

LIFE SCIENCES

SECTION 4

Assessment

4.1 Introduction

Assessment is a continuous planned process of identifying, gathering and interpreting information on learners' performance, using various forms of assessment. It involves four steps: generating and collecting evidence of achievement; evaluating this evidence, recording the findings and using this information to understand and thereby assist the learners' development in order to improve the process of learning and teaching.

Assessment should be both **informal/formative** (Assessment for Learning) and **formal/summative** (Assessment of Learning). In both cases, regular feedback should be provided to learners to enhance their learning experience.

Assessment is a process that measures individual learners' attainment of knowledge (content, concepts and skills) in a subject by collecting, analysing and interpreting the data and information obtained from this process to:

- enable the teacher to make reliable judgements about a learner's progress;
- inform learners about their strengths, weaknesses and progress; and
- assist teachers, parents and other stakeholders in making decisions about the learning process and the progress of the learners.

Assessment should be mapped against the content and intended aims specified for Life Sciences and in informal/formative and formal/summative assessments it is important to ensure that in the course of the year:

- all of the subject content is covered;
- the full range of skills is included; and
- different forms of assessment are used.

4.2 Informal (formative) assessment or daily assessment

Assessment **for** learning has the purpose of continuously collecting information on learners' achievement that can be used to improve their learning.

Informal assessment is daily monitoring of learners' progress. This is done through observations, discussions, practical work, learner-teacher conferences, informal classroom interactions, homework, informal tests, etc. Informal assessment should be used to provide feedback to the learners and to inform planning for teaching, but it need not be recorded. It should not be seen as separate from learning activities taking place in the classroom.

- A minimum of **three informal tasks** should be done per week. These tasks can be marked by learners or teachers.
- It is recommended that a **consolidation task** is completed at the end of a concept/topic.
- It is vital that practical skills are taught and assessed in an integrated way in the context of theoretical concepts; **therefore the investigations listed in Section 3 must be part of daily teaching and learning.**
- Collectively, the informal tasks must reflect **all degrees of difficulty and cognitive levels.**

Informal, ongoing assessments should be used to structure the acquisition of knowledge and skills and should be a precursor to formal tasks in the Programme of Assessment.

The results of daily assessment tasks are not taken into account for promotion or certification purposes.

4.3 Formal (summative) assessment

Grades	Formal school-based assessments	End-of-year examinations
R - 3	100%	n/a
4 - 6	75%	25%
7 - 9	40%	60%
10 and 11	25% including a mid-year	75%
12	25% including mid-year and trial examinations	External examination: 75%

All assessment tasks that make up a formal programme of assessment for the year are regarded as formal assessment. Formal assessment tasks are marked and formally recorded by the teacher for progression and certification purposes. All **formal assessment tasks** are subject to **moderation** to ensure that appropriate standards are maintained.

Formal assessment provides teachers with a systematic way of evaluating how well learners are progressing in a grade and in a particular subject. Examples of formal assessments include tests, examinations, practical tasks, projects, assignments, demonstrations, oral presentations and performances. Formal assessment tasks form part of a year-long formal Programme of Assessment in each grade and subject.

Assessment in Life Sciences must cater for a range of cognitive levels, degrees of difficulty and abilities of learners. The subject content, specific aims and range of skills should be used to inform the

planning and development of assessment tasks.

4.3.1. Degrees of difficulty for examination/test questions

1	2	3	4
Easy for the average learner to answer.	Moderately challenging for the average learner to answer.	Difficult for the average learner to answer.	Very difficult for the average learner to answer. The skills and knowledge required to answer the question allows for level 7 learners (extremely high-achieving/ability learners) to be discriminated from other high ability/proficiency learners.

Other factors besides the type of cognitive demand affect the degree of difficulty of examination/test questions. We know this because questions that align to a particular type of cognitive demand are not always as difficult as other questions that align to the same cognitive demand. For example:

- a recall question that asks students to recall an abstract theory, or complex content is often much more difficult to accomplish than one which asks candidates to recall a simple fact (i.e. differences in content difficulty).
- a question that requires recalling an ordered sequence of events and which entails writing a few sentences is generally easier than one which involves the same type of cognitive demand but entails writing a whole essay (i.e. differences in 'writing difficulty').
- literal comprehension of source material comprising a simple contemporary magazine article is generally easier than literal comprehension of a classical work because of differences in the content, vocabulary, sentence and organisational structure, register, diction, literary techniques, abstractness of ideas and imagery, and background knowledge required (i.e. differences in 'reading difficulty').

In addition to identifying the **type of cognitive demand** made in each examination/test question, examiners are asked to use their knowledge of the subject, their experience of teaching it and marking and/or moderation experience to make judgments about whether each examination/test question is easy, moderately difficult, difficult, or very difficult for the average learner in the grade. .

To judge the level of difficulty of each examination/test question, you need to consider both the demands that each question makes on the cognitive schema of an average learner and the intrinsic difficulty of the question or task. To make this judgment, you need to identify where the difficulty or ease in a particular question resides.

The framework **for thinking about question or item difficulty** comprises the following four general categories of difficulty:

- Content (topic/concept) difficulty;
- Stimulus (question and source material) difficulty;
- Task (process) difficulty; and
- Expected response (memo) difficulty.

Framework for thinking about question difficulty

Content/concept difficulty	Stimulus difficulty	Task difficulty	Expected response difficulty
Content/concept difficulty indexes the difficulty in the subject matter, topic or conceptual knowledge assessed or required. In this judgment of the item/question, difficulty exists in the academic and conceptual demands that questions make and/or the grade level boundaries of the various 'elements' of domain/subject knowledge (topics, facts, concepts, principles and procedures associated with the subject).	Stimulus difficulty refers to the difficulty of the linguistic features of the question (linguistic complexity) and the challenge that candidates face when they attempt to read, interpret and understand the words and phrases in the question AND when they attempt to read and understand the information or 'text' or source material (diagrams, tables and graphs, pictures, cartoons, passages, etc.) that accompanies the question.	Task difficulty refers to the difficulty that candidates confront when they try to formulate or produce an answer.	Expected response difficulty refers to difficulty imposed by examiners in a mark scheme and memorandum . This location of difficulty is more applicable to 'constructed' response questions, as opposed to 'selected' response questions (such as multiple choice, matching/true-false).

No weightings are allocated to the degrees of difficulty. Examiners should analyse the items in their papers to ensure the paper is **not too easy** or **too difficult** even if the cognitive demand of the paper is according to the standard.

4.3.2. Weighting of Cognitive levels for the assessment of content in Grades 10, 11 and 12

Knowing science	Understanding science	Applying scientific knowledge	Evaluating, analysing and synthesising scientific knowledge
40%	25%	20%	15%
<p>To recall or recognise explicit information, details, facts, formulas, terms, definitions, procedures, representations from memory or from material provided.</p>	<p>To communicate understanding of a Life Sciences concept, idea, explanation, model, or theory, for example to:</p> <p>Interpret: change from one form of representation to another (e.g pictures to words; words to pictures; numbers to words, words to numbers, pictures to numbers)</p> <p>Exemplify: Find a specific example or illustration of a concept or principle</p> <p>Classify: Determine that something belongs to a category.</p> <p>Summarize: Abstract a general theme or major points.</p> <p>Infer: Draw a logical conclusion from presented information.</p> <p>Compare: Detect similarities and differences between two objects or concepts.</p> <p>Explain why: create a cause-and-effect model of a system or concept.</p>	<p>To use, perform or follow a basic/ standard/ routine procedure/rule/method/ operation.</p> <p>To use/apply understanding of Life Sciences concepts, facts or details from a known context to an unfamiliar context.</p>	<p>Analyse complex information To adapt a variety of appropriate strategies to solve novel/ non-routine/complex/ open-ended problems. To apply multi-step procedures.</p> <p>Evaluate To evaluate or make critical judgement (for example, on qualities of accuracy, consistency, acceptability, desirability, worth or probability) using background knowledge of the subject. Judge, critique</p> <p>Create a new product To integrate life sciences concepts, principles, ideas and information, make connections and relate parts of material, ideas, information or operations to one another and to an overall structure or purpose.</p>

4.3.3. The verbs used in examination/test questions

Verb	Explanation
Analyse	Separate, examine and interpret
Calculate	This means a numerical answer is required – in general, you should show your working, especially where two or more steps are involved
Classify	Group things based on common characteristics
Compare	Point out or show both similarities and differences between things, concepts or phenomena
Define	Give a clear meaning
Describe	State in words (using diagrams where appropriate) the main points of a structure/process/phenomenon/investigation
Determine	To calculate something, or to discover the answer by examining evidence
Differentiate	Use differences to qualify categories
Discuss	Consider all information and reach a conclusion
Explain	Make clear; interpret and spell out
Identify	Name the essential characteristics
Label	Identify on a diagram or drawing
List	Write a list of items, with no additional detail
Mention	Refer to relevant points
Name	Give the name (proper noun) of something
State	Write down information without discussion
Suggest	Offer an explanation or a solution
Tabulate	Draw a table and indicate the answers as direct pairs

4.4 Assessment requirements for Life sciences:

4.4.1 Grades 10 and 11 Programme of formal assessment

The programme of assessment is designed to spread formal assessment tasks in all subjects in a school throughout a term.

Composition of the SBA component for Grades 10 & 11

TERM	Task	Weighting (% of SBA)	% of Reporting mark per term	% of Promotion Mark
1	Practical Minimum 30 marks	15	25	25
	Test Minimum 50 marks	15	75	
2	Practical Minimum 30 marks	15	25	
	Mid-year Exam One paper - 150 marks Duration: 2½ hours	25	75	
3	Project/Assignment* 50 marks	15	25	
	Test Minimum 50 marks	15	75	
	Total	100		
FINAL EXAM (Paper 1 + Paper 2) Duration: 2½ hours for each paper 150 marks for each paper		300		75

NOTE: * At least ONE project and ONE assignment must be done over the Grade10-11 years.

- The project/assignment can be done in any term (1-3) but must be recorded in term 3.

4.4.2 Grade 12 Programme of formal assessment

The requirements (number and nature of tasks) for Life Sciences are indicated below:

Composition of the SBA component for Grade 12

TERM	Task	Weighting (% of SBA)	% of Reporting mark per term
1	Practical Minimum 30 marks	10	25
	Test Minimum 50 marks	10	75
2	Practical Minimum 30 marks	10	25
	Mid-year Exam One paper - 150 marks Duration: 2½ hours	20	75
3	Assignment 50 marks Duration: 1 - 1½ hours	15	25
	Trial Exam Two papers - 150 marks each Duration: 2½ hours each	35	75
	Total	100	

NOTE: The year mark for grade 12 will be converted to 25% and the **external** examination will count 75% of the final mark.

4.5 Further elaboration on the different tasks of the Programme of Formal Assessment:

4.5.1 Tests and Examinations

When designing the tests as well as the mid-year and trial examinations, the Life Sciences teacher must ensure that:

- The test is a minimum of 50 marks
- The test must cover the content taught in the respective term
- The mid-year examination must cover work completed in term 1 and term 2
- The trial examinations for grade 12 must cover work completed in terms 1, 2 and 3

- Tests and examinations are balanced in terms of cognitive levels and topic weightings. Degrees of difficulty must be determined. In this regard weighting grids must be used
- Tests and examinations follow the NSC examination in its design, rigour and format
- In tests and examinations, one minute is allocated for each mark
- Each test/exam paper must cover all the SAs and the minimum weighting for SA2 is 20% of the total of the paper.
- Tests and examinations must be analysed diagnostically and appropriate remedial and intervention strategies are instituted

4.5.2 Practical Tasks

When designing the practical tasks, the Life Sciences teacher must ensure that:

- At least ONE of the practical tasks include manipulation of apparatus and/or collection of data
- All 7 skills must be covered over the total number of practical tasks required for the year
- Each of the practical tasks must assess at least 3 of the 7 skills
- A minimum of 30 marks is allocated to a practical task

4.5.3 Research Project

When designing the research project, the Life Sciences teacher must ensure that:

- The research project covers Specific Aims 1, 2 and 3
- The mark for the research project is recorded in the 3rd term even if it is completed in term 1 or term 2
- 50 marks is allocated to the research project
- It is a long term task (at least 3-weeks of non-contact time)
- It is an investigative task
- It focuses on the accessing of knowledge through literature research as well as through primary sources such as people
- It includes sub-skills such as:
 - Formulating investigative questions and hypotheses
 - Gathering information from a variety of sources
 - Manipulating and processing information
 - Analysing information
 - Identifying patterns
 - Evaluating data
 - Drawing valid conclusions
 - Communicating findings

4.5.4 Assignment

When designing the assignment, the Life Sciences teacher must ensure that:

- The task should be set in such a way that it is not heavily weighted towards recall of content. It should be more skills-based.
- The assignment covers Specific Aims 1, 2 and 3
- The mark for the assignment is recorded in the 3rd term even if it is completed in term 1 or term 2
- 50 marks is allocated to the assignment

- It is a short term task (1 - 1 ½ hours)
- It is **individually** completed at school **under controlled conditions**
- No resources (e.g. text books, notes, internet, etc.) may be used when completing the task
- It includes a **short source-based essay** (10-15 marks) and also as many as possible of the following:
 - Analysing and interpreting data
 - Making drawings
 - Plotting graphs
 - Drawing tables
 - Performing calculations
 - Justifying conclusions

4.6 Format of a Life Sciences examination paper

The one paper will be:

Sections	Type of questions	Marks
A	A variety of short answer questions, objective questions for example MCQ, Terminology, columns/ statement and items, data-response	50
B	A variety of questions types. 2 questions of 50 marks each divided into 2 – 4 subsections	2 x 50

4.7 The end-of-year examinations:

4.7.1 Grade 10

The examination will consist of two examination papers of 2½ hours and 150 marks each. The weighting and assessment of topics in Paper 1 and Paper 2 will be as follows:

Paper 1

Topic	Time	Weighting	
		%	Marks
Term 1: Chemistry of Life	2½ weeks	16	23
Cells: Basic units of life	3 weeks	17	25
Cell division: Mitosis	2 weeks	12	18
Plant and animal tissues	1 week	5	9
Term 2: Plant and animal tissues	2 weeks	13	20
Plant organs (Leaf)	½ week	3	5
Support and Transport Systems: Plants	3 weeks	17	25
Support Systems: Animals	3 weeks	17	25
Totals	17 weeks	100	150

Paper 2

Topic	Time	Weighting	
		%	Marks
Term 3: Transport Systems in mammals	3 weeks	20	30
Biosphere to Ecosystems	6 weeks	40	60
Term 4: Biodiversity and Classification	1 week	7	10
History of life and Earth	5 weeks	33	50
Totals	17 weeks	100	150

The weighting per topic must serve as a guideline for teachers; slight deviations in respect of the number of marks allocated to a topic are acceptable. The purpose of providing the weighting is to ensure that all topics are covered according to approximately the correct weighting.

4.7.2 Grade 11

The examination will consist of two examination papers of 2½ hours and 150 marks each. The weighting and assessment of topics in Paper 1 and Paper 2 will be as follows:

Paper 1

Topic	Time	Weighting	
		%	Marks
Term 2:			
Energy transformation to sustain Life: Photosynthesis	3 weeks	18	27
Animal nutrition	3 weeks	18	27
Energy transformation: Respiration	1½ weeks	10	15
Term 3:			
Gas exchange	2½ weeks	15	22
Excretion in humans	2½ weeks	15	23
Population Ecology	4 weeks	24	36
Totals	16½ weeks	100	150

Paper 2

Topic	Time	Weighting	
		%	Marks
Term 1:			
Biodiversity and classification of micro-organisms	3 weeks	20	30
Biodiversity in plants and reproduction	3 weeks	20	30
Biodiversity of animals	2 weeks	13	20
Term 4:			
Human impact on the environment	7 weeks 5 weeks	47	70
Totals	15 weeks	100	150

The weighting per topic must serve as a guideline for teachers; slight deviations in respect of the number of marks

allocated to a topic are acceptable. The purpose of providing the weighting is to ensure that all topics are covered in approximately the correct weighting.

4.7.3 Grade 12

The examination will consist of two examination papers of 2½ hours and 150 marks each. The weighting and assessment of topics in Paper 1 and Paper 2 will be as follows:

Paper 1

Topic	Time	Weighting	
		%	Marks
DNA: Code of Life	2 weeks	18	27
Meiosis	1½ weeks	14	21
Genetics and Inheritance	3½ weeks	32	48
Evolution	4 weeks	36	54
Totals	11 weeks	100	150

Paper 2

Topic	Time	Weighting	
		%	Marks
Reproduction in Vertebrates	½ week	5	8
Human Reproduction	3 weeks	27	41
Responding to the environment (humans)	4 weeks	36	54
Responding to the Environment (plants)	1 week	9	13
Endocrine and Homeostasis	2½ weeks	23	34
Totals	11 weeks	100	150

The weighting per topic must serve only as a guideline to teachers and examiners and is included to ensure that all topics are adequately covered in examinations. The number of marks per topic is not expected to be exactly according to this weighting in the examination papers.

4.8 Recording and reporting

Recording is a process in which the teacher documents the level of a learner's performance in a specific assessment task. It indicates learner progress towards the achievement of knowledge as prescribed in the Curriculum and Assessment Policy Statement. Records of learner performance should provide evidence of the learner's conceptual progression within a grade and her or his readiness to progress or be promoted to the next grade. Records of learner performance should also be used to verify the progress made by teachers and learners during the teaching and learning process.

Reporting is a process of communicating learner performance to learners, parents, schools, and other stakeholders. Learner performance can be reported in a number of ways. These include report cards, parents' meetings, school visitation days, parent-teacher conferences, phone calls, letters, class or school newsletters, etc. For all grades, teachers report learners' achievements in percentages next to the appropriate subject. The various achievement levels and their corresponding percentage bands are as shown in the table below.

Note: The seven-point scale should have clear descriptions that give detailed information for each level. Teachers will record actual marks against the task by using a record sheet; and report percentages against the subject on the learners' report cards.

Codes and Percentages for reporting in Grades r-12

Rating code	Description of competence	Percentage
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

Schools are required to provide **quarterly** feedback to parents on the Programme of Assessment using a formal reporting tool such as a report card. The schedule and the report card should indicate the overall level of a learners' performance.

4.9 Moderation of assessment

Moderation refers to the process that ensures that the assessment tasks are fair, valid and reliable. Moderation should be implemented at school and district level and if necessary also at provincial level. Comprehensive and appropriate moderation practices must be in place for the quality assurance of all subject assessments.

4.9.1 Grades 10, 11 and 12

Moderation refers to the process which ensures that the assessment tasks are fair, valid and reliable. Moderation should be implemented at school, district, provincial and national levels. Comprehensive and appropriate moderation practices must be in place for the quality assurance of all subject assessments. Moderation serves five purposes:

- Firstly, it should ascertain whether the subject-specific content and skills are sufficiently covered.
- Secondly, the moderator must ensure that the various levels of cognitive demand

are reflected in the assessments.

- Thirdly, that the assessments and marking are of an acceptable standard and consistency.
- Fourthly, to ensure that assessment in different schools are more or less comparable whilst recognising that different teachers have different standards.
- Finally, to identify areas in which the teacher may need further support and development and to provide such necessary support

Moderation can take place at four levels:

- *School-based moderation and verification of learner performance*

This is intended to ensure that the assessments meet the requirements in terms of content, cognitive demands and skills; that the marking has been consistent and fair and that the marks are a true reflection of learners' performance in the assessments. This will enable the school to easily identify problems related to the pacing, standard and reliability of assessment and to ensure that appropriate interventions are put in place early. This is an ongoing process.

- *Moderation by the subject advisor/teacher moderator/district*

This is also an ongoing process. Subject advisors/teacher moderators/districts should moderate assessments, to ascertain whether:

- Subject-specific content and skills have been covered adequately;
- The prescribed number of assessments has been complied with;
- The appropriate cognitive demands are reflected in the assessments;
- The marking is of an acceptable standard and is consistent;
- The assessments in different schools are comparable whilst recognising that different teachers teach and assess differently.

Subject advisors should provide teachers with the necessary guidance and support should any shortcomings be identified. Early identification of shortcomings and early interventions are essential. It is therefore necessary that moderation at this level should be ongoing and not be a once-off end-of-year event.

- *Moderation by the province*

Moderation of SBA at this level is once-off and is related to the quality assurance processes that are necessary developed jointly by the Department of Basic Education and Umalusi in terms

of National Policy.

- *At a national level*

Statistical moderation of learner performance in the School Based Assessment is necessary to ensure comparability across schools, districts, and provinces.

4.10 General

This document should be read in conjunction with:

4.10.1 *National policy pertaining to the programme and promotion requirements of the National*

Curriculum Statement Grades R-12; and

4.10.2 The policy document, *National Protocol for Assessment Grades R-12.*