



education

Department:
Education
REPUBLIC OF SOUTH AFRICA

**NATIONAL CURRICULUM STATEMENT
GRADES 10-12 (GENERAL)**

SUBJECT ASSESSMENT GUIDELINES

PHYSICAL SCIENCES

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PREFACE TO SUBJECT ASSESSMENT GUIDELINES

The Department of Education has developed and published Subject Assessment Guidelines for all 29 subjects of the National Curriculum Statement (NCS). These Assessment Guidelines should be read in conjunction with the relevant Subject Statements and Learning Programme Guidelines.

Writing Teams established from nominees of the nine provincial education departments and the teacher unions formulated the Subject Assessment Guidelines. The draft copies of the Subject Assessment Guidelines developed by the Writing Teams were sent to a wide range of readers, whose advice and suggestions were considered in refining these Guidelines. In addition, the Department of Education field-tested the Subject Assessment Guidelines in 2006 and asked for the comments and advice of teachers and subject specialists.

The Subject Assessment Guidelines are intended to provide clear guidance on assessment in Grades 10 to 12 from 2008.

The Department of Education wishes you success in the teaching of the National Curriculum Statement.

CONTENTS

SECTION 1:	PURPOSE OF THE SUBJECT ASSESSMENT GUIDELINES	1
SECTION 2:	ASSESSMENT IN THE NATIONAL CURRICULUM STATEMENT	1
SECTION 3:	ASSESSMENT OF PHYSICAL SCIENCES IN GRADES 10 – 12	7
	APPENDICES	17

1. PURPOSE OF THE SUBJECT ASSESSMENT GUIDELINES

This document provides guidelines for assessment in the National Curriculum Statement Grades 10 - 12 (General). The guidelines must be read in conjunction with *The National Senior Certificate: A Qualification at Level 4 on the National Qualifications Framework (NQF)* and the relevant Subject Statements. The Subject Assessment Guidelines will be applicable for Grades 10 to 12 from 2008.

The Department of Education encourages teachers to use these guidelines as they prepare to teach the National Curriculum Statement. Teachers should also use every available opportunity to hone their assessment skills. These skills relate both to the setting and marking of assessment tasks.

2. ASSESSMENT IN THE NATIONAL CURRICULUM STATEMENT

2.1 Introduction

Assessment in the National Curriculum Statement is an integral part of teaching and learning. For this reason, assessment should be part of every lesson and teachers should plan assessment activities to complement learning activities. In addition, teachers should plan a formal year-long Programme of Assessment. Together the informal daily assessment and the formal Programme of Assessment should be used to monitor learner progress through the school year.

Continuous assessment through informal daily assessment and the formal Programme of Assessment should be used to:

- develop learners' knowledge, skills and values
- assess learners' strengths and weaknesses
- provide additional support to learners
- revisit or revise certain sections of the curriculum and
- motivate and encourage learners.

In Grades 10 and 11 all assessment of the National Curriculum Statement is internal. In Grade 12 the formal Programme of Assessment which counts 25% is internally set and marked and externally moderated. The remaining 75% of the final mark for certification in Grade 12 is externally set, marked and moderated. In Life Orientation however, all assessment is internal and makes up 100% of the final mark for promotion and certification.

2.2 Continuous assessment

Continuous assessment involves assessment activities that are undertaken throughout the year, using various assessment forms, methods and tools. In Grades 10-12 continuous assessment comprises two different but related activities: informal daily assessment and a formal Programme of Assessment.

2.2.1 Daily assessment

The daily assessment tasks are the planned teaching and learning activities that take place in the subject classroom. Learner progress should be monitored during learning activities. This informal daily monitoring of progress can be done through question and answer sessions; short assessment tasks completed during the lesson by individuals, pairs or groups or homework exercises.

Individual learners, groups of learners or teachers can mark these assessment tasks. Self-assessment, peer assessment and group assessment actively involves learners in assessment. This is important as it allows learners to learn from and reflect on their own performance.

The results of the informal daily assessment tasks are not formally recorded unless the teacher wishes to do so. In such instances, a simple checklist may be used to record this assessment. However, teachers may use the learners' performance in these assessment tasks to provide verbal or written feedback to learners, the School Management Team and parents. This is particularly important if barriers to learning or poor levels of participation are encountered.

The results of these assessment tasks are not taken into account for promotion and certification purposes.

2.2.2 Programme of Assessment

In addition to daily assessment, teachers should develop a year-long formal Programme of Assessment for each subject and grade. In Grades 10 and 11 the Programme of Assessment consists of tasks undertaken during the school year and an end-of-year examination. The marks allocated to assessment tasks completed during the school year will be 25%, and the end-of-year examination mark will be 75% of the total mark. This excludes Life Orientation.

In Grade 12, the Programme of Assessment consists of tasks undertaken during the school year and counts 25% of the final Grade 12 mark. The other 75% is made up of externally set assessment tasks. This excludes Life Orientation where the internal assessment component counts 100% of the final assessment mark.

The marks achieved in each assessment task in the formal Programme of Assessment must be recorded and included in formal reports to parents and School Management Teams. These marks will determine if the learners in Grades 10 and 11 are promoted. In Grade 12, these marks will be submitted as the internal continuous assessment mark. Section 3 of this document provides details on the weighting of the tasks for promotion purposes.

2.2.2.1 Number and forms of assessment required for Programmes of Assessment in Grades 10 and 11

The requirements for the formal Programme of Assessment for Grades 10 and 11 are summarised in Table 2.1. The teacher must provide the Programme of Assessment to the subject head and School Management Team before the start of the school year. This will be used to draw up a school assessment plan for each of the subjects in each grade. The proposed school assessment plan should be provided to learners and parents in the first week of the first term.

Table 2.1: Number of assessment tasks which make up the Programme of Assessment by subject in Grades 10 and 11

SUBJECTS	TERM 1	TERM 2	TERM 3	TERM 4	TOTAL
Language 1: Home Language	4	4*	4	4*	16
Language 2: Choice of HL or FAL	HL	4*	4	4*	16
	FAL	4*	4	4*	16
Life Orientation	1	1*	1	2*	5
Mathematics or Maths Literacy	2	2*	2	2*	8
Subject choice 1**	2	2*	2	1*	7
Subject choice 2**	2	2*	2	1*	7
Subject choice 3	2	2*	2	1*	7

Note:

* One of these tasks must be an examination

** If one or two of the subjects chosen for subject choices 1, 2 or 3 include a Language, the number of tasks indicated for Languages 1 and 2 at Home Language (HL) and First Additional Language (FAL) are still applicable. Learners who opt for a Second Additional Language are required to complete 13 tasks in total: 4 tasks in term 1 and 3 tasks in each of terms 2, 3 and 4.

Two of the assessment tasks for each subject must be examinations. In Grades 10 and 11 these examinations should be administered in mid-year and November. These examinations should take account of the requirements set out in Section 3 of this document. They should be carefully designed and weighted to cover all the Learning Outcomes of the subject.

Two of the assessment tasks for all subjects, excluding Life Orientation, should be tests written under controlled conditions at a specified time. The tests should be written in the first and third terms of the year.

The remainder of the assessment tasks should not be tests or examinations. They should be carefully designed tasks, which give learners opportunities to research and explore the subject in exciting and varied ways. Examples of assessment forms are debates, presentations, projects, simulations, written reports, practical tasks, performances, exhibitions and research projects. The most appropriate forms of assessment for each subject are set out in Section 3. Care should be taken to ensure that learners cover a variety of assessment forms in the three grades.

The weighting of the tasks for each subject is set out in Section 3.

2.2.2.2 Number and forms of assessment required for Programme of Assessment in Grade 12

In Grade 12 all subjects include an internal assessment component, which is 25% of the final assessment mark. The requirements of the internal Programme of Assessment for Grade 12 are summarised in Table 2.2. The teacher must provide the Programme of Assessment to the subject head and School Management Team before the start of the school year. This will be used to draw up a school assessment plan for each of the subjects in each grade. The proposed school assessment plan should be provided to learners and parents in the first week of the first term.

Table 2.2: Number of assessment tasks which make up the Programme of Assessment by subject in Grade 12

SUBJECTS	TERM 1	TERM 2	TERM 3	TERM 4	TOTAL
Language 1: Home Language	5	5*	4*		14
Language 2: Choice of HL or FAL	HL	5	5*	4*	14
	FAL	5	5*	4*	14
Life Orientation	1	2*	2*		5
Mathematics or Maths Literacy	3	2*	2*		7
Subject choice 1**	2	2*	(2*) 3*		(6 [#]) 7
Subject choice 2**	2	2*	(2*) 3*		(6 [#]) 7
Subject choice 3	2	2*	(2*) 3*		(6 [#]) 7

Note:

- * One of these tasks in Term 2 and/or Term 3 must be an examination
- ** If one or two of the subjects chosen for subject choices 1, 2 or 3 include a Language, the number of tasks indicated for Languages 1 and 2 at Home Language (HL) and First Additional Language (FAL) are still applicable. Learners who opt for a Second Additional Language are required to complete 12 tasks in total: 5 tasks in term 1, 4 tasks in term 2 and 3 tasks in term 3.
- # The number of internal tasks per subject differs from 6 to 7 as specified in Section 3 of this document.

Schools can choose to write one or two internal examinations in Grade 12. Should a school choose to write only one internal examination in Grade 12, a scheduled test should be written at the end of the term to replace the other examination. Internal examinations should conform to the requirements set out in Section 3 of this document. They should be carefully designed and weighted to cover all the Learning Outcomes of the subject.

Two of the assessment tasks for all subjects, excluding Life Orientation, should be tests written under controlled conditions at a specified time.

The remainder of the assessment tasks should not be tests or examinations. They should be carefully designed tasks, which give learners opportunities to research and explore the subject in exciting and focused ways. Examples of assessment forms are debates, presentations, projects, simulations, assignments, case studies, essays, practical tasks, performances, exhibitions and research projects. The most appropriate forms of assessment for each subject are set out in Section 3.

2.3 External assessment in Grade 12

External assessment is only applicable to Grade 12 and applies to the final end-of-year examination. This makes up 75% of the final mark for Grade 12. This excludes Life Orientation which is not externally examined.

The external examinations are set externally, administered at schools under conditions specified in the *National policy on the conduct, administration and management of the assessment of the National Senior Certificate: A qualification at Level 4 on the National Qualifications Framework (NQF)* and marked externally.

In some subjects the external assessment includes practical or performance tasks that are externally set, internally assessed and externally moderated. These performance tasks account for one third of the end-of-year external examination mark in Grade 12 (that is 25% of the final mark). Details of these tasks are provided in Section 3.

Guidelines for the external examinations are provided in Section 3.

2.4 Recording and reporting on the Programme of Assessment

The Programme of Assessment should be recorded in the teacher's portfolio of assessment. The following should be included in the teacher's portfolio:

- a contents page;
- the formal Programme of Assessment;
- the requirements of each of the assessment tasks;
- the tools used for assessment for each task; and
- record sheets for each class.

Teachers must report regularly and timeously to learners and parents on the progress of learners. Schools will determine the reporting mechanism but it could include written reports, parent-teacher interviews and parents' days. Schools are required to provide written reports to parents once per term on the Programme of Assessment using a formal reporting tool. This report must indicate the percentage achieved per subject and include the following seven-point scale.

RATING CODE	RATING	MARKS %
7	Outstanding achievement	80 – 100
6	Meritorious achievement	70 – 79
5	Substantial achievement	60 – 69
4	Adequate achievement	50 – 59
3	Moderate achievement	40 – 49
2	Elementary achievement	30 – 39
1	Not achieved	0 – 29

2.5 Moderation of the assessment tasks in the Programme of Assessment

Moderation of the assessment tasks should take place at three levels.

LEVEL	MODERATION REQUIREMENTS
School	The Programme of Assessment should be submitted to the subject head and School Management Team before the start of the academic year for moderation purposes. Each task which is to be used as part of the Programme of Assessment should be submitted to the subject head for moderation before learners attempt the task. Teacher portfolios and evidence of learner performance should be moderated twice a year by the head of the subject or her/his delegate.
Cluster/ district/ region	Teacher portfolios and a sample of evidence of learner performance must be moderated twice during the first three terms.
Provincial/ national	Teacher portfolios and a sample of evidence of learner performance must be moderated once a year.

3. ASSESSMENT OF PHYSICAL SCIENCES IN GRADES 10 - 12

3.1 Introduction

Physical Sciences focuses on investigating physical and chemical phenomena through scientific inquiry. By applying scientific models, theories and laws, science seeks to explain and predict events in our physical environment.

Assessment tasks should focus on the following in an integrated manner:

- The learner's ability 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 (Learning Outcome 1)
- The learner's demonstration of inquiry skills, like planning, observing, collecting data, comprehending, synthesising, generalising, hypothesising and communicating results and conclusions
- The learner's ability to state, explain, interpret, evaluate and apply scientific and technological knowledge in everyday contexts (Learning Outcome 2)
- The learner's ability 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 3)

The focus of assessment should be formative. This means that daily assessment should be used to give feedback to learners as to their strengths and weaknesses and help them develop a strategy to improve their learning. It should also be used to help the teacher teach more effectively and develop a better Learning Programme.

The content contained in the Learning Outcomes and Assessment Standards of the Physical Sciences National Curriculum Statement has been elaborated on in the *Physical Sciences Content* document (Department of Education, June 2006). This is a supporting document to the Physical Sciences Subject Statement which provides an indication of the core knowledge and concepts to be dealt with for the period 2008 to 2010. This core content will be the focus of the two papers set per examination in Physical Sciences in 2008-2010. It is anticipated that the full curriculum will with time (after 2010) become compulsory.

For the benefit of their learners, teachers are strongly encouraged to work towards teaching the optional content as soon as possible.

3.2 Daily assessment

3.2.1 Introduction

Daily assessment activities should be designed to provide learners with opportunities to develop and sharpen their:

- practical, scientific and problem solving skills;
- ability to construct and apply scientific knowledge, and
- ability to identify and critically evaluate the contested nature of science and its relationships to technology, society and the environment.

Daily assessment tasks can be short, focused and assess only one Assessment Standard within a Learning Outcome at a time. However, some daily assessment activities integrate Learning Outcomes and Assessment Standards.

3.2.2 Examples of daily assessment tasks

Following are some suggestions as to what tasks are suitable for assessing learning at different levels:

EXAMPLE	DESCRIPTION
List, describe or define	Define electric current.
Structured problem solving involving calculations	Content: Newton's Second Law Context: Transportation Given a problem within specified content and context: <ul style="list-style-type: none"> • Draw a simple diagram to represent the given information. • Indicate the given or implied data on the diagram. • Identify the unknown variable. • Analyse the problem in terms of physics and/or chemistry principles. (State the principles.) • Write down the relevant equation(s). • Substitute and solve. • Interpret the numerical answer.
Practical work	Carry out instructions to conduct an experiment. This will involve some or all of the following skills: <ul style="list-style-type: none"> • Collect appropriate apparatus • Assemble apparatus • Use apparatus • Identify and describe variables • Write an investigative question or hypothesis • Take measurements • Make observations • Record observations • Analyse data using graphs, calculations, etc. • Interpret results • Formulate hypotheses • Test hypotheses • Synthesise • Evaluate • Give conclusions
Apply to an unfamiliar situation	Given a diagram of someone pushing on the handle of a stationary roller on an incline, draw a force diagram.
Concept map	Draw a concept map of the concept 'chemical equilibrium'.
Aspect of an investigation	Write the hypothesis for an investigation given a description of the investigative process.
Scientific argument	Given a scientific development that affects humans, for example, an improvement to the motorcar by making it faster, evaluate the impact of this scientific advance.
Predict explore explain	Provide a circuit with three identical bulbs, two in parallel that are in series with the third. Learner A predicts what will happen to the brightness of the bulbs if one of those in parallel is unscrewed. Learner A sets up the circuit and observes what actually happens. Learner A explains the observation. Learner B accounts for any incorrect predictions by identifying the misconception(s) that led learner A to an incorrect prediction.

3.3 Weighting of Cognitive Levels in assessment of Physical Sciences

Examinations papers and control tests in the Physical Sciences in Grades 10-12 could adhere to the weighting of cognitive levels given in Table 3.1.

Table 3.1: Suggested weighting of cognitive levels for examinations and control tests

Cognitive Level Description	Weighting	
	Paper 1	Paper 2
Recall (Knowledge)	15	15
Comprehension	30	40
Analysis, Application	45	35
Evaluation, Synthesis	10	10

3.4 Assessment in Grades 10 and 11

3.4.1 Programme of Assessment in Grades 10 and 11

In addition to daily assessment, teachers should develop a year-long formal Programme of Assessment for each grade. The learner's performance in this Programme of Assessment will be used for promotion purposes in Grades 10 and 11. In Grades 10 and 11 assessment is school-based or internal.

The marks achieved in each of the assessment tasks that make up the Programme of Assessment must be reported to parents. These marks will be used to determine the promotion of learners in Grades 10 and 11.

Table 3.2 illustrates an assessment plan for Physical Sciences.

Table 3.2: Suggested Programme of Assessment for Grades 10 and 11

PROGRAMME OF ASSESSMENT			
ASSESSMENT TASKS (25%)			END-OF-YEAR ASSESSMENT (75%)
TERM 1	TERM 2	TERM 3	TERM 4
Practical investigation	Practical investigation	Research project	Final examination
Control test	Midyear examination	Control test	

Table 3.3 illustrates the weighting of tasks in the Programme of Assessment for Grades 10 and 11.

Table 3.3: Suggested weighting of tasks in the Programme of Assessment for Grades 10 and 11

Task	Weighting	Mark
Practical Investigations	40%	2 investigations X 20
Research Project	20%	20
Control Tests	20%	2 tests X 10
Midyear examination	20%	20
TOTAL	100%	100

3.4.2 Assessment tasks for the Programme of Assessment in Physical Sciences

Assessment tasks that will be used in the Physical Sciences Programme of Assessment are:

- **Control tests and examinations**
Control tests and examinations are written under controlled conditions within a specified period of time. Questions in tests and examinations should assess performance at different cognitive levels across all the Learning Outcomes, with a greater focus on Learning Outcome 2.
- **Practical investigations and experiments**
Practical investigations and experiments should assess all Learning Outcomes with the focus on the practical aspects and the process skills required for scientific inquiry and problem solving. Assessment activities should be designed so that learners are assessed on their use of scientific inquiry skills, like planning, observing and gathering information, comprehending, synthesising, generalising, hypothesising and communicating results and conclusions. Practical investigations should assess performance at different cognitive levels across all the Learning Outcomes, with a greater focus on Learning Outcome 1.
- **Research project**
A research project involves the collection of data and/or information to solve a problem or to understand a particular set of circumstances and/or phenomena. While the problem that focuses the research task is well defined, the nature of the data collected will determine the solution to the problem.

Another option is a case study provided by the teacher. This case study will be used as a basis for questions, investigations, interpretation and conclusions.

Although, time allocation is more relaxed, contact time between the learners and the teacher to facilitate guidance, support and monitoring of the achievement of specific targets should be scheduled at mutually agreed intervals. However, a maximum of three weeks should be allocated to the research task.

Learners can be assessed both individually and collectively.

The assessment of these tasks in the Programme of Assessment should include all cognitive levels that are indicated in Table 3.1.

The following example of a Grade 10 research task is also provided at www.thuthong.org.za. This website has background information and assessment tools for the task.

EXAMPLE OF A GRADE 10 RESEARCH TASK: (FOCUS LEARNING OUTCOME 1)

BACKGROUND TO THE TASK:

The small town of Soetvlei is situated about 10 km away from the Sanibonani Dam. The dam supplies the domestic water of the town and provides recreational opportunities for the local people. A large development company wants to build a golfing estate in the area immediately around the dam.

THE TASK:

Thabo monitors the effect of fertilising and irrigating on the golf course on the concentration of nitrates flowing into the dam. He measures the concentrations of ions currently in the water running into the dam. He measures the electrical conductivity using a conductivity meter. He records his results on a daily basis. Then if the golf estate is built and they start using fertilisers and irrigating the course he will be able to see if there is any increase in conductivity of the water running into the dam. He feels it is necessary to collect results for several years and wants to be able to compare the conductivity of the water on the same day of each the year.

1. What is Thabo's hypothesis?
2. What question is he investigating?
3. What is the independent variable in his investigation?
4. What is the dependent variable Thabo is recording?
5. Why does Thabo want to compare results he records on the same day of successive years?
6. Name two variables Thabo needs to control. Explain each of your choices.
7. What key assumption has Thabo made?
8. Is his assumption correct?
9. Assume the golf estate is built and the estate manager fertilises and irrigates with ammonium nitrate as Thabo anticipates. Will Thabo be able come to any conclusions regarding the flow of nitrates into the dam with his experiment? Explain your answer.
10. Suggest something that Thabo could do with the implementation of his design that might improve the reliability of his results.

3.4.3 Assessment tools

The assessment tools used, specifying the assessment criteria for each task, will be dictated by the nature of the task and the focus of assessment. Assessment tools could be one or a combination of rubrics, checklists, observation schedules and memoranda.

3.4.4 Examination papers for Grades 10 and 11

The core content for 2008-2010 outlined in the *Physical Sciences Content* document (Department of Education, June 2006) is compulsory and will be examined through Papers 1 and 2 for this period. Teachers are encouraged to prepare themselves for the teaching of the full content and to teach this content as soon as they are confident to do so.

End-of-year examination

The end-of-year examination papers for Grades 10 and 11 will be internally set, marked and moderated, unless otherwise instructed by provincial departments of education. Questions may be differentiated according to Physical Sciences taxonomy (as described in Appendix 1).

The internally set, marked and moderated examination will consist of two papers:

- Paper 1: Physics focus (Grade 10 – 2 hours and Grade 11 – 3 hours, 150 marks)
- Paper 2: Chemistry focus (Grade 10 – 2 hours and Grade 11 – 3 hours, 150 marks)
- All of the questions will focus on content as stated in the National Curriculum Statement.

An example of a final Grade 10 examination paper is provided at www.thutong.org.za.

Table 3.4: Weighting of the Learning Outcomes and specification of content across the two papers for the Grade 10 end-of-year examination

		PAPER 1: PHYSICS FOCUS	PAPER 2: CHEMISTRY FOCUS
Duration		2 hours	2 hours
Maximum marks		150 marks	150 marks
Content		<ul style="list-style-type: none">• Mechanics• Waves, sound and light• Electricity and magnetism	<ul style="list-style-type: none">• Chemical change• Chemical systems• Matter and materials
LEARNING OUTCOME		WEIGHTING	
Learning Outcome 1:	Practical scientific inquiry and problem-solving skills	40%	30%
Learning Outcome 2:	Constructing and applying scientific knowledge	45%	45%
Learning Outcome 3:	The nature of science and its relationship to technology, society and the environment	15%	25%

All Learning Outcomes and Assessment Standards in the National Curriculum Statement can be assessed through any of the core concepts in Physical Sciences. Table 3.5 provides a suggested weighting of content for Grade 10.

Table 3.5: Suggested weighting of content in Grade 10 examinations

Paper	Content	Marks	Total Marks per paper
PAPER 1: PHYSICS FOCUS	Mechanics	50	150 marks
	Waves, sound and light	50	
	Electricity and magnetism	50	
PAPER 2: CHEMISTRY FOCUS	Chemical change	45	150 marks
	Chemical systems	45	
	Matter and materials	60	

Table 3.6: Weighting of the Learning Outcomes and specification of content across the two papers for the Grade 11 end-of-year examination

		PAPER 1: PHYSICS FOCUS	PAPER 2: CHEMISTRY FOCUS
Duration		3 hours	3 hours
Maximum marks		150 marks	150 marks
Content		<ul style="list-style-type: none"> • Mechanics • Waves, sound and light • Electricity and magnetism • Matter and materials <ul style="list-style-type: none"> ▪ Electronic properties of matter ▪ Atomic nuclei 	<ul style="list-style-type: none"> • Chemical change • Chemical systems • Matter and materials <ul style="list-style-type: none"> ▪ Atomic combinations: molecular structure ▪ Ideal gases and thermal properties
LEARNING OUTCOME		WEIGHTING	
Learning Outcome 1:	Practical scientific inquiry and problem-solving skills	40%	30%
Learning Outcome 2:	Constructing and applying scientific knowledge	45%	45%
Learning Outcome 3:	The nature of science and its relationship to technology, society and the environment	15%	25%

Table 3.7 provides a suggested weighting of content for Grade 11.

Table 3.7: Suggested weighting of content in Grade 11 examinations

Paper	Content	Marks	Total Marks per paper
PAPER 1: PHYSICS FOCUS	Mechanics	45	150 marks
	Waves, sound and light	45	
	Electricity and magnetism	45	
	Matter and materials <ul style="list-style-type: none"> ▪ Electronic properties of matter ▪ Atomic nuclei (optional concept) 	15	
PAPER 2: CHEMISTRY FOCUS	Chemical change	75	150 marks
	Chemical systems	25	
	Matter and materials <ul style="list-style-type: none"> ▪ Atomic combinations: molecular structure ▪ Ideal gases and thermal properties 	50	

3.5 Assessment in Grade 12

In Grade 12, assessment consists of two components: a Programme of Assessment which makes up 25% of the total mark for Physical Sciences and an external examination which makes up the remaining 75%.

Together the Programme of Assessment and external assessment make up the annual assessment plan for Grade 12.

Table 3.8: Suggested annual assessment plan for Grade 12

COMPONENTS OF ASSESSMENT			
PROGRAMME OF ASSESSMENT (25%)			EXTERNAL ASSESSMENT (75%)
TERM 1	TERM 2	TERM 3	TERM 4
Practical investigation	Practical investigation	Research project	Final examination
Control test	Midyear examination	Control test	
		Trial examination	

In Grade 12 one of the tasks in Term 2 and/or Term 3 must be an internal examination. In instances where only one of the two internal examinations is written in Grade 12, the other examination should be replaced by a test at the end of the term.

Table 3.9 illustrates the weighting of tasks in the Programme of Assessment for Grade 12.

Table 3.9: Suggested weighting of tasks in the Programme of Assessment for Grade 12

Task	Weighting	Mark
Practical Investigations	40%	2 investigations X 20
Research Project	20%	20
Control Tests	10%	2 tests X 5
Midyear examination	10%	10
Trial examination	20%	20
TOTAL	100%	100

3.5.1 Programme of Assessment in Grade 12

The Programme of Assessment for Physical Sciences comprises seven tasks that are internally assessed.

3.5.2 External assessment in Grade 12

The core content for 2008-2010 outlined in the *Physical Sciences Content* document (Department of Education, June 2006) is compulsory and will be examined through Papers 1 and 2. Teachers are encouraged to prepare themselves for the teaching of the full curriculum and to teach this content as soon as they are confident with the material.

Multiple-choice questions could be set in examination papers. However, such questions should have a maximum weighting of 10%.

The final end-of-year examination is nationally set, marked and moderated.

The nationally set, marked and moderated examination will consist of two papers:

- Paper 1: Physics focus (3 hours, 150 marks)
- Paper 2: Chemistry focus (3 hours, 150 marks)
- All of the questions will focus on content as stated in the National Curriculum Statement.
- Questions will reflect the different levels of the Physical Sciences assessment taxonomy appropriate to the paper.

The following table provides further information on both Grade 12 papers.

Table 3.10: Weighting of the Learning Outcomes and specification of content of both papers for the Grade 12 external examination

		PAPER 1: PHYSICS FOCUS	PAPER 2: CHEMISTRY FOCUS
Duration		3 hours	3 hours
Maximum marks		150 marks	150 marks
Content		<ul style="list-style-type: none"> • Mechanics • Waves, sound and light • Electricity and magnetism • Matter and materials <ul style="list-style-type: none"> ▪ Optical phenomena and properties of materials ▪ Mechanical properties 	<ul style="list-style-type: none"> • Chemical change • Chemical systems • Matter and materials <ul style="list-style-type: none"> ▪ Organic molecules ▪ Organic macromolecules
LEARNING OUTCOME		WEIGHTING	
Learning Outcome 1:	Practical scientific inquiry and problem-solving skills	40%	30%
Learning Outcome 2:	Constructing and applying scientific knowledge	45%	45%
Learning Outcome 3:	The nature of science and its relationship to technology, society and the environment	15%	25%

Table 3.11 provides a suggested weighting of content for Grade 12 examination papers.

Table 3.11: Suggested weighting of content in Grade 12 examinations

Paper	Content	Marks	Total Marks per paper
PAPER 1: PHYSICS FOCUS	Mechanics	45	150 marks
	Waves, sound and light	40	
	Electricity and magnetism (Electronics – optional concept)	30	
	Matter and materials <ul style="list-style-type: none"> ▪ Optical phenomena and properties of materials ▪ Mechanical properties 	35	
PAPER 2: CHEMISTRY FOCUS	Chemical change	60	150 marks
	Chemical systems	35	
	Matter and materials <ul style="list-style-type: none"> ▪ Organic molecules ▪ Organic macromolecules (see optional concept) 	55	

3.6 Content

The content to be assessed is given in the National Curriculum Statement for Physical Sciences and further elaborated in the NCS Physical Sciences Content Document (June 2006)

3.7 Promotion

For promotion and certification purposes learners should achieve at least a level 2 rating (Elementary achievement: 30-39%) in Physical Sciences.

3.8 Moderation of assessment

All Grade 10 and 11 tasks are internally moderated, while all Grade 12 tasks should be externally moderated. The subject head or head of department for Physical Sciences at the school will generally manage this process.

APPENDIX 1: PHYSICAL SCIENCES ASSESSMENT TAXONOMY

The following table provides a possible hierarchy of cognitive levels that can be used to ensure tasks include opportunities for learners to achieve at various levels and tools for assessing the learners at various levels. The verbs given in the fourth column below could be useful when formulating questions associated with the cognitive levels given in the first column.

DESCRIPTION OF COGNITIVE LEVELS	EXPLANATION	SKILLS DEMONSTRATED	ACTION VERBS
EVALUATION	*At the extended abstract level, the learner makes connections not only within the given subject area but also beyond it and generalises and transfers the principles and ideas underlying the specific instance. The learner works with relationships and abstract ideas.	<ul style="list-style-type: none"> • Compares and discriminates between ideas. • Assesses value of theories, presentations. • Makes choices based on reasoned arguments. • Verifies value of evidence. • Recognises subjectivity. 	Assess, decide, rank, grade, test, measure, recommend, convince, select, judge, explain, discriminate, support, conclude, compare, summarise, critique, appraise, interpret, justify
SYNTHESIS	*The learner works at the extended abstract level (see level 7 above) but makes errors because he or she is insufficiently informed at more modest levels.	<ul style="list-style-type: none"> • Uses old ideas to create new ones. • Generalises from given facts. • Relates knowledge from several areas. • Predicts and draws conclusions. 	Combine, integrate, modify, rearrange, substitute, plan, create, design, invent, compose, formulate, prepare, generalise, rewrite, categorise, combine, compile, reconstruct, generate, organise, revise, what if?
ANALYSIS	*The learner appreciates the significance of the parts in relation to the whole. Various aspects of the knowledge become integrated, the learner acquires deeper understanding and the ability to break down a whole into its component parts. Elements embedded in a whole are identified and the relations among the elements are recognised.	<ul style="list-style-type: none"> • Sees patterns and the organisation of parts. • Recognises hidden meanings. • Identifies of components. 	Analyse, separate, order, explain, connect, classify, arrange, divide, compare, select, infer, break down, contrast, distinguish, diagram, illustrate, identify, outline, point out, relate

APPLICATION	The learner establishes a relational construct (see level 5 above) but which has errors. The learner has the ability to use (or apply) knowledge and skills in new situations.	<ul style="list-style-type: none"> • Uses information, methods, concepts and theories in new situations. • Solves problems using required skills or knowledge. 	apply, demonstrate, calculate, complete, illustrate, show, solve, examine, modify, relate, change, classify, experiment, discover, construct, manipulate, prepare, produce
COMPREHENSION	*A number of connections may be made but the meta-connections are missed, as is their significance for the whole. The learner has first level understanding, recalls and understands information and describes meaning.	<ul style="list-style-type: none"> • Understands information and grasps meaning. • Translates knowledge into new contexts and interprets facts. • Compares, contrasts, orders, groups and infers causes and predicts consequences. 	summarise, describe, interpret, contrast, predict, associate, distinguish, estimate, differentiate, discuss, extend, comprehend, convert, defend, explain, generalise, give example, rewrite, infer
RECALL	Simple and obvious connections are made. The learner recalls and remembers facts.	<ul style="list-style-type: none"> • Observes and recalls information. 	list, define, tell, describe, identify, show, know, label, collect, select, reproduce, match, recognise, examine, tabulate, quote, name