use language structures and conventions appropriately and effectively.
Grade 12 We know this when the learner is able to: • Identify and explain the meanings of words and use them correctly in a wide range of texts • uses structurally sound sentences in a meaningful and functional manner • develop critical language awareness

6.2.7 IEB Continuous Assessment Portfolio

Candidates are required to present a folder of completed assignments and should comprise:

1. Extended Creative Writing (90 marks)
   Three 5-600 word extended writing pieces of three different genres (excluding literary styles); one essay must be written under controlled conditions
2. Common Assessment Task (50 marks)
3. Literature 4th Genre (60 marks)
   One 'rigorous' task, or two to three smaller tasks, based on a novel or film genre taken from the list of prescribed works; inter-textuality is encouraged
4. Tests (60 marks)
   Incorporating prescribed literature works, comprehension and language, critical language.
5. Preparatory and/or trial examinations (40 marks)
   A full script of examinations which includes tests covering 'reading and viewing and 'writing and presenting'

6.2.8 IEB Oral Assessment

1. Prepared speaking and conversation (20 marks)
2. Reading, prepared and unprepared (20 marks)
3. Communication activity throughout the year: Listening strategies, comprehension and critical awareness (20 marks)
4. Speaking strategies - discussion of fourth genre prescribed work; dialogue, role play, debate, panel discussion, negotiation, consensus reaching, group work, general conversation. (40 marks)

6.2.9 NSC Geography

Geography, IEB assessment			
External Examination	Paper 1	3 hours	300
	Paper 2	1 ½ hours	100
	Total	400 converted to	300
Internal Assessment	Portfolio		100
		Total	400 marks

The division of the IEB papers is reflected through the identification of geographical issues in paper 1 which candidates must address through applying their knowledge and understanding of geographical phenomena to real and hypothetical situations. Paper 2 focuses on skills and practical competence, encompassing visual and spatial issues, testing

candidate ability to utilise their geographical skills in a practical context. In order to facilitate the removal of any examination barriers to success, the IEB examination papers also provide candidates with a 'glossary of terms' which identifies key question words and concepts, and provides descriptions explaining the specific way in which a candidate is expected to approach and answer a question.

The portfolio requirements state that half of the material covered must be reflective of the examination content; the remaining half should be indicative of other aspects of the subject that will not be covered in a formal written examination. Typically this includes fieldwork and geographical projects. All candidates are encouraged to carry out their coursework based studies within their local environments, thus developing theoretical concepts of geography and applying them to practical, 'real-life' situations that a candidate will be able to relate to directly.

Geography, IEB Examination Requirements	
Paper 1	**(3 hours – 300 marks)**
Questions will range from short objective-type questions to those requiring application, analysis, synthesis and evaluation.	
Weighting	This paper will cover all Learning Outcomes Weighting of cognitive skills: 60% of questions to target lower order cognitive levels and 40% of questions to target higher order cognitive levels
SECTION A:	**Geographical Issues** [100]
A compulsory question dealing with an issue/topic/case study in which all Learning Outcomes and content themes are integrated.	
SECTION B:	**Natural Environments** [100]
Two questions will be set, one of which must be answered. Topics examined will be climate and weather, and fluvial processes and landforms.	
SECTION C:	**Human Environments** [100]
Two questions will be set, one of which must be answered. Topics examined will be people and places: rural and urban settlement, and people and their needs.	

Geography IEB Examination Requirements	
Paper 2	**(1 ½ hours – 100 marks)**
Geographical Skills and Techniques [100]	
Basic map work skills will constitute 40% of the paper and application of theory 60%. Questions will range from short objective-type questions to those requiring application, analysis, synthesis and evaluation.	
Weighting	This paper will cover all Learning Outcomes but with an emphasis on Learning Outcome 1. Weighting of cognitive skills: 60% of questions to target lower order cognitive levels and 40% of questions to target higher order cognitive levels.
Questions	
Questions will be set incorporating atlas work, 1:50 000 topographical map, orthophoto map, aerial photograph, map projections, fieldwork and GIS, photographs, graphic data and imagery. Each candidate will be given a topographic map, an aerial photograph and/or an orthophoto map with the question paper. A magnifying glass and a calculator may be used. Candidates are required to supply their own map-work instruments. All questions must be answered on the question paper.	

Portfolio (100 marks)

Each candidate must prepare a portfolio of work. 50% of the portfolio will reflect the external assessment and 50% will reflect alternate forms of assessment, such as fieldwork and research projects. This work will be assessed internally by the candidate's teacher.

Geography Content for Grade 12

Geography Content Frameworks (Taken from NCS)	
Section A Geographical Skills and Techniques	
Using Atlases • Map use and map skills	• Geographical Information Systems (GIS) including: Data management; Data manipulation and analysis/spatial

• Map Projections: Gauss Conformal, Universal Transverse Mercator • Fieldwork	analysis; Product generation; Application
Section B Climate and Weather (Context: South Africa and the World)	
• Global air circulation and resultant weather patterns • Changes in energy balance • Mid-latitude cyclones and associated weather patterns (Impact on human activities in South Africa) • Subtropical anticyclones and resultant weather over South Africa	• Tropical cyclones and associated weather patterns (Impact on human activities; Pre-cautionary strategies and disaster management) • Synoptic weather maps and satellite image reading and interpretation • Climates at regional and local scale • Human-made climates (urban climate) • Climate hazards and human responses to these –risk and vulnerability
Section C Fluvial Processes and Landforms (Context: South Africa)	
• Fluvial processes; Flowing water; River profiles; Superimposed and antecedent rivers; Drainage basis: characteristics, drainage patterns, importance and impact of humans	• Topography associated with horizontal, massive igneous and inclined layers • Slopes: types, characteristics and significance for human activity • Mass movements and human responses
Section D People and Place: Rural and Urban Settlement (Context: South Africa and Africa)	
• **Processes and spatial patterns involved in rural and urban settlements** Settlement function, size and situation, density, hierarchy, services and profile Population size, structure and patterns, land-use characteristics, zones and sphere of influence • **Key human-environment interactions in urban settlements** **Settlement issues**: inner city problems, renewal, urban blight, congestion, pollution and land-use conflict, standards of living, political influences Post-modern urban settlements (changing urban centres) Governance of urban settlements (Agenda 21 and local authorities)	• **Key human-environment interactions in rural settlements** **Settlement issues**: rural depopulation, closure of services, ageing of population, political influences Governance of rural settlements (Agenda 21 and local authorities) • **Key sustainability related strategies include**: Urban: new towns, inner city renewal, self-help cities, urban planning, sustainable strategies to manage expanding centres, informal settlements Rural: sustainable strategies to manage dwindling rural settlements, land reform and land redistribution, impact of HIV/Aids and wars (refugees and displace people) on rural settlement patterns
Section E People and their needs (Suggested context: South Africa and the World)	
• **Economic activities** Primary, secondary, tertiary and quaternary economic activities Influence of economic, physical, political and social factors Perceptions of decision-makers on the location of industries and other economic activities Impact of humans on location of economic activities Response of people to environmental and socio-economic activities on people Impact of the change of location of economic activities on people	Importance and challenges of the informal sector in different contexts Influence of globalisation on economies and change Agriculture as an economic activity - special emphasis on southern Africa - food security - risks and vulnerability Transport and trade • **Water as a critical resource in South Africa** Availability of water Distribution and supply of water to South African citizens Sustainable use and management of water

The information provided by the IEB SAGs for Grade 12 Geography curriculum content is taken from the National Curriculum Statements, and is presented in a well-organised and logical manner. This provides a clear indication of the final year requirements, and undoubtedly facilitates schools and teachers in the satisfactory delivery of the Geography syllabus to students.

6.3 GCE Individual Subject Assessment

6.3.1 GCE A Level Biology

GCE Biology Curriculum A Level Assessment Structure		
AS Sections Assessment & Form of Assessment (each 1 hour duration)		
Unit 1 Molecules and cells	**Unit 2** **Biology**: Exchange, transport and reproduction **Human Biology**: Exchange, transport and reproduction in humans	**Unit 3** Energy and the environment: **Paper 01 T1**: individual investigation externally moderated or **Paper 02 W1**: alternative to investigation option **Paper 03**: compulsory paper
A2 Section Assessment & Form of Assessment (each 1 ½ hours duration)		
Unit 4 Respiration and coordination; options: A Microbiology and biotechnology B Food science C Human health and fitness	**Unit 5** **Biology**: Genetics, evolution and Biodiversity **Human Biology**: Genetics, human evolution and biodiversity	**Unit 6** Synoptic and practical assessment **Paper 01 T1**: Individual investigation externally moderated or **Paper 02 W1**: Alternative to investigation option **Paper 03**: Compulsory paper

Assessment is conducted through a range of coursework and exam-based tests. The unit-based examinations are either an hour or an hour 30 minutes in length. In the A2 class, there is less focus on knowledge accumulation and more on the synthesis of knowledge across different units of study. The laboratory element of the programme is assessed under different categories, although also represents 15% of the final mark in its own right.

6.3.2 GCE A Level Chemistry

Assessment is conducted through a range of coursework and exam-based tests. Synoptic assessment draws together knowledge, understanding and skills gained from different parts of the course. Synoptic assessment emphasises the understanding and application of subject principles through making connections between different areas of chemistry. This may include applying knowledge and understanding of principles and concepts in planning experimental work and in the analysis and evaluation of data. In addition students may also apply skills and ideas that permeate chemistry in areas which are new to them. Finally, Chemistry assessment also comprises a substantial final mark allocation to laboratory work, experiments and investigation.

GCE Chemistry Assessment

GCE Chemistry Examination Paper Format		
AS Sections Assessment & Form of Assessment		
Unit 1: Structure, bonding and main group chemistry (Written paper) 1 hour (15% of final GCE grade)	**Unit 2:** Introductory organic chemistry, energetic, kinetics, and equilibrium and applications (Written paper) 1 hour (15% of final GCE grade)	**Unit 3A:** Internal assessment 1 hour 45 (20% of final GCE grade) or externally assessed practical test **Unit 3B:** Written paper Laboratory chemistry 1 1 hour (20% of final GCE grade)
A2 Section Assessment & Form of Assessment		
Unit 4: Periodicity, quantitative equilibria and functional group chemistry (Written paper) 1 hour 30 (15% of final GCE grade)	**Unit 5**: Transition metals, quantitative kinetics and applied organic chemistry (Written paper) 1 hour 30 (15% of final GCE grade)	**Unit 6A:** Internal assessment or externally assessed practical test 1 hour 45 (10% of final GCE grade) **Unit 6B:** Synoptic paper Laboratory chemistry 2 1 hour 30 (10% of final GCE grade)

6.3.3 GCE A Level Physics

Assessment is conducted through a range of coursework and exam-based tests. Assessment objectives for Physics A level are in line with the other scientific subjects at A level. From a terminological perspective, there is focus on the need to 'interpret', 'apply', and 'explain'. Equally, whilst the need to learn and understand the topic areas is the fundamental aspect of the programme, there is clearly a strong emphasis on the ability to apply this information, whether that be in a theoretical or practical environment.

GCE Physics Assessment

GCE Physics Examination Paper Format		
AS Sections Assessment & Form of Assessment		
Unit 1: Mechanics & Radioactivity 1 hour (15% of final GCE grade)	**Unit 2:** Electricity and thermal physics 1 hour (15% of final GCE grade)	**Unit 3:** Practical test (1 hour 30) and topics test (30 minutes) (Astrophysics, Solid Materials, Nuclear & Particle physics, Medical Physics) (20% of final GCE grade)
A2 Section Assessment & Form of Assessment		
Unit 4: Waves and our Universe 1 hour 20 (15% of final GCE grade)	**Unit 5**: Practical test Fields and Forces 1 hour 30 (15% of final GCE grade) 1 hour (15% of final GCE grade)	**Unit 6:** Synoptic paper 2 hours (20% of final GCE grade)

The GCE Physics assessment structure mirrors that of GCE Biology and Chemistry. The focus of the A2 year shifts significantly from the knowledge-based work towards synoptic assessment – the ability of the student to draw together different pieces of information in responding to broader-based questions. It is also worth noting that the application of knowledge constitutes a greater percentage of the final mark than in the other two sciences. Synoptic assessment is contained within Unit 6 and makes up 20% of the examination grade.

Biology, Chemistry and Physics Examination Commentary

Biology, chemistry and physics examinations contain a variety of different question formats requiring the application and recollection of knowledge and factual data including labelling diagrams, gap-filling pieces of text, interpreting data, completing tables, discussing given problems or situations, devising experiments and predicting likely outcomes. The examinations relate subject matter to real-world contexts where possible by presenting issues or problems inherent in the modern world. For example, this may involve assessing the role of proteases in biological detergents.

GCE science subject questions generally require one sentence answers, short answers, and paragraph length responses and most questions carry a value of between one to six marks. Those questions of a lower value generally require more straight forward observations, factual recall or the identification of principles and theories. Questions carrying further marks involve more explanation and discussion, where candidates must demonstrate ability to reason.

Commonly, questions are organised by theme, often presenting a theory, principle or problem which needs applying or identifying. Subsequently the question theme is developed logically. For example, a question may present an experiment and ask students to identify

the principle or theory that will be applied. Students may then be further required to predict results and outcomes, plot data on graphs, discuss issues surrounding experiment and provide suggestions for modifying or improving the test.

There is evidence of essay length questions in the GCE biology papers, which are worth ten marks, in describing processes; the unit 6 paper contains one essay length question worth 15 marks. Subjects require discursive and analytical treatment, and require an open less prescriptive discussion of themes including 'Genetic variation and natural selection', 'Pollination and the control of growth in flowering plants', 'Genetic variation and natural selection' or 'Meiosis and chromosome mutations'.

Neither the GCE chemistry nor GCE physics papers require such in depth responses to single questions, and do not contain any essay-length questions. In this respect biology allows for more discursive approaches, chemistry and physics require more data calculation, and drawing out formula to facilitate explanations of experimental outcomes, for example. However, the chemistry synoptic paper requires candidates to choose two from three structured questions each carrying 20 marks; equally the physics synoptic examination papers carry a greater amount of marks.

6.3.4 GCE A Level Mathematics

GCE Mathematics Curriculum A Level Assessment Structure			
Section	**Form of Assessment**	**Weighting**	**Duration**
Internal	Coursework	Maximum of 20%	
External	Written papers	15%	1 ½ hours each
Synoptic	Written papers covering the basic six unit qualification	20%	1 hour

Synoptic assessment is addressed in the assessment objectives 1, 2, 3 and 4. The synoptic requirements must be met in full for the basic six-unit qualification. Synoptic assessment in mathematics addresses the candidate's understanding of the connections between different elements of the subject. Making and understanding connections in this way is intrinsic to learning mathematics.

In papers which address the A2 core content, synoptic assessment requires the use of methods from the AS core content. In papers which address mathematical content outside the core content, synoptic assessment requires the use of methods from the core content and/or methods from earlier stages of the same aspect of mathematics: pure mathematics, mechanics, statistics or discrete mathematics.

All AS and A2 specifications in Mathematics must explicitly refer to the importance of using clear, precise and appropriate mathematical language. These references must draw attention to the relevant demands of assessment objective AO2: construct rigorous mathematical arguments and proofs. The GCE Maths assessment objectives seek to determine:

- Memory
- Ability to build rigorous proofs
- Applications of Maths

- Usage of Maths in real-world situations
- Usage of technology and limitations

Therefore, the need to test both memory and the ability to build rigorous proofs would appear to require the additional assessment objective. It can be seen that the majority of the final grade is determined here, which indicates the difficulty in applying newer assessment methods in Mathematics.

GCE Mathematics: Examination Papers

GCE Mathematics Examination Paper Format			
Paper	**Assessment**	**Weighting**	**Duration**
Core Mathematics 1, 2, 3, 4	Written paper	Equally weighted 75 marks per paper	1h 30
Further Maths 1, 2, 3	Written paper	Equally weighted 75 marks per paper	1h 30

GCE Mathematics Examination Paper Format			
Paper	**Assessment**	**Weighting**	**Duration**
Mechanics 1, 2, 3, 4	Written paper	Equally weighted 75 marks per paper	1h 30
Statistics 1, 2, 3, 4	Written paper	Equally weighted 75 marks per paper	1h 30

Mathematics Examination Commentary

The GCE Mathematics assessment objectives provide an overview of general skills and competence that a student would be expected to display upon completion of the course. The learning outcomes provide no specific references to particular elements of the course or aspects of the curriculum.

In this respect the application of the objectives to determine evidence of testing in the individual papers becomes a far easier task to complete since they are not reliant on a direct connection to specific subject information. For example, the second statement, '*construct rigorous mathematical arguments and proofs*' could be evidenced through algebraic manipulation, or proof by contradiction.

The organisation of Mathematics assessment is divided into assessment over six papers, one paper for each unit or option selected. The four compulsory papers must be completed followed by a choice of two further modules from mechanics, calculus or further pure mathematics options. Mathematics papers each last 90 minutes, effectively resulting in six hours of formal written assessment.

The organisation of outcomes reflects a broad approach to mathematics which suggests that its application can be categorised into three strands – problem solving, proving theories, and validation of argumentation.

6.3.5 GCE A Level English Language and Literature

GCE English Language & Literature Curriculum A Level Assessment Structure	
AS Sections Assessment & Form of Assessment	
Unit 1: Exploring Voices in Speech and Writing (100 marks; 2 hours 15 minutes)	**Unit 2:** Creating Texts (80 marks)
External assessment: Clean copies of the prescribed examination texts should be used in the examination Short-question style - data response to unseen material Source booklet provided for Section A	Internal assessment: 2000-2500 words maximum, 500 words maximum for each commentary Prescribed list of topic areas Free choice of literary and non-fiction texts
A2 Section Assessment & Form of Assessment	
Unit 3: Varieties in Language and Literature (100 marks; 2 hours 45 minutes)	**Unit 4:** Presenting the World (80 marks 1 hour 30 minutes)
External assessment: 2 hours 45 minutes Clean copies of the prescribed examination texts should be used in the examination Section A: unprepared prose Section B: prepared drama or poetry	Internal assessment: 2500-3000 words maximum, 1000 words maximum for the commentary Free choice of texts to produce three pieces of writing: literary, non-fiction, and an analytical evaluative commentary

English Language and Literature Examination Commentary

The testing of English Literature and Language emphasises the importance of synoptic assessment, and this is reflected in the examination papers which require an all-round understanding and appreciation of both subject matter and also through the use of language. In this respects examination typically requires candidates to draw on their knowledge not simply from the recommended texts that are necessarily covered in the two years of study. Indeed, further to this candidates are expected to refer more broadly to their experience of a variety of texts, gained through study and also individual interest.

The format of the formal written papers is reflective of typical approaches to testing literature, with the analysis of prepared texts covered during the course of study. In addition, candidates must apply their linguistic and literary knowledge and skills to unseen texts, thus demonstrating an ability that does not solely focus on studying set texts and assimilating critical theories and approaches closely associated with the texts selected. In addition candidates must demonstrate their ability to provide this level of analysis, critique and evaluation to texts they may never have previously encountered.

Assessment in the A2 examinations further challenges students as evidenced through the use of a variety of strategies, including questions which specifically require a candidate to analyse, evaluate, discuss or compare. Similarly, questions may develop a particular theme or subject, and thus require a candidate to provide an extended answer over several sections. Finally, A2 assessment papers also include more open-ended question types, presenting the candidate with the opportunity greater scope within which to answer and in doing so, to demonstrate their ability to apply different styles and approaches to answering the questions. The assessment requirements also provide challenging demands via the portfolio, which over the course of the two years of study amounts to approximately 5 to 5,500 words of work. The coursework component comprises a wide-range of text-types; in other words, candidates are required to demonstrate a sophisticated and dexterous approach to adapting different, appropriate writing styles.

Prescribed Texts	
Unit 1: One text must be chosen from the list below: - The Bloody Chamber and Other Stories, Angela Carter - paddy clarke ha ha ha, Roddy Doyle - The Color Purple, Alice Walker - Restoration, Rose Tremain - Address Unknown, Kressman Taylor - Cloudstreet, Tim Winton - Dubliners, James Joyce	**Unit 3**: Students are required to study a pair of texts from either drama or poetry covering one of the following themes: - A sense of place - The Individual in Society - Love and Loss - Family Relationships
Unit 2: Coursework Presentation of coursework folder of 2-2500 words of the candidates own writing (500 words maximum per piece) Themes: - entrapment; - dystopia; - women's lives; - gothic and supernatural; - journeys and pilgrimages 3 pieces of writing: 1. primarily for a reading audience (word limit 1750) 2. primarily for a listening audience (word limit 750) 3. commentary on the writing process for each piece	**Unit 4: Coursework** Presentation of coursework folder of 2500-3000 words of candidates own writing (1000 words maximum per piece) 3 pieces of writing: 1. literary: e.g. section of writing which presents a factual event through narration 2. non-fiction e.g. an analytical comment article for a broadsheet newspaper 3. an analytical evaluative commentary.

English Language & Literature Assessment Objectives Criteria	
1	Select and apply relevant concepts and approaches from integrated linguistic and literary study, using appropriate terminology and accurate, coherent written expression
2	Demonstrate detailed critical understanding in analysing the ways in which structure, form and language shape meanings in a range of spoken and written texts
3	Use integrated approaches to explore relationships between texts, analysing and evaluating the significance of contextual factors in their production and reception
4	Demonstrate expertise and creativity in using language appropriately for a variety of purposes and audiences, drawing on insights from linguistic and literary studies

6.3.6 GCE A Level Geography

GCE Geography Curriculum A Level Assessment Structure (A1)				
Section	**Assessment**	**Form of Assessment**	**Weighting**	**Duration**
Unit 1	Physical Environments	Answer 1 of 2 questions per study area (20 marks per question) Structured data response questions	60 marks	1 hour 15
Unit 2	Human Environments		60 marks	1 hour 15
Unit 3	Fieldwork investigation	Choice of: **Option 3a:** Personal enquiry **Option 3b:** Applied geographical Skills **Section A:** (40 marks) **Section B:** (20 marks)	60 marks	1 hour 30

GCE Geography Curriculum A Level Assessment Structure (A2)				
Section	**Assessment**	**Form of Assessment**	**Weighting**	**Duration**
Unit 4	Physical systems, processes and patterns	6 semi-structured essay questions 2 questions to answer covering 2 of 3 subject areas	50 marks	1 hour 30
Unit 5	Human systems, processes and patterns		50 marks	1 hour 30
Unit 6	People and their environments	Synoptic assessment Section A: analysis of text, maps and data (50 marks) Section B: choice of 1 from 4 essay questions (25 marks)	75 marks	2 hours

Drawing on similarities in the organisation of all GCE subjects, the assessment format varies considerably in terms of question type, answer length, and data and materials provided for analysis. The GCE involves a complex interaction of the sub-division of unit marks and the

four assessment objectives. Furthermore it is evident that skill assessments reduce in year A2 whilst the quantity of questions testing knowledge and application of knowledge to a variety of seen and unseen situations increases. Fieldwork investigation must address a topic, question or issue relevant to the subject criteria for geography, including the collection of primary data through fieldwork and direct practical experience, and secondary sources when appropriate. Students will be expected to demonstrate an ability to collect, select and interpret information geographically and represent it via a range of graphic and cartographic means. The enquiry should be no more than 2,500 words in length.

For the applied geographical skills option there are two sections:

- Section A: a compulsory question with sub-sections requiring the manipulation and organisation of a range of resource materials, and the application of practical skills in a context unfamiliar to students.
- Section B: a compulsory question addressing the students' own fieldwork. The examination paper expects students to have carried out a minimum of two days' fieldwork.

Synoptic assessment involves testing a students' ability to draw on their understanding of the connections between different aspects of the Geography syllabus. The first part of the examination requires students to bring together and apply in an unfamiliar context knowledge, understanding and skills from different parts of the whole syllabus. The essay questions explore links between the different parts of the syllabus content, requiring the synthesis of geographical understanding and skills in the context of the inter-relationships between physical and human environments.

GCE Geography Assessment Objectives:	
1	show knowledge of specified content
2	show critical understanding of the specified content
3	apply knowledge and critical understanding to unfamiliar contexts
4	select and use a variety of skills and techniques, including communication skills appropriate to geographical investigation.
Progression from AS to A2	
The knowledge, understanding and skills developed in AS units underpin the requirements of the A2 units:	
	systems and processes are studied in different contexts, giving continuity of approach, but requiring increasing breadth and depth of conceptual understanding
	the experience of the AS course offers a background against which students are expected to evaluate new ideas
	a broadening range of interrelationships is established, culminating in assessment of the knowledge and understanding of the connections between all parts of the course

GCE Geography Assessment Commentary

The GCE Geography learning outcomes refer to some skills tested through practical and project based assessment, to be tested by coursework and fieldwork, and others more immediately tested under examination conditions.

AS Geography examinations, units one and two, present a choice of three from six questions relating to physical and human environments. Each question is worth 20 marks. Questions are geared towards structured-answer formats; this incorporates a question stimulus, in the

form of a map, diagrams or graphical data, and sub-questions related to the subject. Initial questions require short responses, generally identifying geographical phenomena or theory, with subsequent questions requiring a more detailed explanation of the phenomena, culminating in the extension of the subject field into an analysis of a relevant case study, often of the candidate's choice.

Examination papers 4 and 5 at the end of A2 contain structured essay questions requiring candidates to discuss topics at length, assimilating discursive, analytical and explanatory skills. The questions are subdivided with the first part addressing visual data stimulus which requires an explanation of the geographical features present; the second part encourages a more open-ended response which involves detailed discussion of the subject.

Examination paper 6 requires extended responses related to questions focusing on one main theme for example, 'describe the location and physical geography of Bolivia'. Subsequent questions develop lines of enquiry on the main theme of the question. For example, providing evidence to justify the classification of Bolivia as a Less Developed Country; assessing the impact the physical geography of Bolivia has on its development; examining the consequences of foreign intervention upon the country and its peoples. This paper concludes with a 25 mark essay question concerning a particular problem or area for discussion, for example the effects of human behaviour on the environment; an analysis of the factors that affect population growth.

7 Summary of Findings

This section provides a conclusion to the analysis of the National Senior Certificate and comparisons with its international counterpart the GCE A level. A summarisation of the main and most relevant findings to emerge from the study is included alongside relevant observations and appropriate recommendations.

The report has viewed the NSC from two main perspectives. Firstly, it has assessed the development of the qualification in accordance with the requirements and guidelines laid down in the National Curriculum Statement. From this perspective it is possible to understand the social, political, educational and cultural contexts that have exerted influence on the NSC and still continue to shape its evolution. Thus, stakeholder influence, interest and opinion have been acknowledged.

Secondly, the report has viewed the NSC qualification providing an overview of the composition of each of the NSC subjects covered. This has accounted for the aims, learning outcomes and content for Life Sciences, Physical Sciences, Mathematics, Mathematical Literacy, English Home Language and Geography as stated in the National Curriculum Statements, and has considered how the subjects compare with their respective GCE counterparts. Finally, the report has considered examination practices, comparing the NSC and GCE approaches to testing student knowledge. In this respect the report has referred specifically to the IEB approaches to examination at Grade 12.

7.1.1 Context of NSC Development

This report has noted the substantial changes to have taken place in the South African education system since 1994, reflecting the pace and scale of social and cultural developments occurring within the country. In particular, it has found that both National Curriculum Statement and NSC development has been extensive, evidenced by the prolific output of materials published both by the national department and the Independent Examinations Board.

To an extent the quantity of published materials has provided some obstacles for the successful completion of this report, principally through the need to identify those materials deemed most relevant to a satisfactory understanding and analysis of the NSC. The National Curriculum Statement Grades 10 to 12 for individual subjects would appear to underpin the very existence of the NSC. These documents offer extensive information relating to the principles behind the curriculum, whilst outlining detailed statements relative to individual subject purpose, scope, learning outcomes, assessment standards and competence descriptions.

However, during the course of conducting this report it has also emerged that the NCS Grades 10 – 12 documents had been criticised for a lack of subject content specificity. This response subsequently lead to the development of further guidelines, namely the Subject Assessment Guidelines, or SAGs and the Learner Programme Guidelines or LPGs. It would appear that the introduction of these additional documents has been universally welcomed by all stakeholders, particularly teachers and examiners. The positive response to the SAG and LPG documents can be attributed to the clearer guidance they provide, by identifying the subject matter that will be assessed in the examinations, and therefore signposting the material that needs specific attention in the classroom.

In particular, the report notes the importance and value associated with the development and application of the Subject Assessment Guidelines, both DoBE and IEB, which facilitate in delivering the aims of the National Curriculum Statement and also clarifying the examinable content at Grade 12. This report noted some difficulties in comparing the content of the NSC subjects with those of the GCE due to the fact that the curriculum statement provides vaguer instructions for specific content delivery because of its predominant focus on learning outcomes. By contrast the content specifications for the GCE A level appear far more accessible and comprehensible. This difficulty emerges most obviously when determining how much of the curriculum content is covered by the examination. In turn, this provides an indication of the extent to which subject coverage is of primary or secondary importance. By contrast, the GCE provides examinations that address each of the subject modules studied, thus ensuring a comprehensive assessment of whole subject knowledge.

The practice of referring to the competence descriptions contained in the NCS Grades 10 – 12 documents has also ceased, although it is unclear whether the intention to construct a new set of descriptors is currently apparent. This report would suggest that competence descriptors applied to actual student performances are an invaluable means to understand what it *means* to achieve a different rating band or score in an NSC subject examination.

This report reviewed actual examination script answers written by IEB candidates, and observed how the differing levels of achievement were graded and reflected by actual student performances. Access to this material provided useful indications of the differences between higher and lower rating band performances. This in turn correlates with the theoretical association of cognitive skills with higher and lower band scores, with lower band scores of 2, 3 and 4 demonstrating fundamental knowledge and understanding of subject content. Higher rating band scores were reflected by more sophisticated script answers, displaying a more applied and evaluative approaches to examination questions. However, the use of level descriptors could also augment the identification of standards and differences in NSC grading. By comparison, the GCE A level provides grade boundary definitions which enable markers to differentiate the quality of student responses.

In relation to the NSC assessment mechanism, this report notes the work conducted by Umalusi, the agency responsible for the quality assurance of the standards of the NSC examinations. In their 2008 report “Maintaining Standards”, Umalusi reviewed the different subject specifications, including content and skills specifications, whilst considering interpretations of examinable and non-examinable content. The report found that NSC examinations focused on a three-level cognitive demand instrument based on Bloom’s taxonomy, incorporating two levels of comprehension, understanding and analysis, and the separation of evaluation and synthesis. This corresponds with the qualitative review of IEB candidate examination scripts.

Finally, the introduction of the NSC has lead to suggestions that undergraduates now entering university are prepared differently to previous cohorts of undergraduate student. Anecdotal evidence suggests that candidates are increasingly more adept at taking initiative and displaying independent research and study skills. It is believed that this contributes to a gradual improvement in the all-round abilities of South African undergraduates. Although universities now provide bridging courses to address knowledge gaps in some of the new intakes of undergraduates (especially at the lower levels of achievement), these courses

achieve their aims of covering any knowledge gaps by the completion of the first year of study. Bridging courses are most common for students of Mathematics and science subjects, although this is felt to be more a reflection of the uneven quality of the delivery of the curriculum as opposed to a problem with the NSC.

7.1.2 Subject Specific Observations

The comparison of individual subjects was not necessarily as straightforward a process as it may initially appear. The organisation and composition of subjects differ noticeably between South Africa and England, Wales and Northern Ireland. This is most evident with Physical Sciences, which was compared with both GCE Physics and Chemistry.

In this respect it is difficult to determine how Physical Science compares with both Physics and Chemistry. Firstly, it is clear that the GCE A level covers a wider range of subject matter in both Physics and Chemistry. Indeed, the GCE in each subject is assessed over 6 examinations in the two years of study, which compares with three examination papers for Physical Sciences.

Whilst an analysis of the examinations revealed that both the GCE and IEB were rigorously tested, it is difficult to gauge how the content of three years of study can be sufficiently condensed for assessment in one examination per subject area. In practical terms, this appears to be impossible to achieve; the National Curriculum Statement further supports this view by stating that the whole of the Physical Sciences specification cannot be covered. Secondly, in a continuation of this point, it is also important to refer to the three-part Umalusi report “2008 Maintaining Standards”. Analysis in this report noted that Physical Sciences contained 368 hours of subject material, contrasted against the reality of only 242 classroom hours being available for delivery. Furthermore, the Umalusi report implied that the Physical Sciences content favoured the coverage of physics subject matter.

In this respect, it would appear that the curriculum content for Physical Science requires further attention, with the reduction of content to more manageable and deliverable levels. On the other hand, it is also possible that the introduction of separate Physics and Chemistry subjects seems in theory to be an acceptable solution, although whether this would be the case in practice is unclear.

With regard to the comparability of subjects from NSC to GCE, it should also be noted that there was no direct equivalent to Mathematical Literacy at GCE A level that would have enabled satisfactory comparison. However, it should be stressed that the report found that Mathematical Literacy represents a robust and rigorously tested NSC subject. Furthermore, the emphasis on Mathematical Literacy reflects the national department’s drive to address the wider issue of numeracy standards within the country. The subject focuses on the understanding, utilisation and application of mathematical knowledge in practical and every day contexts. In this respect, the inclusion of Mathematical Literacy confirms the commitment to improving standards of numeracy across the country.

The provision for Mathematics also raises some interesting questions and issues in the course of the analysis: firstly, the requirement to write two Mathematics papers only, with the option of sitting a third; secondly, the IEB provision of Advanced Programme Mathematics as a separate subject option outside of the recognised NSC list of subjects. It seems plausible

that comparisons with the GCE AS-level should be considered for candidates who write the three Mathematics examinations. Thus, this report suggests that comparisons between the AS level are at their strongest when the reference is made to candidates completing all three Mathematics papers. Comparability between the AS level and NSC Mathematics is less certain – except with the instances of high achieving candidates – where comparisons take into account candidates sitting papers 1 and 2 only. However, it is also important to consider the specific entry requirements of some university faculties for undergraduate Mathematics degree programmes that necessitate the completion of all three examination papers. The provision of the third paper does not appear in principle to challenge capable mathematics candidates any further than in the first two papers.

In addition to this, the report finds that the content of the three Mathematics papers plus the Advanced Programme Mathematics is more broadly in line with the requirements of the GCE A level in Mathematics, both in terms of breadth of content and also in terms of the level of mathematical competence required. The IEB Advanced Programme Mathematics covers modules in calculus and algebra, and provides three optional areas in statistics, finance and modelling, and matrices and graph theory. The addition of these areas of mathematics is an extension to the content and subject matter covered in the NSC Mathematics papers, and is in turn more reflective of the GCE A level content. Furthermore, the Advanced Programme paper emphasises more independent and creative thinking on the part of the student, requiring an extension in application of subject knowledge and in turn a more rigorous preparation for the demands of study at undergraduate level.

It is possible that the value that is added to both the NSC qualification and to the learner experience would be further enhanced by advanced papers in a greater range of subjects, rather than being restricted to Mathematics only. With respect to the English Home Language papers, discussions at the IEB intimated that an advanced paper is also a consideration for English. The IEB English Home Language examinations already provide a rigorous challenge to the linguistic capabilities of students. Comparisons revealed great similarities between both the GCE and IEB examination papers; the combination of language and literature based tasks and the emphasis on appreciating the diversity with which language can be used highlight two features common to both examinations. In this respect it would appear that the IEB English Home Language examination is certainly comparable with the AS-level, whilst some comparability with the overall A level standard is also apparent.

The analysis of NSC Geography reflects the overall findings reached by this report, namely that the subject is broadly comparable to the AS-level counterpart. Indeed, this conclusion is further strengthened by the fact that comparisons between the NSC and AS-level Geography encountered very few issues of contention. Comparisons reveal that the IEB examination mirrors the approaches adopted by the GCE in that both sets of papers focus on geographical knowledge, and practical skills and applications. Thus, candidates are expected to address geographical issues by applying the subject knowledge to given or theoretical situations. In addition, candidates are also required to demonstrate the application of their practical geographical skills, including map reading, for example.

Specifically, the report highlights the quality of the IEB organisation and presentation of Grade 12 content and examinations. This supports the assertion that the clear organisation of examination and content is also likely to facilitate successful subject delivery within the

classroom. Furthermore, it ensures that Grade 12 content coverage is also reflective of the final examinations. In addition, the inclusion of a glossary of terms in the IEB examination papers provides further help and guidance to students. The glossary specifies what question words 'mean', and is thus intended to facilitate the candidates approach to different examination tasks. In the process of doing this the glossary also acts to remove potential barriers and misunderstanding that can often occur in examination conditions.

Thus, in summary, the report finds that the NSC subjects are each broadly comparable to the standard required at GCE AS-level standard. Specifically, the NSC Mathematics papers plus the IEB Advanced Programme Mathematics paper is broadly comparable to GCE A level.

7.1.3 Linguistic Diversity

This report has noted the extent of linguistic diversity evident in South Africa, and indeed has commented on the effect that 11 officially recognised languages must place on the delivery of the education system. The IEB, for example offers seven of the eleven official languages to NSC level. This report contends that it is clearly essential for South Africa to display both respect and sensitivity to the needs of the many indigenous languages spoken within the country. Nevertheless, the provision of National Curriculum Statement delivery in eleven official languages must place the educational system under some degree of strain. However, it should also be acknowledged that the languages of learning and teaching are English and Afrikaans. Thus, delivery of the curriculum for the majority of learners in South Africa is through their second or third language. In practice this means that the curriculum is only delivered in all official languages at the Foundation Phase. On a practical level, the identification and recruitment of sufficiently talented and capable teachers who can deliver the NSC at Grades 10 to 12, as specialists within particular subject fields, is an unenviable, difficult task. Furthermore, the linguistic diversity must in turn present issues of its own, particularly in relation to quality assurance and the maintenance of NSC standards in the delivery of subjects.

Comparisons with the GCE level reveal that one of the clearest contrasts emerges in approaches to assessment in each year of study. This report has established that for NSC students, Grades 10 and 11 must be successfully completed in order to progress onto Grade 12. However, performances at Grades 10 and 11 do not contribute towards the composition of the final NSC score. Thus, whilst two-thirds of the curriculum may be covered during Grades 10 and 11, it is only at Grade 12 that performances contribute to a student's certificate score. From a logistical and practical perspective, the coverage of the whole NSC subject content would appear to be very difficult to achieve in two or possibly three end of Grade 12 tests. This does not undermine the rigours of the Grade 12 examinations, although it highlights the fact that examinations will assess a more limited selection of the curriculum. By comparison, the GCE A level incorporates examinations in both years of study, at AS-level during the first year of study, and at A level during the second year of study. Performances in all examinations contribute to the final A level grade. This system permits a more substantial examination of knowledge from a wider range of subjects covered in the curriculum. Furthermore, at the completion of the first year of study candidates are notionally awarded the AS-level, providing recognition of achievement during the first year of GCE A level study. Candidates who decide not to progress onto the second year of study, or more commonly 'specialise' onto a narrower range of subjects receive official recognition of

achievements during the AS-level year. Indeed, the AS-level is a recognised qualification. In summary, the NSC provides the opportunity for candidates to study a broader range and number of subjects; by comparison the GCE A level allows candidates to study a broad number of subjects initially, in AS-level year, prior to focusing on more in-depth study in a narrower number of subjects in the second year of study.

7.1.4 School-based Assessment

The requirements for internal, school-based assessment in the NSC are impressively rigorous. All subjects require the submission of a portfolio of work addressing subject material from a variety of approaches. Some these approaches are also highly original in outlook, as exemplified by Mathematics assessment tasks including the student delivering a lesson on a particular subject. The school-based assessment demonstrates a flexible outlook to measuring candidate knowledge and performances, and clearly encourages candidates to express themselves through a large number of different channels. In addition, this report has also noted that the national department and IEB guidance for school-based assessment is detailed and thorough. This also highlights the value of the SAG and LPG once again.

7.1.5 Assessment

The National Curriculum has encouraged a clear move away from rote learning to an education that is clearly imbedded in the modern world. All subject specifications make explicit in their aims and objectives that subject knowledge be applied to real-life situations where relevant and appropriate. This supports the claim that the NSC empowers students, by providing them with the tools to learn, discover and explore within their subject areas.

Higher Education of South Africa (HESA) acknowledges that some learning gaps are evident in the first year of undergraduate intake from NSC matriculated students. However, informal feedback provided from the Higher Education of South Africa suggested that the new NSC cohorts appear to highly competent at working independently and taking the initiative in their studies. Furthermore, most knowledge gaps are addressed during the first few semesters of study through bridging courses.

7.1.6 Conclusions and Recommendations

Analysis of the NSC indicates that the qualification is both robust and fit for the purposes of examining senior secondary school levels. The report concludes that the National Senior Certificate at Grade 12 is broadly comparable to the GCE AS-level. The aims and learning outcomes of both qualifications are largely similar, and approaches to assessment, including school-based assessment or coursework are comparably rigorous and demanding.

The main difference between the NSC and the GCE A level is evident in the respective content of each course. Whilst the NSC permits candidates to study a broad range of subjects, the GCE A level focuses on more in-depth coverage of fewer subjects. In addition, GCE assessment occurs during both years of study, and encompasses the formal examination of a wider range of the subject specifications. By contrast, the NSC is awarded on the basis of performances in the final year of study, Grade 12, and thus restricts the curricula content tested. Indeed, whilst many similarities emerge in relation to the learning outcomes of both NSC and GCE subjects, it is ultimately important to consider the extent to

which the content is covered in examination conditions. The inclusion of advanced papers augments the scope of study, and in the sole instance of IEB Advanced Programme Mathematics, the paper is a supplement to the three NSC Mathematics papers, resulting in closer comparability with the GCE A level in Mathematics.

Whilst the report finds broad comparability with the GCE AS-level standard, it also highlights the need for closer scrutiny of the relationships between NSC and GCE subjects. Of particular concern is the extent to which curricula content can realistically be covered by end of year examinations. The specific example of NSC Physical Sciences and GCE Chemistry and Mathematics highlights the practical limitations of covering two subjects within one set of IEB examinations in comparison with the GCE examination which tests both subjects individually.

The report notes the invaluable developmental work that has driven the NSC forward within the last decade. This commenced with the realisation of the National Curriculum Statement in 2003, which has subsequently been augmented through the application of Learning Programme Guidelines and Subject Assessment Guidelines in 2006 and 2008. Stakeholders suggest that the fine-tuning work on a subject by subject basis is already a work in progress. In doing so, this has facilitated the provision of greater clarity and understanding of NCS requirements.

7.1.7 Recommendations

In order for the NSC to grow from strength to strength, it is clearly important that the difference between NSC participation and pass rates improves. Current figures suggest that only a third of candidates starting Grade 10 are likely to advance to Grade 12. Furthermore, the national rate of successful Grade 12 students rests at approximately 60% of the candidates. This clearly shows that the majority of students in education at Grade 10 will not leave their formal education with a recognised exit qualification. Improvements to both participation and pass rates should be essential objectives of the NSC and integral to establishing the relevance of the qualification to the majority of the young South African population.

This issue also draws attention to the absence of a recognised and respected qualification representative of the completion of ‘general education’. In England, Wales and Northern Ireland, for example, the GCSE is the fundamental qualification in a child’s education, representing the foundations to an individual’s education. The lack of a qualification broadly comparable to the GCSE is problematic since it suggests there is no recognition of educational achievement at its most fundamental level.

This report would recommend that the successful completion of studies in Grade 10 could be regarded as an achievement comparable to the GCSE standard. However, this would require clear improvements in the provision of foundation education from Grades R to 9. At the completion of Grade 9 students currently ‘achieve’ the GETC, although this staging post appears not to be held in particularly high esteem.

Improvements would also need to address the cross-over from Grade 9 to Grade 10, which many stakeholders have acknowledged to be problematic. Thus, the relationship between the delivery of the curriculum up to and including Grade 9 needs further review to ensure

that the curriculum adequately prepares students for study at Grade 10. In response to this, the national department has established a curriculum development programme to address knowledge gaps evident between Grades 9 and 10.

The value of formally recognised achievement at the end of Grade 10 should not be underestimated; it would represent the successful negotiation of a minimum threshold of standards. Furthermore, recommendations of a benchmark at this level do not necessarily impose an obligation to provide an exit point but serves to distinguish between a recognised standard at the foundation education level and that at senior secondary level. In turn, this provides candidates with a recognised qualification that acknowledges their baseline achievement in formal education, irrespective of their promotion through to Grade 12 and the award of the NSC.

In order to achieve this, there is a clear need to ensure that the provision of well-qualified teachers is available throughout the whole of South Africa. This should focus both on the up-skilling of current teachers, and on increasing the volume of readily available skilled teachers. Teacher training considerations should focus on a commitment to a specific B.Ed teacher training programme, incorporated alongside a drive to increase the numbers of skilled teachers currently working, with the aim of gradually raising the standard of delivery. This should augment the provision of suitably capable and trained teachers who are able to deliver the curriculum, consistently and evenly across the country as whole.

Notwithstanding these recommendations, it is clear that there are nationally-held concerns regarding the success of the NSC in South Africa, and in particular with regard to participation and pass rates. The negative impact of poverty and social and familial attitudes towards the value of a formal education are not to be underestimated. However, this at least indicates that the problem, perceived to be one of the greatest challenges that the education system in South Africa must tackle, has already been recognised.

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Mathematical Literacy paper 2 appendix

Mathematical Literacy paper 2 appendices

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Mathematics paper 1 answer booklet

Mathematics paper 1 information sheet

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Appendices

Appendix 1: IEB Learning Outcomes in relation to Assessment Standards

Life Science Learning Outcomes in relation to Assessment Standards at Grade 12

LO 1 - AS 1 *Identifying and questioning phenomena and planning an investigation*
• Generate and question hypotheses based on identified phenomena for situations involving more than one variable. *Attainment is evident when the learner, for example:* o observes the high incidence of respiratory problems in the community; o hypothesises that this could be linked to smoking or the local oil refinery. • Design tests and/or surveys to investigate these variables. *Attainment is evident when the learner, for example:* o designs a survey to find the correlation between smokers/non-smokers and respiratory problems; o designs tests to find out the amount of air pollutants in the community. • Evaluate the experimental design. *Attainment is evident when the learner, for example:* o checks the accuracy of the air pollution test or survey.
LO 1 - AS 2 *Conducting an investigation by collecting and manipulating data*
• Compare instruments and techniques to improve the accuracy and reliability of data collection. *Attainment is evident when the learner, for example:* o works co-operatively in a group; o uses different instruments and techniques to collect data on the air pollutants; o compares data collected using the different instruments. • Manipulate data in the investigation to reveal patterns. • Identify irregular observations and measurements. • Allow for irregular observations and measurements when displaying data. *Attainment is evident when the learner, for example:* o draws graphs using the data collected; o takes note of data that does not fit the graph; o displays irregular observations on the graph but does not include them in the construction of the graph.
LO 1 - AS 3 *Analysing, synthesising, evaluating data and communicating findings*
• Critically analyse, reflect on and evaluate the findings. • Explain patterns in the data in terms of knowledge. • Provide conclusions that show awareness of uncertainty in data. • Suggest specific changes that would improve the techniques used. *Attainment is evident when the learner, e.g.* o analyses and reflects on data represented in graphs and other data, looks for evidence of the causes of respiratory problems, and evaluates experimental findings; o presents a report to the class in which they communicate their findings; o demonstrates an awareness of weaknesses in their design and possible inaccuracy of results, and proposes how they could improve their experiments.
LO 2 – AS 1 *Accessing knowledge*
• Use various methods and sources to access relevant information from a variety of contexts. *Attainment is evident when the learner, for example:* o searches for information on theories about the origin of life and about South Africa as the cradle of mankind by making use of various sources of information such as libraries, local people, the Internet and magazines.
LO 2 – AS 2 *Interpreting and making meaning of knowledge in Life Sciences*
• Interpret, organise, analyse, compare and evaluate concepts, principles, laws, theories and models and their application in a variety of contexts. *Attainment is evident when the learner, for example:* o engages in debates regarding the origin of life; o compares different theories regarding the origin of life and identifies their shortcomings; o analyses and evaluates theories on changes in different species over time.
LO 2 – AS 3 *Showing an understanding of the application of Life Sciences knowledge in everyday life*
• Evaluate and present an application of Life Sciences knowledge. *Attainment is evident when the learner, for example:* o writes a report on how DNA can be used to identify the parents of a lost child.
LO 3 – AS 1 *Exploring and evaluating scientific ideas of past and present cultures*
• Critically evaluate scientific ideas and indigenous knowledge of past and present cultures. *Attainment is evident when the learner, for example:* o critically evaluates ideas on parental care during early childhood in various communities (e.g. quarantine of mother and newborn baby immediately after birth).
LO 3 – AS 2 *Comparing and evaluating the uses and development of resources and products, and their impact on the environment and society*
• Analyse and evaluate different ways in which resources are used in the development of biotechnological products, and make informed decisions about their use and management in society for a healthy, sustainable environment. *Attainment is evident when the learner, for example:* o differentiates, analyses and evaluates the impact of non-indigenous plants on the environment.
LO 3 – AS 3 *Comparing the influence of different beliefs, attitudes and values on scientific knowledge*

• Critically evaluate and take a justifiable position on beliefs, attitudes and values that influence developed scientific and technological knowledge and their application in society. *Attainment is evident when the learner, for example:* ○ debates and takes a justifiable position on deforestation and its impact on certain communities and the environment.

Physical Sciences Learning Outcomes in relation to Assessment Standards

LO 1 *practical scientific inquiry and problem-solving skills*	
1. Conducting an investigation	**2. Solving problems**
• Design, plan and conduct a scientific inquiry to collect data systematically with regard to accuracy, reliability and the need to control variables. *Attainment is evident when the learner, for example,* - designs and carries out an experiment to identify specific variables that affect motion (e.g. an experiment to verify Newton's second law of motion); - uses experimentation to determine some of the properties of organic compounds; - synthesises a common organic compound such as soap.	• Select and use appropriate problem-solving strategies to solve (unseen) problems. *Attainment is evident when the learner, for example,* - decides what information is needed and what steps must be followed to determine how far away a satellite is, using a laser
3. Interpreting data to draw conclusion	**4. Communicating and presenting information and scientific arguments**
• Seek patterns and trends, represent them in different forms, explain the trends, use scientific reasoning to draw and evaluate conclusions, and formulate generalisations. *Attainment is evident when the learner, for example,* - interprets patterns and trends in data in order to analyse and explain the motion of objects; - interprets the information gathered on the use of electrical energy, to identify patterns and trends of power usage during all seasons, day and night, and formulates strategies to conserve energy.	• Communicate and defend scientific arguments with clarity and precision. *Attainment is evident when the learner, for example,* - formulates and defends scientific arguments for wearing safety belts; - formulates and defends scientific arguments around the compulsory installation of airbags in all means of transport; - presents scientific arguments on the risks and benefits of the combustion of organic products and the manufacturing of synthetic products on human development, society and the environment; - explains the dangers associated with the use of organic solvents and other organic products like combustibility and toxicity, and presents scientific arguments against the use of synthetic organic solvents.

LO 2 *constructing and applying scientific knowledge*
1. Recalling and stating specified concepts
• Define, discuss and explain prescribed scientific knowledge. *Attainment will be evident when the learner, for example,* - recalls and explains the concepts of distance, speed, time, acceleration, force and momentum; - defines energy and explains the differences between different types of energy; - discusses the characteristics of the carbon atom (referring to bonding and chain formation) and identifies the functional groups of common families (e.g. alkanes, alkenes, alcohols, acids, esters); - describes electrochemical processes.
2. Indicating and explaining relationships
• Express and explain prescribed scientific principles, theories, models and laws by indicating the relationship between different facts and concepts in own words. Attainment is evident when the learner, for example, - indicates and explains the relationships between distance, time, mass, speed, force, acceleration, and balanced and unbalanced forces, and represents these relationships in more than one form; - explains the principles underlying the use of distillation to separate organic compounds; - describes, using basic knowledge about chemical reaction and structural formulae, typical organic reactions such as addition, combustion and polymerisation;
3. Applying scientific knowledge

• Apply scientific knowledge in everyday life contexts. *Attainment is evident when the learner, for example,* - applies scientific knowledge to identify precautions that can be taken to avoid accidents; - shows how energy transformation technologies are applied in everyday life; - applies understanding of electrolysis to the production of chlorine in swimming pool chlorinators; uses available materials to construct an electrochemical cell.

LO 3 *the nature of science and its relationships to technology, society and the environment*
1. Evaluating knowledge claims and science's inability to stand in isolation from other fields.
• Research, discuss, compare and evaluate scientific and indigenous knowledge system knowledge claims by indicating the correlation among them, and explain the acceptance of different claims. *Attainment is evident when the learner, for example,* - compares and evaluates various explanations from different historical perspectives on the concept of force; - researches and evaluates the suitability of alternative energy sources such as ethanol as a fuel, wind, solar and nuclear power, and discusses the acceptance of different viewpoints based on scientific knowledge.
2. Evaluating the impact of science on human development.
• Research case studies and present ethical and moral arguments from different perspectives to indicate the impact (pros and cons) of different scientific and technological applications. *Attainment is evident when the learner, for example,* - explains the impact on human beings of collisions during road accidents; - explores the precautions that can be taken to avoid accidents and discusses the technologies used to minimise the effects of collisions; - analyses and explains the relationship between force and motion with political, economic, environmental and safety issues in the development and use of transportation technologies; - researches and presents arguments on the impact of organic reactions on the quality of human life and the environment; - researches and presents arguments on the economic, social and environmental impact of various energy sources; - identifies typical organic reactions that add value to life (e.g. combustion and addition polymerisation) and researches their impact on socio-economic development; - explains the dangers and impact associated with the use of organic solvents and other organic products (e.g. combustibility, toxicity) and suggests intervention strategies; - discusses ethical issues related to the use of newly-synthesised drugs without proper testing.
3. Evaluating science's impact on the environment and sustainable development
• Evaluate the impact of scientific and technological research and indicate the contribution to the management, utilisation and development of resources to ensure sustainability continentally and globally. *Attainment is evident when the learner, for example,* - analyses and explains the relationship between force and motion with political, economic, environmental and safety issues in the development and use of transportation technologies; - evaluates strategies used to determine the influence and impact of motion on the quality of life and the environment; - analyses the sustainable use of energy; - presents scientific arguments on the risks and benefits of combustion of organic products and manufacturing of synthetic products on human development, society and the environment; - explains the impact on the environment of combustion of fossil fuels (organic compounds); - presents a report on the social, environmental and economic consequences of the use and discarding of organic products.

Physical Science Content and Contexts for the Attainment of Assessment Standards

LO 1: ***Practical Scientific Inquiry and Problem-solving Skills***	
Grade 10-12: Each theme must include at least ONE activity involving practical investigation and/or data interpretation linked to an opportunity for communicating and presenting information and scientific arguments.	
LO 2: ***Constructing and Applying Scientific Knowledge***	
Grade 10: Mechanics (12.5%) • Motion in one dimension: • Gravity and mechanical energy:	**Grade 11: Mechanics** • Force, momentum and impulse:
Grade 12: Mechanics (12.5%) • Motion in two dimensions: - projectile motion represented in words, diagrams, equations and graphs; - conservation of momentum in 2D; - frames of reference.	• Work, power and energy: - when a force exerted on an object causes it to move, work is done on the object (except if the force and displacement are at right angles to each other); - the work done by an external force on an object/system equals the change in mechanical energy of the object/system; - power (rate at which work is done).

Grade 10: Waves, sound and light (12.5%) • Transverse pulses on a string or spring: • Transverse waves: • Geometrical optics:	**Grade 11: Waves, sound and light (12.5%)** • Geometrical optics: • Longitudinal waves: • Sound: • Physics of music:
Grade 12: Waves, sound and light (12.5%) • Doppler Effect (source moves relative to observer): - with sound and ultrasound; - with light – red shifts in the universe (evidence for the expanding universe). • Colour: - relationship to wavelength and frequency; - pigments, paints; - addition and subtraction of light.	• 2D and 3D wave-fronts: - diffraction; - interference (special kind of superposition); - shock waves, sonic boom. • Wave nature of matter: - de Broglie wavelength; - electron microscope.
Grade 10: Electricity and Magnetism (12.5%) • Magnetism: • Electrostatics: • Electric circuits:	**Grade 11: Electricity and Magnetism (12.5%)** • Electrostatics: • Electromagnetism: • Electric circuits:
Grade 12: Electricity and Magnetism (12.5%) • Electrodynamics: - electrical machines (generators, motors); - alternating current; - capacitance and inductance. • Electronics: - capacitive and inductive circuits; - filters and signal tuning; - active circuit elements, diode, LED and field effect transistor, operational amplifier; - principles of digital electronics – logical gates, counting circuits.	• Electromagnetic radiation: - dual (particle/wave) nature of EM radiation; - nature of an EM-wave as mutual induction of oscillating magnetic/electric fields; - EM spectrum; - nature of EM as particle – energy of a photon related to frequency and wavelength; - penetrating ability.
Grade 10: Matter and materials (25%) • Observing, describing, classifying and using materials - a macroscopic view • Particles substances are made of • The Atom: basic building block of all matter	**Grade 11: Matter and materials (25%)** • Electronic properties of matter: • Atomic combinations: molecular structure • Atomic nuclei: • Ideal gases and thermal properties:
Grade 12: Matter and materials (25%) • Optical phenomena and properties of materials: - transmission and scattering of light; - emission and absorption spectra; - lasers; - photoelectric effect. • Organic molecules: - organic molecular structures – functional groups, saturated and unsaturated structures, isomers; - systematic naming and formulae, structure physical property relationships;	- substitution, addition and elimination reactions. • Mechanical properties: - elasticity, plasticity, fracture, creep (descriptive); - Hooke's Law, stress-strain, ductile and brittle materials; - fracture, strength of materials. • Organic macromolecules: - plastics and polymers – thermoplastic and thermo-set; - biological macromolecules – structure, properties, function.
Grade 10: Chemical change (18.75%) • Physical and Chemical Change • Representing chemical change	**Grade 11: Chemical change (18.75%)** • Quantitative aspects of chemical change: • Energy and chemical change: • Types of reaction:
Grade 12: Chemical change (18.75%) • Rate and Extent of Reaction: - rates of reaction and factors affecting rate (nature of reacting substances, concentration [pressure for gases], temperature and presence of a catalyst); - measuring rates of reaction; - mechanism of reaction and of catalysis; - chemical equilibrium and factors affecting equilibrium; - equilibrium constant; - application of equilibrium principles.	• Electrochemical reactions: - electrolytic and galvanic cells; - relation of current and potential to rate and equilibrium; - understanding of the processes and redox reactions taking place in cells; - standard electrode potentials; - writing of equations representing oxidation and reduction half reactions and redox reactions.
Grade 10: Chemical systems (18.75%) • Global cycles: * The water cycle: * The nitrogen cycle: • Industrial fixation of nitrogen: The hydrosphere:	**Grade 11: Chemical systems (18.75%)** • Exploiting the lithosphere/Earth's crust: • The atmosphere:
Grade 12: Chemical systems (18.75%) • Chemical industry – resources, needs and the chemical connection: - SASOL, fuels, monomers and polymers, polymerisation; - the chloralkali industry (soap, PVC, etc); - the fertiliser industry (N, P, K) - batteries, torch, car, etc.	

LO 3: *The Nature of Science and its Relationship to Technology, Society and the Environment* The information below outlines possible contexts for subject coverage in each of the modules in each Grade of study.	
Mechanics (12.5%) **Grade 10**: transportation; planets and their movement; astronomy, cosmology; machines and mechanics; structures, including architecture; weather systems.	**Grade 11**: transportation; movement; astronomy, cosmology; road accidents; structures.
Grade 12: transportation; planets and their movement; astronomy, cosmology; machines and mechanics; structures, including architecture; weather systems	
Waves, sound and light (12.5%) **Grade 10**: communication; medical technologies, sonar; astronomical instruments; starlight and sunlight, microwaves; astronomical and terrestrial speed determination, cosmology; cellular communications; solar energy	**Grade 11**: communication; medical technologies; astronomical instruments; starlight and sunlight; eyes, human and animal; earthquakes.
Grade 12: communication; medical technologies, sonar; astronomical instruments; starlight and sunlight, microwaves; astronomical and terrestrial speed determination, cosmology; cellular communications; solar energy.	
Electricity and magnetism (12.5%) **Grade 10:** information technologies; social and societal changes; digital (e-)communications; medical technologies; storage and transport of energy; lightning as electric/capacitative discharge; cellular communications; power generation, power grid; solar energy.	**Grade 11**: medical technologies; communication; storage and transport of energy; ESKOM power grid; lightning as electric/ capacitative discharge; aurora, cyclotrons.
Grade 12: information technologies; social and societal changes; digital (e-)communications; medical technologies; storage and transport of energy; lightning as electric/capacitative discharge; cellular communications; power generation, power grid; solar energy.	
Matter and materials (25%) **Grade 10:** chemistry around us; chemistry in the home; strengths of materials.	**Grade 11:** chemistry in the home; strength of materials; nuclear energy in South Africa; uses of nuclear technology; radioactivity in medicine.
Grade 12: Matter and materials (25%) Possible contexts could include: chemistry in the home; science in fashion; medical and industrial uses of lasers; astrophysics; civil engineering.	
Chemical change (18.75%) **Grade 10:** chemistry in the home; human nutrition.	**Grade 11**: alternative fuel; mining and mineral processing.
Grade 12: mining and mineral processing; polymers, paints and plastic.	
Chemical systems (18.75%) **Grade 10:** waste management; water management.	**Grade 11:** waste management; mining and mineral processing; alternative energy sources; pollution, dealing with pollution and its prevention.
Grade 12: waste management; mining and mineral processing; cosmetology	

Mathematics Content and Context for attainment of assessment standards

Mathematics Content and Context for attainment of assessment standards
Learning Outcome 1: Geographical Skills and Techniques (practical competence)
The learner is able to demonstrate a range of geographical skills and techniques.

Grade 10

When solving problems, the learner is able to recognise, describe, represent and work confidently with numbers and their relationships to estimate, calculate and check solutions.

The learner will use the following content in order to calculate and estimate accurately in solving standard problems, as well as those that are non-routine and unseen. The problems will be taken from mathematical and real-life contexts such as health and finance. Proposed content:

- Conversion of terminating and recurring decimals to the form:
  a–b ; a, b, _ _; b _ 0.
- The laws of exponents for integral exponents.
- Rational approximation of surds.
- Number patterns, including those where there is a constant difference between consecutive terms indicating that the general term is linear.
- Simple and compound growth formulae $A=P(1+ni)$ and $A=P(1+i)n$; solving for any variable except in the compound growth formula.
- Foreign exchange rates.

Grade 11

Recognition of non-real numbers:

- Use of the laws of exponents for rational exponents.
- Add, subtract, multiply and divide simple surds.
- Error margins.
- Number patterns, including those where there is a constant second difference between consecutive terms indicating that the general term is quadratic
- Simple and compound decay formulae $A=P(1-ni)$ and $A=P(1-i)n$. Calculation of all variables in $A=P(1-i)n$ (for n by trial and error using a calculator).
- Different periods of compounding growth and decay.

Grade 12

- Definition of a logarithm and any laws needed to solve real-life problems (e.g. growth and decay).
- The calculation of n using the growth and decay formulae.
- Number patterns, including arithmetic and geometric sequences and series.
- Sigma notation.
- Proof and application of the formulae for the sum of series, including
- Recursive formulae (e.g. Tn+1 = Tn + Tn-1)
  Annuities, bond repayments and sinking funds, with or without the use of the formulae:
- Loan options.

Mathematics Content and Context for attainment of assessment standards
Learning Outcome 2: Knowledge and Understanding (foundational competence)
The learner is able to demonstrate knowledge and understanding of processes and spatial patterns dealing with interactions between humans, and between humans and the environment in space and time.

Grade 10

Functions and Algebra
The learner is able to investigate, analyse, describe and represent a wide range of functions and solve related problems.
The approach to the content of this Learning Outcome should ensure that learning occurs through investigating the properties of functions and applying their characteristics to a variety of problems. Functions and algebra are integral to modelling and so to solving contextual problems. Problems which integrate content across Learning Outcomes and which are of a non-routine nature should also be used. Human rights, health and other issues which involve debates on attitudes and values should be involved in dealing with models of relevant contexts.

- Algebraic manipulation:
  - multiplying a binomial by a trinomial;
  - factorising trinomials;
  - factorising by grouping in pairs;
  - simplifying algebraic fractions with monomial denominators.
- Solution of:
  - linear equations;
  - quadratic equations by factorisation;
  - exponential equations of the form $kax+p = m$ (including examples solved by trial and error);
  - linear inequalities in one variable and graphical illustration of the solution;
  - linear equations in two variables simultaneously (numerically, algebraically and graphically).
  - the discrete or continuous nature of graph.
- Average rate of change of a function between two values of the independent variable.

Grade 11

- Study of functions including
  $y = ax + q$; $y = ax2 + q$; $y = a–x + q$; $y = abx + q$; $b > 0$; $y = a \sin(x) + q$; $y = a \cos(x) + q$; $y = a \tan(x) + q$
- Conversion between numerical, graphical, verbal and symbolic representations.
- Investigation of the effects of the parameters *a* and *q* on the above functions.
- Sketch graphs of the above functions using the following characteristics:
  - domain and range;
  - intercepts with the axes;
  - turning points, minima and maxima;
  - asymptotes;
  - shape and symmetry;
  - periodicity and amplitude;
  - average gradient (average rate of change);
  - intervals on which the function increases/decreases;
  - the discrete or continuous nature of the graph;
  - the discrete or continuous nature of the graph.
- Algebraic manipulation:
  - completing the square;
  - simplifying algebraic fractions with binomial denominators.
- Solution of:
  - quadratic equations (by factorisation, by completing the square, and by using the quadratic formula);
  - quadratic inequalities in one variable and graphical interpretation of the solution;
  - equations in two unknowns, one of which is linear and one which is quadratic, algebraically or graphically.
- Average gradient between two points on a curve and the gradient of a curve at a point.
- Linear programming:
  - optimising a function in two variables subject to one or more linear constraints, by numerical search along the boundary of the feasible region;
  - solving a system of linear equations to find the co-ordinates of the vertices of the feasible region.

Grade 12

- Study of functions:
  - formal definition of a function;
  - the inverses of: $y = ax + q$; $y = ax2$; $y = ax$; $a>0$
- Sketch graphs of the inverses of the functions above using the characteristics:
  - domain and range;
  - intercepts with the axes;
  - turning points, minima and maxima;
  - asymptotes;
  - shape and symmetry;
  - average gradient (average rate of change);
  - intervals on which the function increases/decreases.
- Factorise third-degree polynomials (including examples which require the factor theorem).
- Differential calculus:
  - an intuitive understanding of the limit concept in the context of approximating the rate of change or gradient of a function at a point;
  - the derivatives of the following functions from first principles:
    $f(x) = b$; $f(x) = x$; $(x) = x2$; $f(x) = x3$; $f(x) = 1–x$; • the derivative of $f(x) = xn$ (proof not required);
  - the following rules of differentiation:
    $d — dx [f(x)±g(x)] = d — dx [f(x)]± d — dx [g(x)]$ $d — dx [k.f(x)]= k\ d — dx [f(x)]$
  - the equations of tangents to graphs;
  - sketch graphs of cubic and other suitable polynomial functions using differentiation to determine the stationary points (maxima, minima and points of inflection) and the factor theorem and other techniques to determine the intercepts with the *x*-axis;
  - practical problems involving optimisation and rates of change.
- Linear programming:
  - optimisation of a function in two variables, subject to one or more linear constraints, by means of a search line and further comparing the gradients of the objective and constraint functions.

Mathematics Content and Context for attainment of assessment standards
Learning Outcome 3: Application (foundational competence)

The learner is able to apply geographical skills and knowledge to environmental issues and challenges, recognise values and attitudes, and demonstrate the ability to recommend solutions and strategies.

Grade 10

Space, Shape and Measurement

The learner is able to describe, represent, analyse and explain properties of shapes in 2-dimensional and 3- dimensional space with justification.

An important aspect of this Learning Outcome is the use of the content indicated in the representation of contextual problems in two and three dimensions so as to arrive at solutions through the measurement and calculation of associated values. Powerful mathematical tools which enable the investigation of space are embedded in the content. The treatment of formal Euclidean geometry is staged through the grades so as to assist in the gradual development of proof skills and an understanding of local axiomatic systems. Opportunities for making connections
across the geometries involved in this Learning Outcome as well as with the Mathematics of other Learning Outcomes should

be sought in requiring the solution to standard as well as non-routine unseen problems.

- The effect on the volume and surface area of right prisms and cylinders, of multiplying one or more dimensions by a constant factor k.
- Investigation of polygons, using any logical method (Euclidean, co-ordinate and/or transformation).
- Alternative definitions of polygons.
- Co-ordinate geometry: for any two points ($x1$; $y1$) and ($x2$; $y2$), derive and use the formula for calculating:
  - the distance between the two points;
  - the gradient of the line segment joining the points;
  - the co-ordinates of the mid-point of the line segment joining the points.
- Transformation geometry:
  - translation of p units horizontally and q units vertically;
  - reflection in the x-axis, the y-axis and the line $y = x$.
- Trigonometry:
  - introduction through the similarity of triangles and proportion;
  - scale drawing and the interpretation of maps and building plans;
  - definition and use of the definitions sin _, cos _ and tan _;
  - the periodicity of trigonometric functions.

Research into the history of the development of geometry and trigonometry in various cultures.

Grade 11

- Apply the formulae for the surface area and volume of right prisms, right cones, spheres and combinations of these shapes.
- Euclidean geometry:
  - necessary and sufficient conditions for polygons to be similar;
  - the line drawn parallel to one side of a triangle divides the other two sides proportionally (and the Mid-point Theorem as a special case of this theorem);
  - equiangular triangles are similar;
  - triangles with sides in proportion are similar;
  - Theorem of Pythagoras by similar triangles.
- Transformation geometry:
  - rotation around the origin through an angle of 90˚ or 180˚; the enlargement of a polygon, through the origin, by a factor of k.
- Trigonometry:
  - function values of the special angles 30˚, 45˚ and 60˚ (in surd form where applicable);
  - derivation and use of the identities tan _ = s–in cos —_– _ and sin2 _ + cos2_ = 1;
  - derivation and use of reduction formulae for
    sin(90˚±_), cos(90˚±_), sin(180˚±_),
    cos(180˚±_), tan(180˚±_), sin(360˚±_),
    cos(360˚±_), tan(360˚±_), sin(-_),
    cos(-_) and tan(-_).;
  - the general solution of trigonometric equations;
  - proof and application to problems in two dimensions, of the sine, cosine and area rules.
- Research into the history of the development of geometry and trigonometry in various cultures.

Grade 12

- Euclidean geometry: accepting as axioms all results established in earlier grades and the fact that the tangent to a circle is perpendicular to the radius, drawn to the point of contact, prove the following theorems:
  - the line drawn from the centre of a circle perpendicular to a chord bisects the chord and its converse;
  - the perpendicular bisector of a chord passes through the centre of the circle;
  - the angle subtended by an arc at the centre of a circle is double the size of the angle subtended by the same arc at the circle;
  - angles subtended by a chord at the circle on the same side of the chord are equal and its converse;
  - the opposite angles of a cyclic quadrilateral are supplementary and its converse;
  - two tangents drawn to a circle from the same point outside the circle are equal in length;
  - the tangent-chord theorem and its converse.
- Co-ordinate geometry:
  - the equation of a circle (any centre);
  - the equation of a tangent to a circle given a point on the circle.
- Transformation geometry:
  - the compound angle formula in generalising the effect on the co-ordinates of the point (x ; y) after rotation about the origin through an angle _;
  - rigid transformations (translations, reflections, rotations and glide reflections) and enlargement.
- Trigonometry:
  - compound angle identities:
    sin(_ ± _) = sin _ cos _ ± cos _ sin _
    cos(_ ± _) = cos _ cos _ _ sin _ sin _
    sin 2_ = 2 sin _ cos a
    cos 2_ = cos2 _ – sin2 _
    = 2 cos2 _ – 1 = 1 – 2 sin2 _
  - Problems in two and three dimensions.
- Research into history and one or more other geometries such as:
  - spherical geometry;
  - taxi-cab geometry;
  - fractals.

Mathematics Content and Context for attainment of assessment standards **Learning Outcome 3: Application (reflexive competence)**
Grade 10
• Data handling (calculations): o measures of central tendency (mean, median, mode) of grouped and ungrouped data; o measures of dispersion: range, percentiles, quartiles, interquartile and semi-interquartile range; o errors in measurement; o sources of bias. • Data handling (representation): o bar and compound bar graphs; o histograms (grouped data); o frequency polygons; o pie charts; o line and broken line graphs. • Probability: o definition in terms of equally likely outcomes; o relative frequency after many trials approximating the probability; o Venn diagrams as an aid to solving probability problems: * the sample space of a random experiment (S), * an event of the random experiment as a subset of the sample space, * the union and intersection of two or more subsets of the sample space, * P(S) = 1 (where S is the sample space), * P(A or B) = P(A) + P(B) – P(A and B); o (where A and B are events within a sample space), * disjoint (mutually exclusive) events: P(A or B) = P(A) + P(B), * complementary events: P(not A) = 1 – P(A); o potential uses and misuses of statistics and charts.
Grade 11
• Calculations and data representation: o measures of central tendency and dispersion in univariate numerical data by: * five number summary (maximum, minimum and quartiles), * box and whisker diagrams, * ogives, * calculating the variance and standard deviation sets of data manually (for small sets of data) and using available technology (for larger sets of data), and representing results graphically using histograms and frequency polygons; o scatter plot of bivariate data and intuitive choice of function of best fit supported by available technology; o symmetric and skewed data. • Probability: o dependent and independent events; o two-way contingency tables; • the product rule for independent events: o P(A and B) = P(A).P(B); • Venn diagrams and other techniques to solve probability problems (where events are not necessarily independent).
Grade 12
• Content from previous grades as used in statistical investigations. • Sampling. • An intuitive understanding of the least squares method for linear regression. • Regression functions and correlation for Bivariate data by the use of available technology. • Identification of normal distributions of data. • Probability problems using the fundamental counting principle.

Mathematical Literacy Content and Context (for attainment of assessment standards, Grades 10 – 12)

LO 1: Number and Operations in Context *The learner is able to use knowledge of numbers and their relationships to investigate a range of different contexts which include financial aspects of personal, business and national issues.*	
The learner will be involved in life-related problem situations such as those involving finance and quantities. In order to solve such problems, the learner will have to estimate efficiently and calculate accurately while making use of the following concepts and content as well as that from other Learning Outcomes.	
Grade 10 • Fractions, decimals, percentages. • Positive exponents and roots. • The associative, commutative and distributive laws. • Rate. • Ratio.	• Direct proportion. • Inverse proportion. • Simple formulae. • Simple and compound growth. • Scientific notation.
Grade 11 • Content involved in Grade 10 work but applied to more complex situations. • Square roots and cube roots.	• Ratio and proportion. • Complex formulae. • Cost price and selling price. • Profit margins.
Grade 12 • Content of Grade 10 and Grade 11 but applied to more complex situations	• Taxation. • Currency fluctuations. • Financial and other indices.
LO 2: Functional Relationships *The learner is able to recognise, interpret, describe and represent various functional relationships to solve problems in real and simulated contexts.*	
The learner will be involved in situations that involve relationships between variables depicted graphically, numerically and in tables. These situations can be dealt with through making use of the following content and concepts. Some of the content and concepts more directly related to the other Learning Outcomes will also have to be used.	
Grade 10 • Tables of values. • Formulae depicting relationships between variables. • Cartesian co-ordinate system. • Linear functions.	• Inverse proportion. • Compound growth. • Graphs depicting the relationship between variables. • Maximum and minimum points. • Rates of change (speed, distance, time).
Grade 11 • The content of Grade 10 but applied to more complex situations. • Simple quadratic functions.	• Solution to linear, quadratic and simple exponential equations. • Solution to two simultaneous linear equations.
Grade 12 • The content of Grade 10 and Grade 11 but applied to more complex situations.	• Simple linear programming (design and planning problems). • Graphs showing the fluctuations of indices over time.
Learning Outcome 3: Space, Shape and Measurement *The learner is able to measure using appropriate instruments, to estimate and calculate physical quantities, and to interpret, describe and represent properties of and relationships between 2-dimensional shapes and 3-dimensional objects in a variety of orientations and positions.*	
Contexts that the learner will deal with here involve space, shape and time. In order to deal with real-life situations in such contexts, the learner will make use of the following and other content and concepts.	
Grade 10 • Measurement of length, distance, volume, area, perimeter. • Measurement of time (international time zones). • Polygons commonly encountered (triangles, squares, rectangles that are not squares, parallelograms, trapesiums, regular hexagons). • Circles.	• Angles (0˚-360˚). • Theorem of Pythagoras. • Conversion of units within the metric system. • Scale drawings. • Floor plans. • Views. • Basic transformation geometry, symmetry and tessellations
Grade 11 • Grade 10 content but applied to more complex situations. • Measurement in 3D (angles included, 0˚-360˚). • Surface area and volumes of right prisms and right circular cylinders	• Conversion of measurements between different scales and systems. • Compass directions. • Properties of plane figures and solids in natural and cultural forms. • Location and position on grids. • Trigonometric ratios: sin x, cos x, tan x.
Grade 12 • Content of Grade 10 and Grade 11 but applied to more complex situations.	• Surface areas and volumes of right pyramids and right circular cones and spheres. • Scale models. • Sine rule, cosine rule, area rule.

Learning Outcome 4: Data Handling *The learner is able to collect, summarise, display and analyse data and to apply knowledge of statistics and probability to communicate, justify, predict and critically interrogate findings and draw conclusions.*	
The learner will investigate and interpret situations which can be dealt with using statistical techniques. The following and other content and concepts will assist the learner to do so	
Grade 10 • Construction of questionnaires. • Populations. • Selection of a sample. • Tables recording data. • Tally and frequency tables. • Single and compound bar graphs.	• Pie charts. • Histograms. • Line and broken-line graphs. • Mean, median, mode. • Range. • Relative frequency. • Probability
Grade 11 • The content of Grade 10 but applied to more complex situations. • Selection of samples and bias. • Cumulative frequencies. • Ogives (cumulative frequency graphs).	• Variance (interpretation only). • Standard deviation (interpretation only). • Quartiles. • Compound events. • Contingency tables. • Tree diagrams.
Grade 12 • The content of Grade 10 and Grade 11 but applied to more complex situations. • Bivariate data.	• Scatter plots. • Intuitively-placed lines of best fit. • Percentiles.

Appendix 2: IEB NSC Subject Assessment Weighting

Life Sciences Examination			
Weighting of the learning outcomes across the papers			
	LO 1	**LO 2**	**LO 3**
Paper 1	30 marks	70 marks	50 marks
Paper 2	30 marks	70 marks	50 marks
Paper 3 (practical examination)	50 marks		
	31% of 350	40% of 350	29% of 350

Physical Sciences, IEB Examination		
Weighting of knowledge areas across the two papers		
Knowledge Areas		**Marks (approx %)**
Paper 1 (Physics)	Mechanics	65-75 (35%)
	Waves, Sound and Light	45-55 (25%)
	Electricity and Magnetism	55-65 (30%)
	Matter and Materials (optical phenomena and properties of materials)	15-25 (10%)
	Total	200 (100%)
Paper 2 (Chemistry)	Chemical Change	75-85 (40%)
	Chemical Systems	55-65 (30%)
	Matter and Materials (organic molecules and macromolecules)	50-70 (30%)
	Total	200 (100%)

Physical Sciences, IEB Examination		
Weighting according to a taxonomy of cognitive levels (papers 1 and 2)		
Level		**Approximate %**
1	Knowledge, recall, low demand	15
2	Comprehension, routine exercises	45
3	Application (15%) and analysis (10%)	25
4	Synthesis and Evaluation/ Creativity	15

Mathematics, IEB Examination Requirements: Paper 1 (3 hours – 150 marks)	
…covering learning outcomes 1 and 2	
Content and Learning Outcomes	**Marks**
LO 1: Patterns and sequences	30±5 (25-35)
LO 1: Annuities and finance	15±5 (10-20)
LO 2: Functions and graphs *	35±5 (30-40)
LO 2: Algebra and equations	20±5 (15-25)
LO 2: Calculus	35±5 (30-40)
LO 2: Linear Programming	15±5 (10-20)
Total Marks:	**150**

*The trigonometric graphs listed in LO2 10.2.2 and LO2 11.2.2 can be examined in both papers 1 and 2. In paper 1 they are incorporated into the 'Function and graphs' section for the purpose of modeling. In paper 2 they may be examined in the trigonometry section.

Mathematics, IEB Examination Requirements Paper 2 (3 hours – 150 marks)	
…covering learning outcomes 3 and 4	
Content and Learning Outcomes	**Marks**
LO 3: Coordinate geometry	40±5 (35-45)
LO 3: Transformation	25±5 (20-30)
LO 3: Trigonometry *	60±5 (55-65)
LO 4: Data Handling	25±5 (20-30)
Total Marks:	**150**

* LO3 (Measurement) will be part of the applied problem solving requirements in trigonometry or one of the other Assessment Standards.

Mathematics, IEB Examination Requirements Paper 3 (optional)	
…covering learning outcomes 1, 3 and 4	
Content and Learning Outcomes	**Marks**
LO 1: Recursive sequences	5±5 (0-10)
LO 3: Geometry	40±5 (35-45)
LO 4: Descriptive statistics and interpretation	20±5 (15-25)
LO 4: Probability	20±5 (15-25)
LO 4: Bivariate data	15±5 (10-20)
Total Marks:	**150**

*Questions will be arranged roughly according to level of difficulty from easier to more difficult through the full length of the paper rather than grouped into content focus questions that go from easy to more difficult within a specific content question, i.e. a simple stand alone trigonometry question could be question 1, but there could be another stand alone trigonometry question towards the end of the paper that assesses problem solving. This does not exclude a question with some sub-questions that address similar content at a similar level of difficulty.

Mathematics, IEB Examination		
Weighting according to taxonomy of cognitive level for both paper 1 and 2 (tasks are designed to the following weighting…)		
Level		**%**
1	Knowledge	15 – 25 % (20)
2	Routine procedures	25 – 35 % (30)
3	Complex procedures	25 – 35 % (30)
4	Problem solving and investigations – reasoning and reflecting	Maximum 20 % (20)
	Total	100

*60% of the marks allocated must be for tasks or questions that assess knowledge, routine procedures and easy, highly scaffolded investigations.

Mathematics, IEB Examination					
Weighting of learning outcomes					
	LO 1	**LO 2**	**LO 3**	**LO 4**	**LO 5**
Papers 1 & 2	45	105	125	25	300
Papers 1, 2 & 3	50	105	165	80	400

Appendix 3: IEB Subject Assessment Content Grade 12

Mathematical Literacy, IEB Examination					
Weighting according to taxonomy of cognitive					
		Paper 1		**Paper 2**	
Level		%	Marks	%	Marks
1	Knowledge	50	75 (70-80)	-	-
2	Applying routine procedures in familiar contexts	40	60 (55-65)	10	15 (10-20)
3	Applying multi-step procedures in a variety of contexts	10	15 (10-20)	50	75 (70-80)
4	Reasoning and reflecting	-	-	40	60 (55-65)
	Total	100	150	100	150

Mathematical Literacy, IEB Examination Paper 1 & 2 (3 hours – 150 marks)	
Weighting of learning outcomes	
Learning Outcomes	**Marks**
LO 1: Number and Operations in Context	(30-45) 37.5
LO 2: Functional Relationships	(30-45) 37.5
LO 3: Space, Shape and Measurement	(30-45) 37.5
LO 4: Data Handling	(30-45) 37.5
Total Marks:	**150**

Appendix 4: Example GCE Level Descriptors

Highest Descriptors

Analysis of GCE grade A descriptors in Geography
Knowledge, concepts and principles
students show a comprehensive, in-depth knowledge of places, themes and environments required by the specification and of the physical and human processes which affect their development
they have a sound knowledge of the concepts, principles and theories relevant to the understanding and analysis of the specification content, and show a knowledge of a wide range of geographical terms
Analysis, synthesis and interpretation of information
students display skill in interpreting a range of sources of geographical information including spatial and temporal data at different scales
they show the ability to identify appropriate geographical questions in a range of contexts and to formulate and adopt effective approaches to enquiry
they collect evidence using an appropriate range of skills and techniques, including those used in fieldwork, from both primary and secondary sources
they use a variety of appropriate techniques to present and analyse evidence
they draw selectively on their knowledge of specification content to reach well-reasoned conclusions and evaluate both the effectiveness of their methodology and the validity of the outcomes, recognising the limitations of both
Communicative competence
they communicate their findings fluently in different formats, synthesising geographical information from a variety of sources, and presenting them within a logical and coherent structure which addresses closely the nature of the task
they use standard conventions of spelling, punctuation and grammar with a high level of accuracy and use geographical terminology with confidence

Middle-range Descriptors

Analysis of GCE grade C descriptors in Geography
Knowledge, concepts and principles
students show a sound knowledge of places, themes and environments required by the specification and of some of the main physical and human processes which affect their development
they have a knowledge of the main concepts, principles and theories relevant to the understanding and analysis of the specified content, and show a knowledge of a range of geographical terms.
they show their understanding by applying their knowledge of specification content to both familiar and unfamiliar geographical contexts at different scales
they comment on the usefulness of concepts and theories and their relevance to particular contexts
they show understanding of the connections between the different aspects of geography represented in the specification.
Analysis, synthesis and interpretation of information
students display skill in interpreting selected sources of geographical information including spatial and temporal data at different scales
they identify appropriate geographical questions, and formulate and adopt effective approaches to enquiry

they apply their knowledge of the specification content to reach some valid conclusions and comment upon both the effectiveness of their methodology and the validity of the outcomes
Communicative competence
they communicate clearly their knowledge and understanding, and the outcomes of their enquiries in different formats, showing some ability to synthesise geographical information from different sources and presenting findings in a structured manner appropriate to the task
they employ standard conventions of spelling, punctuation and grammar with reasonable accuracy, and use a range of geographical terms

Lowest Level Descriptors

Analysis of GCE grade E descriptors in Geography
Knowledge, concepts and principles
students show a knowledge of some of the places, themes and environments required by the specification and of some of the main processes which affect their development
they are aware of the contribution that concepts, principles and theories can make to the interpretation of geographical contexts
they have a knowledge of some geographical terminology
they explain familiar contexts using basic ideas and concepts, and show some understanding of the connections between the different aspects of geography represented in the specification.
Analysis, synthesis and interpretation of information
students display skill in interpreting commonly encountered sources of geographical information
they identify relevant geographical questions when presented with familiar contexts and can suggest and adopt approaches to enquiry
they use basic techniques, including those used in fieldwork, for data collection from primary and secondary sources
they use a limited range of methods to present and analyse evidence
they use their knowledge of the specification content to reach simple conclusions, and identify the strengths and weaknesses of their enquiries.
Communicative competence
they communicate their knowledge and understanding in different formats, largely in everyday language, by drawing upon a limited number of sources.
they use standard conventions of spelling, punctuation and grammar with limited accuracy.