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NATIONAL CURRICULUM STATEMENT GRADES 10-12 (GENERAL)

LEARNING PROGRAMME GUIDELINES

LIFE SCIENCES

JANUARY 2008

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SECTION 1

INTRODUCTION

1.1 INTRODUCING THE NATIONAL CURRICULUM STATEMENT

1.1.1 BACKGROUND

In 1995 the South African government began the process of developing a new curriculum for the school system. There were two imperatives for this. First, the scale of change in the world, the growth and development of knowledge and technology and the demands of the 21st Century required learners to be exposed to different and higher level skills and knowledge than those required by the existing South African curricula. Second, South Africa had changed. The curricula for schools therefore required revision to reflect new values and principles, especially those of the Constitution of South Africa.

The first version of the new curriculum for the General Education Band, known as Curriculum 2005, was introduced into the Foundation Phase in 1997. While there was much to commend the curriculum, the concerns of teachers led to a review of the Curriculum in 1999. The review of Curriculum 2005 provides the basis for the development of the Revised National Curriculum Statement for General Education and Training (Grades R–9) and the National Curriculum Statement for Grades 10–12.

1.1.2 THE NATIONAL CURRICULUM STATEMENT

The National Curriculum Statement consists of 29 subjects. Subject specialists developed the Subject Statements which make up the National Curriculum Statement. The draft versions of the Subject Statements were published for comment in 2001 and then re-worked to take account of the comments received. In 2002 24 subject statements and an overview document were declared policy through Government Gazette. In 2004 five subjects were added to the National Curriculum Statement. The National Curriculum Statement now consists of the Subject Statements for the following subjects:

- Languages – 11 official languages (each counted as three subjects to cater for the three levels Home Language, First Additional Language and Second Additional Language); 13 non-official languages

- Mathematics; Mathematical Literacy; Physical Sciences; Life Sciences; Computer Applications Technology; Information Technology

- Accounting; Business Studies; Economics

- Geography; History; Life Orientation; Religion Studies

- Consumer Studies; Hospitality Studies; Tourism

- Dramatic Arts; Dance Studies; Design; Music; Visual Arts

- Agricultural Sciences, Agricultural Management Practices, Agricultural Technology

- Civil Technology; Mechanical Technology; Electrical Technology; Engineering Graphics and Design

1.1.3 NATIONAL SENIOR CERTIFICATE

The *National Senior Certificate: A Qualification on Level 4 of the National Qualifications Framework (NQF)* provides the requirements for promotion at the end of Grades 10 and 11 and the awarding of the National Senior Certificate at the end of Grade 12. This document replaces two of the original National Curriculum Statement documents: the *Overview* and the *Qualifications and Assessment Policy Framework.*

1.1.4 SUBJECT ASSESSMENT GUIDELINES

The Subject Assessment Guidelines set out the internal or school-based assessment requirements for each subject and the external assessment requirements. In addition, the *National Protocol for Recording and Reporting (Grades R-12)* (an addendum to the policy, *The National Senior Certificate*) has been developed to standardise the recording and reporting procedures for Grades R to 12. This protocol came into effect on 1 January 2007.

1.2 INTRODUCING THE LEARNING PROGRAMME GUIDELINES

1.2.1 PURPOSE AND CONTENT OF THE LEARNING PROGRAMME GUIDELINES

The Learning Programme Guidelines aim to assist teachers and schools in their planning for the introduction of the National Curriculum Statement. The Learning Programme Guidelines should be read in conjunction with the National Senior Certificate policy and the National Curriculum Statement Subject Statements.

Section 2 of the Learning Programme Guidelines suggests how teaching the particular subject may be informed by the principles which underpin the National Curriculum Statement.

Section 3 suggests how schools and teachers might plan for the introduction of the National Curriculum Statement. The Department of Education encourages careful planning to ensure that the high skills, high knowledge goals of the National Curriculum Statement are attained.

The Learning Programme Guidelines do not include sections on assessment. The assessment requirements for each subject are provided in the Subject Assessment Guidelines which come into effect on 1 January 2008.

1.2.2 WHAT IS A LEARNING PROGRAMME

INTRODUCTION

A Learning Programme assists teachers to plan for sequenced learning, teaching and assessment in Grades 10 to 12 so that all Learning Outcomes in a subject are achieved in a progressive manner. The following three phases of planning are recommended:

- Phase 1 – develop a *Subject Framework* for grades 10 to 12

- Phase 2 – develop a *Work Schedule* for each grade

- Phase 3 – develop *Lesson Plans*

It is recommended that the teachers of a subject at a school or cluster of schools first put together a broad subject outline (Subject Framework) for the three grades to arrive at an understanding of the content of the subject and the progression which needs to take place across the grades (see Section 3.3.1). This will assist with the demarcation of content for each grade. Thereafter, teachers of the subject teaching the same grade need to work together to develop a year long Work Schedule. The Work Schedule should indicate the sequence in which the content and context will be presented for the subject in that particular grade (see Section 3.3.2). Finally, individual teachers should design Lesson Plans using the grade-specific Work Schedule as the starting point. The Lesson Plans should include learning, teaching and assessment activities that reflect the Learning Outcomes and Assessment Standards set out in the Subject Statements (see Section 3.3.3). Learning Programmes should accommodate diversity in schools and classrooms but reflect the core content of the national curriculum.

An outline of the process involved in the design of a Learning Programme is provided on page 6.

DESIGNING A LEARNING PROGRAMME

A detailed description of the process involved in the design of a Learning Programme is provided in Sections 3.3.1 – 3.3.3 of the Learning Programme Guidelines. The first stage, the development of a Subject Framework does not require a written document but teachers are strongly advised to spend time with subject experts in developing a deep understanding of the skills, knowledge and values set out in the Subject Statements. The quality and rigour of this engagement will determine the quality of teaching and learning in the classroom.

Once the Subject Framework has been completed, teachers should develop Work Schedules and Lesson Plans. Examples of Work Schedules and Lesson Plans are provided in the Learning Programme Guidelines. Teachers are encouraged to critically engage with these formats and develop their own.

Developing a Subject Framework (Grades 10-12)

Planning for the teaching of subjects in Grades 10 to 12 should begin with a detailed examination of the scope of the subject as set out in the Subject Statement. No particular format or template is recommended for this first phase of planning but the steps recommended should be used as a checklist.

Although no prescribed document is required for this stage of planning, school-wide planning (timetables, requisitioning, teacher development, classroom allocation) as well as the development of grade-specific work schedules would benefit from short documents which spell out:

- The scope of the subject – the knowledge, skills and values; the content; the contexts or themes; electives etc. to be covered in the three grades for each subject
- A three-year assessment plan for the subject
- The list of LTSM required for the subject

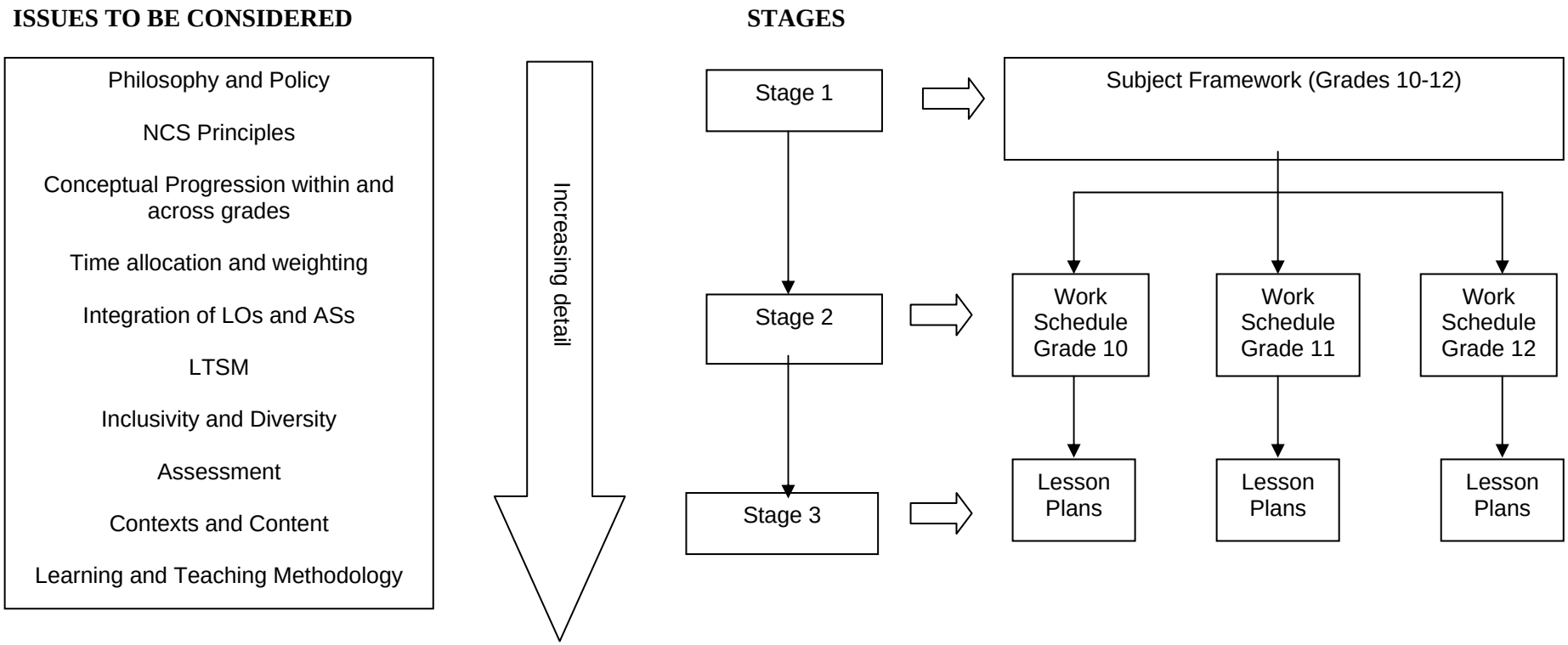
Designing Work Schedules

This is the second phase in the design of a Learning Programme. In this phase teachers develop Work Schedules for each grade. The Work Schedules are informed by the planning undertaken for the Subject Framework. The Work Schedules should be carefully prepared documents that reflect what teaching and assessment will take place in the 36-40 weeks of the school year.

Designing Lesson Plans

Each grade-specific Work Schedule must be divided into units of deliverable learning experiences, that is, Lesson Plans. Lesson Plans are not equivalent to periods in the school timetable and each contains a coherent series of teaching, learning and assessment activities. A Lesson Plan adds to the level of detail for each issue addressed in the Work Schedule. It also indicates other relevant issues to be considered when teaching and assessing a subject.

FIGURE 1: RELATIONSHIP BETWEEN THE 3 STAGES OF PLANNING WHEN DEVELOPING A LEARNING PROGRAMME



SECTION 2

INTRODUCING LIFE SCIENCES

2.1 WHAT IS LIFE SCIENCES?

The subject Life Sciences involves the systematic study of life in the natural and human-made environment. The study focuses on the understanding of basic life processes and the interrelationship and interdependence of components of the living and the physical world. Scientific inquiry, problem-solving, critical thinking and application of knowledge are essential skills in the study of Life Sciences. Through the understanding of the relationships between Life Sciences, technology, environment and society learners develop values that contribute to their development as responsible citizens.

The subject Life Sciences draws from disciplines such as Botany, Zoology, Genetics and Physiology.

2.2 WHAT IS THE PURPOSE OF LIFE SCIENCES?

The study of Life Sciences enables learners to 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. Learners explore those concepts, which are essential to basic life processes and the interrelationship and inter-dependence of components of the living and the physical world. This understanding is directed to the improved quality of life and life support systems in the biosphere. It also allows learners to apply knowledge and skills in a way that will lead to sustainable management of resources and life support systems.

2.3 WHAT IS THE RELATIONSHIP BETWEEN THE LIFE SCIENCES AND THE NATIONAL CURRICULUM STATEMENT PRINCIPLES?

The Constitution of the Republic of South Africa (Act 108 of 1996) provides the basis for curriculum transformation and development in South Africa. The National Curriculum Statement Grades 10-12 (General) lays a foundation for the achievement of these goals by stipulating Learning Outcomes and Assessment Standards, and by spelling out the key principles and values that underpin the curriculum. The Life Sciences curriculum supports the application of the nine NCS principles as follows:

2.3.1 Social transformation

The importance of transforming South African society through various mechanisms arises from the need to redress the legacy of apartheid. Social transformation therefore focuses on ensuring that the imbalances and discriminations of the past are addressed, and that equal opportunities are provided for all sections of the population. If social transformation is to be achieved, all South Africans must receive a quality education. Life Sciences will contribute to social transformation by ensuring the development of responsible, sensitive and scientifically literate citizens who can critically debate scientific issues and participate in an informed way in democratic decision-making processes.

2.3.2. Outcomes based education

Life Sciences makes use of learning outcomes and assessment standards to describe what a learner should know and be able to demonstrate i.e. the skills, knowledge, and values that are the results of learning. The content in Life Sciences is constructed and applied within four knowledge areas/themes namely, tissues, cells and molecular studies; structures and control of processes in basic life systems; environmental studies; diversity, change and continuity. Life Sciences encourages learners to develop inquiring and problem solving skills which support the practical application of knowledge in the Life Sciences and involves active and high level teaching, learning and assessment.

2.3.3 High knowledge and high skills

The National Curriculum Statement Grades 10-12 (General) aims to develop a high level of knowledge and skills in learners. Life Sciences places particular emphasis on creating opportunities for all learners to realise their full potential as thinking and doing beings who will contribute to an improved quality of life for themselves and others in society.

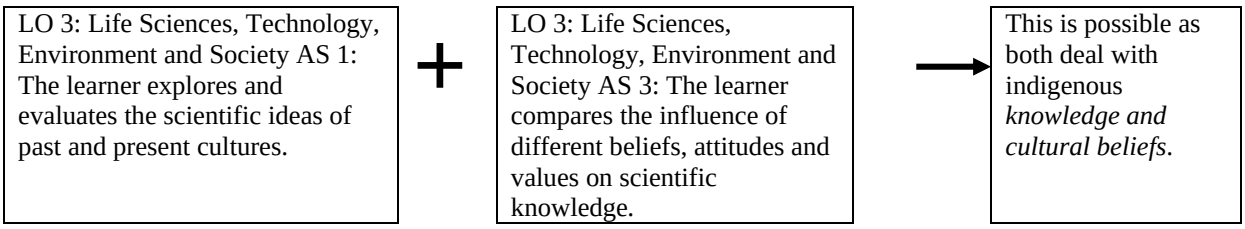
High knowledge is demonstrated by showing an understanding of the application of Life Sciences knowledge in everyday life, for example how DNA testing can be used to identify the parents of a lost child. This is indicative of the process skills learners will acquire during their investigations in the Life Sciences.

2.3.4 Integration and applied competence

Integration within a subject involves the grouping of Assessment Standards that link naturally. This grouping is a mechanism that enriches learning, teaching and assessment. Life Sciences allows for an integrated approach to learning, teaching and assessment in that the issues dealt with in the subject are integrated across the three learning outcomes of the subject. The scientific inquiry and problem solving skills addressed in all Learning Outcomes of Life Sciences therefore build on and interact with each other and are not isolated. It is important that the integrated nature of Life Sciences is reflected in the development of a learning programme for Life Sciences. This will ensure that the three learning outcomes are learnt, taught and assessed in an integrated and holistic manner.

The following presents an example of how Life Sciences teachers can integrate Learning Outcomes and Assessment Standards from Life Sciences within the subject:

Integration within the subject Life Sciences is possible when the following are integrated:



2.3.5 Progression

The Assessment Standards for each Learning Outcome in the *National Curriculum Statement Grades 10-12 (General)* are designed at various levels of complexity and depth to provide for progression as learners move from the beginning to the end of a grade and from grade to grade.

Within Life Sciences an example of this progression can be seen when looking at the first Assessment Standard of Learning Outcome 1 for Grades 10-12 where the Assessment Standard increases in complexity by moving from focusing on identifying and questioning phenomena to finding reasons for the occurrence of certain phenomena through surveys which involve more than one variable. All Assessment Standards are written to show progression in conceptual complexity.

2.3.6 Articulation and portability

Life Sciences builds on the Natural Sciences Learning Area in the GET Band which includes the following four knowledge areas: (a) life and living; (b) energy and change; (c) earth and beyond; (d) matter and materials.

2.3.7 Human rights, inclusivity, and environmental and social justice

The *National Curriculum Statement Grades 10-12 (General)* seeks to promote human rights, social and environmental justice and adopts an inclusive approach to learning, teaching and assessment. The principles of human rights, inclusivity, and environmental and social justice are essential components in the Life Sciences and contribute to the development of responsible, sensitive and scientifically literate citizens who can critically debate scientific issues and participate in an informed way in democratic decision-making processes. For example, learners will study how high levels of pollution in certain sectors like mining contribute to sickness and increase mortality rates in certain communities.

The development of appropriate skills, knowledge, values and attitudes together with an understanding of the principles and processes of the Life Sciences enables learners to make sense of their natural world.

Life Science teachers should be aware of the social, emotional, physical and other needs of the learners as they develop Learning Programmes for the subject. In addition, teachers should consider any particular barriers to learning and/or assessment that exist on the part of learners in Life Sciences.

2.3.8 Valuing indigenous knowledge systems

Nowadays people recognise the wide diversity of knowledge systems through which people make sense of, and attach meaning to, the world in which they live. Indigenous knowledge systems in the South African context refer to the body of knowledge embedded in African philosophical thinking and social practices that have evolved over thousands of years, for example the making of African beer as compared to the traditional western methods of manufacturing beer. It is also possible in Life Sciences to consider traditional methods used for healing certain ailments which include herbal treatment.

Life Sciences recognises the richness of indigenous knowledge systems. Indigenous knowledge features in Learning Outcomes 2 and 3 in the Life Sciences.

2.3.9 Credibility, quality and efficiency

The *National Curriculum Statement Grades 10-12 (General)* aims to achieve credibility through pursuing a transformational agenda and through providing an education that is comparable in quality, breadth and depth to that of other countries. The Life Sciences curriculum focuses on tissues, cells and molecular studies; structures and control processes in basic life systems;

environmental studies; and diversity and change. These are internationally recognised as relevant areas for the learning, teaching and assessment of Life Sciences.

2.4 PROFILE OF A LIFE SCIENCES LEARNER ENROLLING FOR THE SUBJECT IN THE FURTHER EDUCATION AND TRAINING

Life Sciences builds on the foundation laid by the Natural Sciences Learning Area in the General Education and Training Band. The Natural Sciences Learning Area focuses on four knowledge areas: (a) life and living; (b) energy and change; (c) earth and beyond; (d) matter and materials.

The scope, Learning Outcomes and Assessment Standards of Life Sciences in Grades 10-12 is deeper, broader and covers the following:

- Tissues, cells and molecular study;
- Structures and control of processes in basic life systems;
- Environmental Studies; and
- Diversity, change and continuity of life.

In addition, learners in the Life Sciences are expected to develop the following competences:

- Scientific inquiry and problem-solving skills;
- Construction and application of Life Sciences knowledge; and
- Understanding of the interrelationship of Life Sciences, technology, the environment and society.

The envisaged Life Sciences learner will be imbued and empowered with skills and knowledge for lifelong learning and will be in a position to pursue careers at tertiary level such as medicine, bioengineering, psychology, nursing, education, marine biology and environmental science.

2.5 RELATIONSHIP BETWEEN LIFE SCIENCES LEARNING OUTCOMES AND CRITICAL AND DEVELOPMENTAL OUTCOMES

There are seven cross-curricular Critical Outcomes and five cross-curricular Developmental Outcomes. These outcomes are derived from the Constitution and indicate the desired profile of a learner leaving the schooling system. The Critical and Developmental Outcomes in turn inform the Learning Outcomes that are set for each subject in the National Curriculum Statement and therefore inform the learning, teaching and assessment process in Life Sciences. The three Learning Outcomes of Life Sciences relate to the Critical Outcomes (CO) and Developmental Outcomes (CO) as follows:

LIFE SCIENCES LEARNING OUTCOMES	CRITICAL OUTCOMES	DEVELOPMENTAL OUTCOMES
LO 1: Scientific inquiry and problem solving skills	**CO 1**: Solve problems, decision-making and thinking **CO 4**: Collect, analyse, organise and critically evaluate information **CO 5**: Communicate effectively using visual, language, symbolic and other modes	**DO 1**: Reflect and explore a variety of learning strategies
LO 2: Construction and application of Life Sciences knowledge	**CO 6**: Use science and technology effectively and responsibly towards environment and people **CO 3:** Organise and manage themselves and their activities responsibly and effectively **CO 7**: Demonstrate understanding of the world as a set of related systems by recognising that problem solving contexts do not exist in isolation	**DO 2:** Participate as responsible citizens in the life of local, national and global communities **DO 4:** Explore education and career opportunities
LO 3: Life Sciences, technology, environment and society	**CO 2**: Work with others as members of a team, group, organisation and community **CO 6**: Use science and technology effectively and responsibly towards environment and people	**DO 2**: Participate as responsible citizens in the life of local, national and global communities **DO 3**: Be culturally sensitive across a range of social contexts **DO 5**: Develop entrepreneurial opportunities

2.6 WAYS TO ACHIEVE LIFE SCIENCES LEARNING OUTCOMES

The **three** Learning Outcomes of Life Sciences should not be covered in isolation. Where possible, Learning Outcomes and Assessment Standards should be linked and integrated. This integration should not be forced but opportunities for integration should be identified and Learning Programmes should be designed around this interrelatedness.

The approach to teaching and learning Life Sciences emphasises learning through experience and/or simulations. Assessment Standards for each Learning Outcome specify more complex, deeper and broader knowledge, skills, values and understanding to be achieved in each grade. The Assessment Standards per grade are the minimum requirements expected of a learner in order to progress to the next grade.

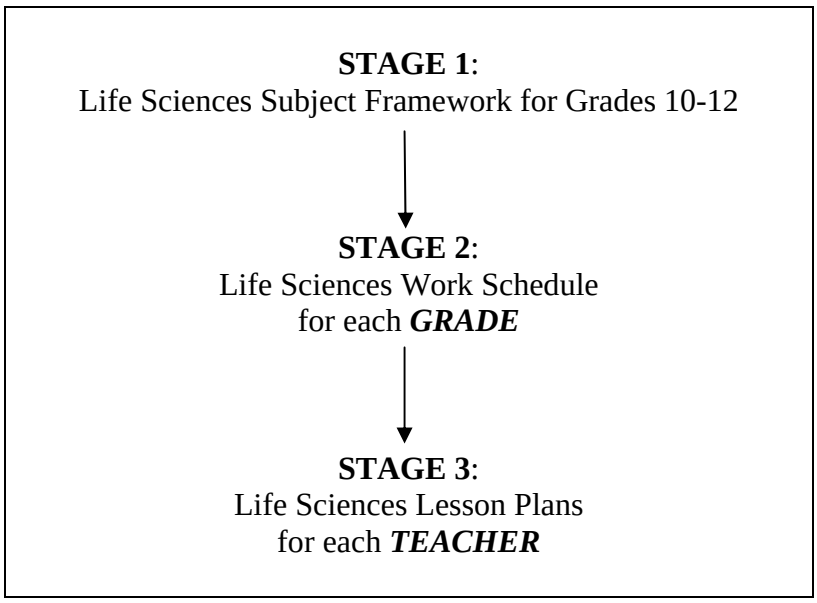
SECTION 3

DESIGNING A LEARNING PROGRAMME FOR LIFE SCIENCES

3.1 INTRODUCTION

A Learning Programme is a tool to plan for sequenced learning, teaching and assessment across Grades 10-12 so that all three Learning Outcomes in Life Sciences are achieved in a progressive manner. It is recommended that the Life Sciences teachers at a school first put together a broad subject outline (i.e. Subject Framework) for Grades 10-12 to arrive at an understanding of the progression which needs to take place across the grades (see Section 3.3.1). This will assist with the demarcation of content for each grade. Thereafter, Life Sciences teachers teaching the same grade need to work together and draw from the content and context identified for their grade in the Subject Framework, to develop a Work Schedule in which they indicate the sequence in which the content and context will be presented for Life Sciences in that particular grade (see Section 3.3.2). Finally, the individual Life Sciences teacher should design Lesson Plans using the grade-specific Work Schedule as the starting point. The Lesson Plans should include learning, teaching and assessment activities (see Section 3.3.3).

An outline of the process involved in the design of a Learning Programme for Life Sciences is provided in the diagram below:



The process to be followed in the development of a Learning Programme is not a neatly packaged sequence of numbered steps that follow one another in a particular order. Teachers may find themselves moving back and forth in the process as they plan and critically reflect on decisions taken before moving on to the next decision in the process. The process is therefore not strictly linear and is reflective in nature. For this reason the steps provided in this Section are a guide and should be used as a checklist in the planning process.

3.2 ISSUES TO ADDRESS WHEN DESIGNING A LEARNING PROGRAMME

The issues to be addressed in the development of a Life Sciences Learning Programme are presented in a tabular format to indicate the implications of each issue at each of the three stages of the development of a Learning Programme:

- Stage 1 – Subject Framework
- Stage 2 – Work Schedule
- Stage 3 – Lesson Plan

3.2.1 Policies and Principles

STAGE 1 Subject Framework **STAGE 2** Work Schedule **STAGE 3** Lesson Plan	The various Policies that impact on curriculum implementation should be considered throughout the planning process. *NCS:* • Principles: Refer to Section 2.3 to see how Life Sciences supports the application of the nine principles of the NCS • Critical and Developmental Outcomes: Refer to Section 2.5 to see how Life Sciences supports the application of the Critical and Developmental Outcomes *Other Policies and Legislation:* • White Paper 6, Language in Education Policy, Religion and Education Policy, HIV/AIDS Policy– all have implications for LTSM and teaching methods in Life Sciences • White Paper 7 – gives an indication on the use of computers in the classroom and therefore has implications for LTSM and teaching methods in Life Sciences

3.2.2 Content

In the NCS Grades 10-12 content means the combination of knowledge, skills and values.

STAGE 1 Subject Framework	The content is provided by the ASs. These give an indication of the knowledge, skills and values (KSVs) to be covered in each of the three grades. The Subject Framework sets out the content for the three years (i.e. Grades 10, 11 and 12).
STAGE 2 Work Schedule	The Work Schedule sets out the content for one year. Here the focus falls on the grade-specific KSVs required by the NCS.
STAGE 3 Lesson Plan	The Lesson Plans set out the content to be covered in each coherent series of learning, teaching and assessment activities. Each Lesson Plan can be one or more weeks in duration.

3.2.3 Integration

Integration involves the grouping of Assessment Standards according to natural and authentic links.

STAGE 1 Subject Framework	Integration within the subject should be considered in broad terms during discussions at this stage. All Grade 10-12 teachers should consider integration of ASs within and across the grades.
STAGE 2 Work Schedule	The integration and sequencing of the ASs is undertaken in the Work Schedule to ensure that all ASs for a particular grade are covered in the 40-week contact period. Refer to Section 2.3.4 for an example of integration within Life Sciences.
STAGE 3 Lesson Plan	The same groupings of LOs and ASs as arrived at in the Work Schedule should be used to develop a coherent series of learning, teaching and assessment activities for each Lesson Plan.

3.2.4 Conceptual Progression

STAGE 1 Subject Framework	The Subject Framework should indicate the increasing depth of difficulty across Grades 10-12. Progression across the three grades is shown in the ASs per Learning Outcome.
STAGE 2 Work Schedule	Progression in a grade is evident in the increasing depth of difficulty in that particular grade. Grade-specific progression is achieved by appropriately sequencing the groupings of integrated LOs and AS in the Work Schedule.
STAGE 3 Lesson Plan	In the individual Life Sciences classroom increasing depth of difficulty is shown in the activities and Lesson Plans. Progression is achieved by appropriately sequencing the activities contained within each Lesson Plan and in the series of Lesson Plans.

3.2.5 Time Allocation and Weighting

STAGE 1 Subject Framework	4 hours per week is allocated to Life Sciences in the NCS. This is approximately 160 hours per year. The teachers of the subject should plan how this time will be used for the teaching of Life Sciences in the three grades. The suggested weighting of the three LOs for Life Sciences in Grades 10-12 is approximately equal.
STAGE 2 Work Schedule	The groupings of ASs as arrived at in the integration process should be paced across the 40 weeks of the school year to ensure coverage of the curriculum.
STAGE 3 Lesson Plan	The amount of time to be spent on activities should be indicated in the Lesson Plans.

3.2.6 LTSM

LTSM refers to any materials that facilitate learning and teaching. LTSM need to be chosen judiciously because they have cost implications for the school and the learner. The NCS provides scope for the use of a variety of resources. All teachers and learners must have a textbook. However, teachers are required to go beyond the textbook. They do not necessarily need exotic, specialised materials. Rather common and readily available items can be used.

STAGE 1 Subject Framework	Compile a list of general LTSM (text books and other resources) that will be necessary and useful in the teaching, learning and assessment of the content. This assists with the requisition and availability of LTSM at a school.
STAGE 2 Work Schedule	List grade-specific LTSM (resources) required in the learning, teaching and assessment process for the grade.
STAGE 3 Lesson Plan	Identify specific resources related to the individual activities contained within a Lesson Plan.

3.2.7 Assessment

All Grade 10, 11 and 12 learners are expected to complete seven internal tasks for Life Sciences. Of the seven tasks, two must be tests, two must be examinations and the remaining three tasks should take any form suitable to the teaching and assessment of Life Sciences – See Section 3 of the Subject Assessment Guidelines for Life Sciences for further details. In addition, Grade 12 learners are expected to complete an external examination for Life Sciences.

In order to administer effective assessment one must have a clearly defined purpose. It is important that all the tasks are well covered as spelt out in the Subject Assessment Guidelines document. By answering the following questions the teacher can decide what assessment activity is most appropriate:

- What concept, skill or knowledge needs to be assessed?
- What should the learners know?

- At what level should the learners be performing?
- What type of knowledge is being assessed: reasoning, memory or process?

Observation-based assessment requires that learner performance be assessed while the learner is actually performing a skill in the classroom as there will be no concrete product for the teacher to assess after the performance. Not all observations need culminate in a formally recorded assessment of learner performance. **Performance-based assessment** relies on the availability of a product as evidence of learner performance that can be assessed by the teacher after the completion of the performance. **Test-based assessment** focuses on assessing the presentation and application of knowledge.

STAGE 1 Subject Framework	Develop a three-year assessment plan using the Subject Assessment Guidelines for Life Sciences. This should ensure the use of a variety of assessment forms relevant to the subject and progression across the three grades.
STAGE 2 Work Schedule	Use the Subject Assessment Guidelines for Life Sciences to develop a grade-specific assessment plan. The forms of assessment listed must facilitate the achievement of the particular LOs and ASs in each grouping.
STAGE 3 Lesson Plan	Indicate more classroom-specific assessment strategies, by mentioning the methods, forms and tools that will be used to assess learner performance in each activity. HINT: Not all activities need to be assessed – some may just be introductory in nature or for enrichment. The choice of an assessment strategy is determined by the LOs and ASs that have been grouped together for a particular Lesson Plan. The assessment strategy chosen must facilitate the achievement of these particular LOs and ASs in the classroom.

3.2.8 Inclusivity and Diversity

The following steps can be taken to effectively address diversity in the classroom when planning Life Sciences teaching activities:

- consider individual past experiences, learning styles and preferences;
- develop questions and activities that are aimed at different levels of ability;
- provide opportunity for a variety of participation levels such as individual, pairs and small group activities;
- consider the value of individual methods ; and
- assess learners based on individual progress.

STAGE 1 Subject Framework	Teachers should be sensitive to inclusivity and diversity when identifying content, teaching styles and methods, forms of assessment and LTSM (Resources). Diversity should be accommodated in the following areas:
STAGE 2 Work Schedule	• Learning styles: provide optional activities / different ways of doing same activity • Pace of learning: provide for both slower and faster learners by providing optional extra activities, reading or research, as well as multiple assessment opportunities • Differences in levels of achievement: provide optional extra activities, challenges and materials that cater for these differences between learners. • Gender diversity: ensure that teachers do not inadvertently allow or contribute towards discrimination against boys or girls in the classroom on the basis of gender. • Cultural diversity: recognise, celebrate and be sensitive when choosing content, assessment tasks and LTSM.
STAGE 3 Lesson Plan	This is catered for as EXPANDED OPPORTUNITIES in the Lesson Plan. Enrichment is provided for high achievers and remediation or other relevant opportunities for learners requiring additional support. It is not necessary to develop an activity to cater for each type of diversity which arises in the classroom. Teachers may find it possible to cater for different diversities within one activity with effective planning.

3.2.9 Learning and Teaching Methodology

STAGE 1 Subject Framework	It is not necessary to record Teaching Methods for either of these stages.
STAGE 2 Work Schedule	
STAGE 3 Lesson Plan	This is catered for as TEACHING METHOD in the Lesson Plan. It provides an indication of how teaching and learning will take place, that is, how each activity will be presented in the classroom.

3.3 DESIGNING A LEARNING PROGRAMME

A detailed description of the process involved in the design of a Learning Programme for Life Sciences is provided in this section (see Sections 3.3.1 – 3.3.3). The process presented here is a suggestion of how to go about designing a Learning Programme.

3.3.1 Subject Framework (Grades 10-12) for Life Sciences

Planning for the teaching of Life Sciences in Grades 10 to 12 should begin with a detailed examination of the scope of the subject as set out in the Subject Statement. No particular format or template is recommended for this first phase of planning but the five steps below should be used as a checklist.

Although no prescribed document is required for this stage of planning, school-wide planning (timetables, ordering, teacher development, classroom allocation) as well as the development of grade-specific work schedules would benefit from short documents which spell out:

- The scope of the subject – the knowledge, skills and values; the content; the contexts or themes; electives etc. to be covered in the three grades (See Annexure 1 for skills areas in Life Sciences)
- A three-year assessment plan
- The list of LTSM required

❶ Clarify the Learning Outcomes and Assessment Standards.

The essential question for Life Sciences is: What Learning Outcomes do learners have to master by the end of Grade 12 and what Assessment Standards should they achieve to show that they are on their way to mastering these outcomes?

All learning, teaching and assessment opportunities must be designed down from what learners should know, do and produce by the end of Grade 12. The Learning Outcomes and Assessment Standards that learners should master by the end of Grade 12 are specified in the Life Sciences Subject Statement.

❷ Study the conceptual progression across the three grades.

Study the Assessment Standards for Life Sciences across the three grades. Progression should be clearly evident across the grades.

❸ **Identify the content to be taught.**

Analyse the Assessment Standards to identify the skills, knowledge and values to be addressed in each grade. Also consider the content and context in which they will be taught.

❹ **Identify three-year plan of assessment.**

Use the Subject Assessment Guidelines to guide the three-year assessment plan. Consider what forms of assessment will be best suited to each of the Learning Outcomes and Assessment Standards. This ensures that assessment remains an integral part of the learning and teaching process in Life Sciences and that learners participate in a range of assessment activities.

❺ **Identify possible LTSM (resources).**

Consider which LTSM will be best suited to the learning, teaching and assessment of each Learning Outcome in the three grades using the Assessment Standards as guidance.

3.3.2 Designing Work Schedules for Life Sciences

This is the second phase in the design of a Learning Programme. In this phase teachers develop Work Schedules for each grade. The Work Schedules are informed by the planning undertaken for the Subject Framework. The Work Schedules should be carefully prepared documents that reflect what teaching and assessment will take place in the 40 weeks of the school year. See Annexures 2, 3 and 4 for examples of Work Schedules for Grades 10, 11 and 12.

The following steps provide guidelines on how to approach the design of a Work Schedule per grade for Life Sciences:

❶ **Package the content.**

Study the Learning Outcomes and Assessment Standards prescribed for the particular grade in Life Sciences and group these according to natural and authentic links.

❷ **Sequence the content.**

Determine the order in which the groupings of Learning Outcomes and Assessment Standards will be presented in the particular grade in Life Sciences. Besides the conceptual progression in the Assessment Standards for Life Sciences, *context* can also be used to sequence groupings in Life Sciences.

❸ **Pace the content.**

Determine how much time in the school year will be spent on each grouping of Learning Outcomes and Assessment Standards in the particular grade.

❹ **Review forms of assessment.**

Revisit the forms of assessment listed for the particular grade in the Subject Assessment Guidelines, and refine them to address each grouping of Learning Outcomes and Assessment Standards as developed in Step 1.

❺ Review LTSM.

Revisit the LTSM (resources) listed for the particular grade in the Subject Framework, and refine them to address each grouping of Learning Outcomes and Assessment Standards as developed in Step 1.

3.3.3 Designing Lesson Plans for Life Sciences

Each grade-specific Work Schedule for LIFE SCIENCES must be divided into units of deliverable learning experiences, that is, Lesson Plans. A Lesson Plan adds to the level of detail in the Work Schedule. It also indicates other relevant issues to be considered when teaching and assessing Life Sciences.

A Lesson Plan is not equivalent to a subject period in the school timetable. Its duration is dictated by how long it takes to complete the coherent series of activities contained in it.

The following steps provide guidelines on how to design Lesson Plans for Life Sciences:

❶ Indicate the content, context, Learning Outcomes and Assessment Standards.

Copy this information from the Work Schedule for the particular grade.

❷ Develop activities and select teaching method.

Decide how to teach the Learning Outcomes and Assessment Standards indicated in Step 1 and develop the activity or activities that will facilitate the development of the skills, knowledge and values in the particular grouping. Thereafter, determine the most suitable teaching method(s) for the activities and provide a description of how the learners will engage in each activity.

❸ Consider diversity.

Explore the various options available within each activity that will allow expanded opportunities to those learners that require individual support. The support provided must ultimately guide learners to develop the skills, knowledge and values indicated in the grouping of Learning Outcomes and Assessment Standards.

❹ Review assessment and LTSM.

Indicate the details of the assessment strategy and LTSM to be used in each activity.

❺ Allocate time.

Give an indication of how much time will be spent on each activity in the Lesson Plan.

3.3.4 Reflection and review of the Life Sciences Learning Programme

After the Learning Programme has been delivered by means of Lesson Plans in the classroom, the teacher should reflect on what worked, how well it worked and what could be improved. Teachers need to note these while the experience is still fresh in their minds, so that if necessary, they can adapt and change the affected part of the Life Sciences Learning Programme for future implementation. It is advisable to record this reflection on the Lesson Plan planning sheets.

ANNEXURE 1: SKILLS AREAS FOR LIFE SCIENCES

LO 1- SCIENTIFIC INQUIRY AND PROBLEM SOLVING SKILLS

	GRADE 10	GRADE 11	GRADE 12
Assessment Standard 1 The learner identifies and questions phenomena and plans an investigation	• Identify and question phenomena • Plan an investigation using instructions • Consider implications of investigative procedures in a safe environment	• Identify phenomena involving one variable to be tested • Design simple tests to measure the effects of this variable • Identify advantages and limitations of experimental design	• Generate and question hypothesis based on identified phenomena for situations involving more than one variable • Design tests and/or surveys to investigate these variables • Evaluate the experimental design
Assessment Standard 2 The learner conducts investigations by collecting and manipulating data	• Systematically and accurately collect data using selected instruments and/or techniques and following instructions • Display and summarise the data collected	• Systematically and accurately collect data using selected instruments and/or techniques • Select a type of display that communicates the data effectively	• Compare instruments and techniques to improve the accuracy and reliability of data collection • Manipulate data in the investigation to reveal patterns • Identify irregular observations and measurements • Allow for irregular observations and measurements when displaying data
Assessment Standard 3 The learner analyses, synthesises, evaluates data and communicate findings	• Analyse, synthesise, evaluate data and communicate findings	• Compare data and construct meaning to explain findings • Draw conclusion and recognise inconsistencies in the data • Assess the value of the experimental process and communicate 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.

LO 2- CONSTRUCTION AND APPLICATION OF LIFE SCIENCES KNOWLEDGE

	GRADE 10	GRADE 11	GRADE 12
Assessment Standard 1 Assessing knowledge	• Use a prescribed method to access information	• Use various methods and sources to access information	• Use various methods and sources to access relevant information from a variety of contexts
Assessment Standard 2 Interpreting and making meaning of knowledge in Life Science	• Identify concepts, principles, laws, theories & models of Life Sciences in the context of everyday life • Describe and explain concepts, laws, theory and/models	• Identify, describe and explain concepts, principles, laws, theories and models by illustrating relationships • Evaluate concepts, principles, laws, theories and models.	• Interpret, organise, analyse, compare and evaluate concepts, principles, laws, theories and models and their application in a variety of contexts
Assessment Standard 3 Showing an understanding of the application of Life Science knowledge in everyday life.	• Organise, analyse and interpret concepts, principles, laws, theories and/models of Life Sciences in the context of everyday life	• Analyse and evaluate the costs and benefits of applied Life Science knowledge	• Evaluate and present an application of Life Science knowledge

LO 3- LIFE SCIENCES, TECHNOLOGY, ENVIRONMENT AND SOCIETY

	GRADE 10	GRADE 11	GRADE 12
Assessment Standard 1 Exploring and evaluating scientific ideas of past and present cultures	• Identify and investigate scientific ideas and indigenous knowledge of past and present cultures	• Compare scientific ideas and indigenous knowledge of past and present cultures	• Generate and question hypotheses based on identified phenomena for situations involving more than one variable • Design tests and/or surveys to investigate these variables • Evaluate the experimental design
Assessment Standard 2 Comparing and evaluating the uses and development of resources and products, and their impact on the environment and society.	• Describe different ways in which resources are used and applied to the development of products, and report on their impact on the environment and society	• Compare different ways in which resources are used in the development of biotechnological products, and analyse the impacts 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
Assessment Standard 3 Comparing the influence of different beliefs, attitudes and values on scientific knowledge	• Analyse and describe the influence of different beliefs, attitudes and values on scientific knowledge and its application to society.	• Compare, debate and argue the strengths and limitations of different beliefs, attitudes and values in the interpretation of scientific knowledge and its application to society	• Critically evaluate and take a justifiable position on beliefs, attitudes and values that influence developed scientific and technological knowledge and their application in society.

ANNEXURE 2: EXAMPLE OF A GRADE 10 WORK SCHEDULE

This first table provides an overview of the year and suggestions for the coverage of content across the 4 terms follow.

<table>
<tr><th>LEARNING OUTCOMES & ASSESSMENT STANDARDS</th><th>Teaching Strategies</th><th>Resources</th><th>Assessment Strategies</th></tr>
<tr><td>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.
Assessment Standard 1: Identifies and questions phenomena
Plans an investigation using instructions
Considers implications of investigative procedures in a safe environment.
Assessment Standard 2: Systematically and accurately collects data using selected
instruments and /or techniques and following instructions
Displays and summarises the data collected.
Assessment Standard 3: Analyses, synthesises, evaluates data and communicates findings.</td><td rowspan="2">Microscopy work, research, excursions, group work, experimental work, case studies, problem solving, interviews, questionnaires, guest talks, career opportunities</td><td rowspan="2">Textbooks, charts, brochures, videos, microscopes, reference books, recycled materials, food labels and containers, computer software, internet programs, OH, transparencies, Life Sciences kits, micrographs</td><td rowspan="2">Rubrics, tests, portfolio work, class work, homework, practical work, projects, data and oral presentations, reports, posters, interviews, peer assessment, self assessment</td></tr>
<tr><td>Learning Outcome 2: Constructs and Applies Life Sciences Knowledge The learner is able to access, interpret, construct and use Life Sciences concepts to explain phenomena relevant to Life Sciences
Assessment Standard 1: Uses a prescribed method to access information.
Assessment Standard 2: Identifies concepts, principles, laws, theories and models of Life
Sciences in everyday life context.
Assessment Standard 3: Organises, analyses and interprets concepts, principles, laws,
theories and models of Life Sciences in everyday life context.</td></tr>
<tr><td>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.
Assessment Standard 1: Identifies and investigates scientific ideas and indigenous knowledge of
past and present cultures.
Assessment Standard 2: Describes different ways in which resources are used and applied for the
development of products and report on their impact on the environment and
society.
Assessment Standard 3: Analyses and describes the influence of different beliefs, attitudes and
values on scientific knowledge and their application to society.</td><td colspan="3">Time allocation to Knowledge Areas:

9 Weeks - Tissues, cells and molecular studies

11 Weeks - Structure and control of processes in basic life systems

7 Weeks - Environmental studies

7 Weeks - Diversity, change and continuity</td></tr>
</table>

Terms 1-4

Knowledge Area: Tissues, Cells and Molecular Studies	**LO 1 Scientific Inquiry & Problem-solving Skills** • Microscopic skills /prepare a wet mount or other comparative methods or resources • Set up and use a microscope • Magnification of different lenses • Research in a field of biotechnology e.g. cell structure, tissue growth, chemotherapy • Investigates (community) diseases: conducts surveys, collects data • Collects latest research information on disease	**Total 9 weeks** 3 weeks	**LO2 Constructs and Applies Life Sciences Knowledge** • Cell structure o Nucleus o Chromatin material o Cytoplasm o Cell membrane o Nuclear membrane o Chloroplast o Cell wall o Vacuole o Ribosome o Tabulate differences between plant and animal cells o Demonstrate the processes of diffusion and osmosis o Explain the processes of diffusion and osmosis	**LO3 Life Sciences, Technology, Environment & Society** Historical developments: IKS, biotechnology, environment, legislation, social behaviour and ethics o Historical developments - History of microscopy - History of the discovery of cell o Ethics and legislation: - Tissue sampling, tissue culture, cloning, ethics o IKS and biotechnology: - Medical biotechnology e.g. immunity, antibiotics o Beliefs, attitudes and values - concerning diseases - blood transfusion and impact of disease on society and the individual
		2 weeks	• Cell division (mitosis) o Define the process of mitosis as a cell divides into two identical cells o Explain importance of mitosis as additional cells form for: Growth (and reproduction in some simple organisms) Repair and replacement of damaged cells o State role of mitosis in forming new cells which are identical to each other and the original mother cell o State where mitosis takes place in plant and animals o Describe the structure of chromosomes. o Use diagrams, describe the main events that occur during the process of mitosis (without the mentioning the names of the phases) o Explain how cloning occurs	
		2 weeks	• Tissues o Define tissue as group of similar cells that perform a common function o Define an organ and a system o Compile a table outlining the location and function of the various plant and mammalian tissues (studied later in relevant topics) o Describe the general characteristics of blood as an example of a tissue o List the functions of the following blood components: white blood cells, red blood corpuscles, blood plasma and platelets o Explain how the clotting of blood takes place. o Explain each of the following relating to blood: Blood types and blood transfusion o Defence against infections – blood clotting, white blood cells, antibodies and immunity	
		2 weeks	• Describe the causes, prevention and treatment of cancer (uncontrolled cell growth) and any other tissue related disease such as osteoporosis – bone tissue wasting; Alzheimer – nerve tissue wasting and the impact of the disease on the individual and on society	

Knowledge Area: Structure, Control and Processes in Basic Life Systems	**LO 1 Scientific Inquiry & Problem-solving Skills** - Structure of systems: - Investigate kidneys, hearts, eyes through dissections **and/or** other comparative techniques using models, charts - Carry out the basic starch test on leaves - Experimental investigation (one or more) in photosynthesis - *chlorophyll is essential for photosynthesis* - *sunlight is essential for photosynthesis* - *CO_2 is essential for photosynthesis* *O_2 is evolved / formed during photosynthesis* - Make a labelled drawing of the l/s of a mitochondrion - Design a model : e.g. Anatomy of a system such as the digestive system. - Microscope work e.g. alveoli or stomata - - Conduct **one or more** investigations in cellular respiration such as, to	**Total 11 weeks** **3 weeks**	**LO2 Constructs and Applies Life Sciences Knowledge** Energy release • Energy in universe remains constant – neither created nor destroyed; flows from high to low energy levels o Producers, consumers and decomposers o Define cellular respiration o State the 'Law of Conservation of Energy' and how it relates to cellular respiration o Explain how breathing, gas exchange and cellular respiration are different but related processes o Differentiate between photosynthesis and cellular respiration as anabolic and catabolic processes, respectively o Describe the role of ATP as an energy carrier in its formation from ADP+P o List different uses for the energy that is obtained from ATP • Differentiate between aerobic and anaerobic respiration in terms of oxygen requirement • Define aerobic respiration • State where in a cell aerobic respiration occurs • State the requirements and products of aerobic respiration • Describe the structure of a mitochondrion • Describe ways in which the mitochondrion is adapted for the process of cellular respiration • Describe the process of aerobic respiration by listing the main events (without biochemical details) of: o Glycolysis (occurs in the cytosol; glucose receives energy from ATP; the activated glucose molecule is broken down step-wise to form 2 x 3 carbon molecules of pyruvic acid. Energised hydrogen and ATP is formed in the process. o Krebs Cycle (occurs only when oxygen is present; pyruvic acid enters the mitochondrion where it is used in a cyclic series of reactions; energised hydrogen atoms and CO2 are released. Co-enzymes that act as hydrogen carriers pick up the hydrogen atoms. o Oxidative Phosphorylation (occurs in the mitochondrion; the energised hydrogen atoms are transferred through a system of co-enzymes; at each transfer energy is released and trapped as ATP; the hydrogen finally combines with oxygen to form water. • Write down an equation for aerobic respiration **(No biochemical details are required**) • List differences between aerobic and anaerobic respiration • Write a brief account of: o anaerobic respiration in humans during strenuous exercise o anaerobic respiration in micro-organisms such as bacteria and yeast • Conduct an investigation to demonstrate anaerobic respiration	**LO3 Life Sciences, Technology, Environment & Society.** Historical developments: IKS, biotechnology, environment, legislation, social behaviour, ethics and beliefs o Food manufacturing and preservation - Discuss traditional ways that people of different cultures have used to preserve food for later use - Compare the effectiveness of various methods of preservation - Discuss how modern technology has allowed humans to preserve food for much longer periods of time - Identify which foods are best suited to each method of preservation. - Discuss consequences of large scale removal of vegetation such as in deforestation - Share recipes and prepare products emanating from fermentation such as ginger beer, bread and yogurt - Discuss moral and ethical issues related to cellular respiration such as: • describing ways in

	show that: • heat is released during respiration • carbon dioxide is released during respiration • oxygen is required for aerobic cellular respiration - Conduct research on any of the latest medical practices		• Describe the role of anaerobic respiration in the biotechnology industry in, for example, the production of alcohol, bread, cheese, yogurt, wine and in the treatment of sewage	which athletes increase energy production in preparation for sporting events • discussing the moral and ethical views on techniques used by athletes to increase energy production

		2 weeks	• Food production o Plants as food producers through process of photosynthesis o Use models, prepared slides or charts list the various parts of the leaf and state the function and adaptation of each part o Define photosynthesis, and list the requirements of photosynthesis o Explain how the leaf and its tissues play a role in meeting the requirements of photosynthesis o Discuss the importance of photosynthesis in terms of providing energy for all living organisms and maintaining the correct balance of carbon dioxide / oxygen levels • Briefly describe the process of photosynthesis (no further biochemical details): o *Light Phase* – chlorophyll traps light energy from the sun and uses this energy to split water molecules to form energised hydrogen and oxygen. The energised hydrogen atoms are released and then passed on to the dark phase. The oxygen is released into the atmosphere. o Some energy trapped by the chlorophyll is used to form the energy carrier, ATP o *Dark phase* – use of the energised hydrogen from the light phase and CO2 to form hydrocarbons, ultimately to form sugars like glucose and later starch. Energy for this formation comes from ATP from the light phase • Discuss the factors that could affect the rate of photosynthesis **(Study of biochemical mechanisms NOT required)**	

	- Use charts and torso/dissections to investigate structure of the digestive system - Investigate whether learners are getting a balanced diet - Analyse the ingredient list on the labels of various food items to explore the importance of the ingredients to a healthy life	**2 weeks**	Human nutrition • State the importance of food for the supply of energy needs; provision of material for growth and to maintain body processes • Describe the structure and functions of parts of the digestive system: major components being mouth, pharynx, oesophagus, stomach, small intestine, large intestine, rectum and anus. Associated organs: salivary glands, liver, gall bladder and pancreas • Explain how food is physically and chemically digested (mention that there are enzymes that act upon proteins, carbohydrates and lipids, and mention the end products, without names of specific enzymes) • Explain how digested food is absorbed • Explain how undigested food and indigestible substances are eliminated from the body • Describe the adaptations of the tissues that play a role in nutrition • Describe the homeostatic balance of glucose in the body • State the importance of maintaining a balanced diet • Describe causes, prevention, symptoms and treatment of one or more of the following nutrition related diseases/disorders/allergies e.g. obesity, anorexia, nutritional marasmus, kwashiorkor, bulimia, allergy to various foods. • Discuss the use of indigenous plants in treating nutritional disorders	- Discuss the impact of the chosen disease/s on the individual and society - Discuss **one or more** of the following: • Socio-economic factors/poverty and nutrition - related to school nutrition programme/feeding poor learners • How your school can promote good eating habits e.g. school tuckshop not selling junk food. • Should richer countries help to feed the starving, poorer nations? • Role of organizations e.g. Heart Foundation in promoting good nutrition • People with special diets e.g., diabetes, vegetarian, athletes, pregnancy, cultural diets

	- Construct/ use a constructed model to demonstrate the process of breathing	**2 weeks**	Gaseous exchange • Explain how the processes of breathing, gas exchange and cellular respiration are different but related processes • Explain the need for oxygen in the body and the need to eliminate carbon dioxide from the body • State the requirements of an efficient gas exchange surface, including the following: o large surface area o thin and moist surface o adequate ventilation o adequate protection o efficient mode of transport of gases • Describe the structure of the trachea, bronchi and lungs • Describe the adaptations to function of the air passages and the lungs • Describe the adaptations to function of the tissues related to the gas exchange system • Describe the process of inhalation and exhalation aided by the following : o diaphragm muscle o intercostal muscles o abdominal muscles • List ways in which oxygen and carbon dioxide are transported in the blood • Explain how the breathing rate may be modified to meet the changing needs of the body • Describe the structure of the leaf in relation to gaseous exchange with a focus on the: o epidermis o stomata o mesophyll tissue • Explain how gases enter and exit the stems(lenticels) and leaves(stomata) • Explain how gases enter and exit the cells of the plant (diffusion)	
		2 weeks	• Discuss the causes, prevention, symptoms and treatment of tuberculosis and any one other related disease, disorder or allergy, such as: o asthma o hay fever o cancer of the respiratory system o emphysema • Describe the steps that should be taken when providing first aid for choking	- Describe the impact of tuberculosis and the chosen disease on the individual and on society

<table>
<tr>
<td rowspan="3">Knowledge Area: Environmental Studies</td>
<td rowspan="3">LO 1 Scientific Inquiry and Problem-solving Skills

- Practical study of one ecosystem
(At least one hypothesis testing practical should be done in this section)

- Investigate the human influences on the environment e.g. introduction of exotic species

- Manage and maintain natural resources</td>
<td>Total 7 weeks</td>
<td>LO2 Constructs and Applies Life Sciences Knowledge</td>
<td rowspan="3">LO3 Life Sciences, Technology, Environment & Society.
Historical developments: IKS, biotechnology, environment, legislation, social behaviour and ethics
o Exploitation vs. sustainability:
- Exploring issues
- Industrialisation and impact of industry and management.

o Management of resources, use and abuse of resources e.g. fossil fuel usage:
- Ecotourism
- Waste management
- Describe the impact of human activities on the existence of food chains and food webs
- Discuss the uses of one or more natural resources in cultural practices e.g. water for baptism; cows for lobola; reeds for craft making; nutrient cycles and energy flow within an environment</td>
</tr>
<tr>
<td>4 weeks</td>
<td>• Define the terms biosphere, biome and ecosystem
• Explain biosphere as hydrosphere, lithosphere and atmosphere
• Describe examples of biomes found in South Africa with reference to:
o climate
• Discuss the biotic components of an ecosystem e.g.:
o plants (e.g. number of plants, adaptations to environment, muti plants, invader plants)
o animals (e.g. number of carnivores, herbivores, invaders/pests)
o decomposers (fungi and bacteria; biodegradable and non-biodegradable substances)
• Discuss the following abiotic components
o temperature
o water
o light
o soil
o physiographic factors
• Discuss the interaction between biotic and abiotic components in an ecosystem selected from one of the biomes in South Africa (e.g. effect of light/water, etc. on the growth of plants and activity of animals)
Conduct an investigation involving one or more of the abiotic components listed above
• Explain what is meant by energy flow.
• List major components of the pathway of energy flow as: producers, consumers (herbivores and carnivores), decomposers. Use the organisms found in the selected ecosystem to explain how the following will be formed
o food chains
o food webs</td>
</tr>
<tr>
<td>3 weeks</td>
<td>Living and non-living resources
• Briefly outline the following nutrient cycles (no inorganic chemistry details are required):
o water cycle
o nitrogen cycle
o carbon cycle
• Discuss the way in which one or more of our natural resources can be used in a more sustainable way e.g. water, soil, wood, plants, animals</td>
</tr>
</table>

	LO 1 Scientific Inquiry & Problem Solving Skills	Total 7 weeks	LO 2 Constructs and Applies Life Sciences Knowledge	LO 3 Life Sciences, Technology, Environment & Society
Knowledge Area: Diversity, Change and Continuity	- Plan and conduct an investigation on plants and animals- comparison - Analyse given data and findings to evaluate growth and behavioural issues among population	**2 weeks**	Biodiversity of plants and animals and their conservation • Define biodiversity and conservation • Outline the biodiversity that exists with regard to: o habitats o modes of nutrition o structural adaptations • State five kingdom classification- (no details required) o Explain the need for classification o Briefly mention different systems of classification of life forms o Using examples, state the general characteristics of each kingdom • With reference to biodiversity of organisms and their conservation, focus on biomes o Define a biome o Review the variety of biomes that exist (from Environmental Studies) o Briefly describe the selected biome and list the challenges that face organisms that live here o Describe the diversity of organisms that exist in a selected biome o Compare, through a practical study, the similarities and differences that organisms show order to survive in water and on land (using at least one example of an aquatic and terrestrial plant and animal) • Highlight the advantages of structural adaptations of organisms to the environment for survival, in contributing to biodiversity.	Historical developments: IKS, biotechnology, environment, legislation, social behaviour and ethics o Adaptation and Survival o Sustainable development o History and nature of science o Extinction of species, red data listing and endangered species o Fossils records, museum, zoo's - Investigate how some communities use living and non-living resources for cultural purposes
		1 week	• Significance and value of biodiversity to ecosystem function and human survival • Energy flow and energy relationships (link to Environmental Studies knowledge area) o Review energy flow through an ecosystem (from environmental studies) o Use data to briefly describe the effect of environmental imbalances (e.g. drought, disease) on food chains, food webs, energy flow and biodiversity o Explain the influence of biodiversity on the number of food chains in an ecosystem o Explain how the number of food chains increases the complexity of the food web in an ecosystem o Explain how the complexity of a food web contributes to ecosystem survival • Adaptations for survival o Define the term adaptation o Explain why it is necessary for organisms to adapt in the environment o Explain how increased survival of the species contributes to biodiversity	

		2 weeks	• Provision of living and non-living resources for humans. o Define natural resources o Name the living and non-living resources in an ecosystem near you o Discuss ways that humans utilise these resources o Explain how humans can use these resources in a sustainable way • Living relationships as being mutualism commensalism, communalism, parasitism, competition, and predator-prey. o Define the above terms providing one example in each case o Using pictures or illustrations analyse and evaluate the different types of symbiotic relationships o In a local ecosystem observe and record examples of various living relationships o Analyse and evaluate given data (graphs, tables) on symbiotic relationships o State the significance of various living relationships to human survival o Explain how the various living relationships contribute to biodiversity • Factors that effect energy flow and energy relationships • Threats to the continued provision of living and non-living resources for humans. • Threats to biodiversity o What is meant by loss of biodiversity o List consequences of a loss in biodiversity o Discuss any two natural factors that may lead to loss of biodiversity such a floods, earthquakes, fires, tsunamis,, volcanic eruptions, cyclones, tornadoes and droughts o Discuss any two human activities that may lead to loss of biodiversity such as habitat destruction, deforestation, silviculture/commercial forestry, poaching and hunting, over fishing, traditional medicine/muti-trade, introduction of alien species, global warming, ozone depletion, commercial agriculture, ranching pollution and dune mining	- Conduct research to find out • species that have become extinct • species that are endangered • factors that lead to species becoming endangered or becoming extinct • strategies to prevent extinction (arbour day, world environment day, etc.) • legislation as a strategy to overcome threats to biodiversity, e.g. legislation controlling fishing, • legislation for protected species, legislation over pollution control
		1 week	Parasitism • Define parasitism • Describe the relationship between parasitism and biodiversity • Describe the life cycle of a parasitic organism (choose one example) • Use a microscope to study the different developmental stages of the selected parasite • For the disease caused by the parasite, describe the: o nature of the disease o symptoms of the disease o treatment and protection against that disease (traditional and modern) • Explain the adaptations shown by the selected parasite for its survival • Collect and analyse data on any community disease caused by the selected or any other parasite	
		1 week	Nutritional disorders • Use one example of a nutritional disorder that arises from resource limitations, e.g. mineral, protein, carbohydrate, vitamin deficiency	

ANNEXURE 3: EXAMPLE OF A GRADE 11 WORK SCHEDULE

This first table provides an overview of the year and suggestions for the coverage of content across the 4 terms follow.

<table>
<tr><th>LEARNING OUTCOMES & ASSESSMENT STANDARDS</th><th>Teaching Strategies</th><th>Resources</th><th>Assessment Strategies</th></tr>
<tr><td>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.

Assessment Standard 1: Identifies phenomena involving one variable to be tested.
Designs simple tests to measure the effects of this variable.
Identifies advantages and limitations of experimental design.
Assessment Standard 2: Systematically and accurately collects data using selected instruments and /or Techniques.
Selects a type of display that communicates the data effectively.
Assessment Standard 3: Compares data and constructs meaning to explain findings.
Draws conclusions and recognises inconsistencies in the data.
Assessses the value of the experimental process and communicates findings.</td><td rowspan="2">Microscopy work, research, excursions, group work, experimental work, case studies, problem solving, interviews, questionnaires, guest talks, career opportunities</td><td rowspan="2">Charts, brochures, videos, microscopes, textbooks, reference books, recycled materials, food labels and containers, computer software, Internet programs, OH transparencies, Life Sciences kits, micrographs</td><td rowspan="2">Rubrics, tests, portfolio work, class work, homework, practical work, projects, data and oral presentations, reports, posters, interviews, peer assessment, self assessment</td></tr>
<tr><td>Learning Outcome 2: Constructs and Applies Life Sciences Knowledge The learner is able to access, interpret, construct and use Life Sciences concepts to explain phenomena relevant to Life Sciences
Assessment Standard 1: Uses various methods and sources to access information
Assessment Standard 2: Identifies, describes and explains concepts, principles, laws, theories and models by illustrating relationships
Evaluates concepts, principles, laws, theories and models.
Assessment Standard 3: Analyses and evaluates the costs and benefits of applied Life Sciences knowledge</td></tr>
<tr><td>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.
Assessment Standard 1: Compares scientific ideas and indigenous knowledge of the past and present
Assessment Standard 2: Compares different ways in which resources are used in the development of biotechnological products and analyses the impact on the environment and society.
Assessment Standard 3: Compares the influence of different beliefs, attitudes and values on scientific knowledge and its application on society.</td><td colspan="3">Time allocation to Knowledge areas:

7 Weeks - Tissues, cells and molecular studies

12 Weeks - Structure and control of processes in basic life systems

7 Weeks - Environmental studies

8 Weeks - Diversity, change, and continuity</td></tr>
</table>

Terms 1-4

<table>
<tr>
<td rowspan="4">Knowledge Area: Tissues, Cells and Molecular Studies</td>
<td rowspan="4">LO 1 Scientific Inquiry & Problem-solving Skills
• Microscopic skills or other comparative methods or resources
• Research in a field of biotechnology e.g. cell structure, tissue growth, chemotherapy
• Investigates (community) diseases: conducts surveys, collects data
• Collects latest research information on disease</td>
<td>Total 7 weeks
2 weeks</td>
<td>LO2 Constructs and Applies Life Sciences Knowledge
Micro-organisms
• Organisms that require a microscope to study structure, characteristics and value
o viruses, bacteria, protests, fungi
• Do one related disease and choose another disease and outline its cause, effects and management, from each of the four groups
o viruses – e.g. HIV and AIDS, rabies,</td>
<td rowspan="4">LO3 Life Sciences, Technology, Environment & Society
Historical developments: IKS, biotechnology, environment, legislation, social behaviour and ethics

o Historical developments
- History of microscopy applicable to discovery of cell

o Ethics and legislation:
- Tissue sampling, tissue culture, cloning, ethics

o IKS and biotechnology:
- Micro-organisms and biotechnology in the food industry e.g. cheese, beer.
- Traditional technology e.g. traditional medicines & healers
- Medical biotechnology e.g. immunity, antibiotics,

o Beliefs attitudes and values concerning diseases.</td>
</tr>
<tr>
<td>1 week</td>
<td>• Bacteria
o tuberculosis
o other e.g. blight, cholera</td>
</tr>
<tr>
<td>2 weeks</td>
<td>• Protests
o malaria
o other e.g. bilharzia
• Fungi
o rusts
o other e.g. thrush</td>
</tr>
<tr>
<td>2 weeks</td>
<td>Immunity
• Immune response against drugs by infecting organisms
• Immune response by organism against infecting agent</td>
</tr>
</table>

Knowledge Area: Structure, Control and Processes in Basic Life Systems	**LO 1 Scientific Inquiry & Problem-solving Skills** • Structure of systems • Investigates through dissections and/or other comparative techniques using models, charts • Experimental investigation • Design a model : e.g. Anatomy of a system. • Microscope work • Conduct research on any of the latest medical practices	**Total 12 weeks** 2 weeks	**LO2 Constructs and Applies Life Sciences Knowledge** • Axial skeleton o Skull: (Names of bones of are not required). Teeth and jaws related to functions. Vertebral column and rib cage: functions only • Appendicular skeleton o Transport Girdles: components of pectoral and pelvic girdles; attachment of girdles to axial skeleton. o Limbs: main components (names of individual carpals and tarsals required). • Joints: Structure of joints. Mention fixed and synovial joints. Study synovial joint as an example. • Skeletal muscles, antagonistic arrangement and attachment to bones; functioning of muscles and skeleton to bring about locomotion • Disorders related to muscles and joints e.g. muscle, hip and knee injuries; joint replacement	**LO3 Life Sciences, Technology, Environment & Society.** Historical developments: IKS, biotechnology, environment, legislation, social behaviour, ethics and beliefs o Food manufacturing & preservation (IKS & industry) o Drug influence o Hormones like insulin o Blood transfusion o Life support systems e.g. dialysis, and organ transplant and ethics o Sperm banks, surrogate motherhood, test tube babies, abortion & ethics o Ultrasound for determining sex of the child, amniocentesis. o Sexuality, child-parental responsibility (parent as protector, provider and potential threat), ethics and beliefs
		2 weeks	Transport • Structure of the heart - atria and ventricles, and the nature of their walls; tricuspid, bicuspid and semi-lunar valves, main blood vessels to and from the heart. • Explain pumping blood by heart - cardiac cycle; systole and diastole; blood pressure • Structure and function of blood vessels -arteries, capillaries and veins • Examples of blood disorders - anaemia, leukaemia, hypertension and hypotension • Transport (and support) in plants • Locate and name tissues and their functions – root, stem and leaf	
		2 weeks	Excretion • The removal of metabolic waste • Name excretory organs and their products – examples being skin, lung and kidneys • Macroscopic structure and function of the urinary system • emphasis on internal structure of kidneys and structure of a nephron and its blood supply	
		2 weeks	Nervous system • Neuron o State main features, functions, location of: sensory neurons (structure and functions of sensory organs – eye, ear, skin, tongue and nose), motor neurons, connector neurons (only location and function) o Movement of impulses along and in-between neurons o Central nervous system: brain- structure and function of cerebrum cerebellum and medulla oblongata, spinal cord- structure and function as pathway for impulses between brain and organs; o Peripheral nervous system as all nerves outside the central nervous system • Mechanism of reflex	

		2 weeks	• Chemical co-ordination (positive and negative feedback) o Hormones – As organic chemical messengers, mostly protein in nature; may have several specific effects on organs and thus control a wide variety of activities; do not operate in isolation but form an integrated system. o Glands –State position and give functions of the following glands: pituitary, adrenal, pancreatic islets, ovary, testes and thyroid glands.	
		2 weeks	• Drug misuse related conditions of the above • Medical conditions e.g. stroke, diabetes, hyperthyroidism	

Knowledge Area: Environmental Studies	**LO 1 Scientific Inquiry & Problem-solving Skills** • Investigate the human influences on the environment e.g. introduction of exotic species • Manage and maintain natural resources • Investigate a local environmental issue, problem solving and decision making e.g. managing rubbish dumps	**Total 7 weeks** 2 weeks	**LO2 Constructs and Applies Life Sciences Knowledge** • Human influences on the environment – air, land and water issues o Define a food pyramid. o Use food pyramids to interpret environmental changes – e.g. impact of deforestation on food production and consumers, impact of use of insecticides and culling on consumers, impact of pollutants and overpopulation on producers and consumers. o Describe the following: global warming, green house effect, acid rain and ozone depletion. Explain their effects on the environment	**LO3 Life Sciences, Technology, Environment & Society.** Historical developments: IKS, biotechnology, environment, legislation, social behaviour and ethics • Exploitation vs. sustainability • Exploring issues: e.g. industrialisation and impact of industry & management. • Land issues: e.g. ownership and use of land, nature and game reserves, agriculture, desertification, forestation / deforestation, urban decay • Exploring the land issue: politically, legally, economically, ethically, environmentally and other influences
		2 weeks	• Sustaining our environment o Management of the cause and effects of pollution, deforestation, land use, industrialisation and extinction.	
		3 weeks	• Air, land and water borne diseases o Discuss one example in each of the following: ▪ Air borne disease e.g. influenza, polio, chicken pox, measles ▪ Land borne disease e.g. round worms, sleeping sickness ▪ Water borne disease e.g. cholera, amoebic dysentery	

<table>
<tr>
<td rowspan="4">Knowledge Area: Diversity, Change and Continuity</td>
<td rowspan="4">LO 1 Scientific Inquiry & Problem Solving Skills
• Plans and conducts an investigation on plants and animals- comparison
• Analyse given data and findings to evaluate growth and behavioural issues among population</td>
<td>Total 8 weeks</td>
<td>LO 2 Constructs and Applies Life Sciences Knowledge</td>
<td rowspan="4">LO 3 Life Sciences, Technology, Environment & Society
Historical developments: IKS, biotechnology, environment, legislation, social behaviour and ethics
• Adaptation & Survival
• Sustainable development
• History and nature of science
• Extinction of species, red data listing and endangered species
• Population changes over time</td>
</tr>
<tr>
<td>3 weeks</td>
<td>• Population studies
o Characteristics of populations and population growth, fluctuations, limiting factors.
o Define population by referring to cells, unicellular and multicellular organisms.
o Define species with reference to shared characteristics and reproductive ability.
o Outline characteristics of populations in terms of habitat, size, density and distribution.
o Provide details on environmental changes – earthquakes, volcanoes, earth slides, tornados, droughts, flood and extreme temperatures that effect biomes, ecosystems and habitats.
o Brief outline of factors influencing population growth – births, migration, resources, death and human developments.
o Fluctuations of populations as influenced by limited resources; population size and growth; cells, unicellular and multicellular organisms.</td>
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<tr>
<td>3 weeks</td>
<td>• Social behaviour
o Describe behavioural effects based on preservation, conservation, sustainability - predation, competition, instinct and socially learnt behaviour.
o Descriptive examples of mating behaviours, social animals based on density dependent and density independent factors.</td>
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<tr>
<td>2 weeks</td>
<td>• Managing populations in terms of :
o Biodiversity of plants and animals and their conservation
o Significance and value of biodiversity to ecosystem function and human survival
o Threats to biodiversity
o Diseases.</td>
</tr>
</table>

ANNEXURE 4: EXAMPLE OF A GRADE 12 WORK SCHEDULE

This first table provides an overview of the year and suggestions for the coverage of content across the 4 terms follow.

<table>
<tr><th>LEARNING OUTCOMES & ASSESSMENT STANDARDS</th><th>Teaching Strategies</th><th>Resources</th><th>Assessment Strategies</th></tr>
<tr><td>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.
Assessment Standard 1: Generates and questions hypotheses based on identified phenomena for situations involving more than one variable
Designs tests and / or surveys to investigate these variables.
Evaluates the experimental design.
Assessment Standard 2: Compares instruments and techniques to improve the accuracy and reliability of data collection
Manipulation of data in the investigation to reveal patterns
Identifies irregular observations and measurements
Allows for irregular observations and measurements when displaying data
Assessment Standard 3: Critically analyses, reflects and evaluates the findings.
Explains patterns in the data in terms of knowledge
Provides conclusions that show awareness of uncertainty in data.
Suggests specific changes that would improve the techniques used</td><td rowspan="2">Microscopy work, research, excursions, group work, experimental work, case studies, problem solving, interviews, questionnaires, guest talks, career opportunities</td><td rowspan="2">Charts, brochures, videos, microscopes, textbooks, reference books, recycled materials, food labels and containers, computer software, internet programs, OH transparencies, Life Sciences kits, micrographs</td><td rowspan="2">Rubrics, tests, portfolio work, class work, homework, practical work, projects, data and oral presentations, reports, posters, interviews, peer assessment, self assessment</td></tr>
<tr><td>Learning Outcome 2: Constructs and Applies Life Sciences Knowledge The learner is able to access, interpret, construct and use Life Sciences concepts to explain phenomena relevant to Life Sciences
Assessment Standard 1: Uses various methods and sources to access relevant information from a variety of contexts.
Assessment Standard 2: Interprets, organises, analyses, compares and evaluates concepts, principles, laws, theories and models and their application in a variety of contexts.
Assessment standard. 3: Evaluates and presents application of Life Science knowledge.</td></tr>
<tr><td>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.
Assessment Standard 1: Critically evaluates scientific ideas and indigenous knowledge of the past and present cultures
Assessment Standard 2: Analyses and evaluates different ways in which resources are used in the development of biotechnological products and makes informed decisions about their use and management in society for a healthy, sustainable environment.
Assessment Standard 3: Critically evaluates and takes a justifiable position on beliefs, attitudes and values that influence developed scientific and technological knowledge and their application in society</td><td colspan="3">Time allocation to Knowledge areas:

9 Weeks - Tissues, cells and molecular studies

6 Weeks - Structure and control of processes in basic life systems

8 Weeks - Environmental studies

7 Weeks - Diversity, change and continuity</td></tr>
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Terms 1-4

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<tr>
<td rowspan="4">Tissues, Cells and Molecular Studies</td>
<td rowspan="4">LO 1 Scientific Inquiry & Problem-solving Skills
• Microscopic skills or other comparative methods or resources
• Research in a field of biotechnology e.g. cell structure, tissue growth, chemotherapy
• Investigates (community) diseases: conducts surveys, collects data
• Collects latest research information on disease</td>
<td>Total 9 weeks
3 weeks</td>
<td>LO2 Constructs and Applies Life Sciences Knowledge
• DNA, protein synthesis
o State location of DNA
o Name 4 nitrogenous bases of DNA: adenine (A), thiamine (T), cytosine (C), guanine (G)
o Name 4 nitrogenous bases of RNA: adenine (A), uracil (U), cytosine (C), guanine (G)
o Briefly describe transcription of RNA from DNA
o Briefly describe translation of RNA into protein
o Reference to specialised RNA not required</td>
<td rowspan="4">LO3 Life Sciences, Technology, Environment & Society
Historical developments: IKS, biotechnology, environment, legislation, social behaviour and ethics

o Historical developments
- History of microscopy applicable to discovery of cell

o Ethics and legislation:
- Tissue sampling, tissue culture, cloning, ethics

o IKS and biotechnology:
- Micro-organisms and biotechnology in the food industry e.g. cheese, beer.
- Traditional technology e.g. traditional medicines & healers

o Genetic engineering and its use in medicine, agriculture e.g. genetically modified crops
- Cloning
- DNA, fingerprinting and forensics.

o Beliefs, attitudes and values
- concerning diseases.
- Genetic counselling</td>
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<td>2 weeks</td>
<td>• Chromosomes, meiosis, production of sex cells
o Location of chromosomes
o Chromosomes as key to cell division
o Haploid and diploid number of chromosomes
o Define the process of meiosis
o State where meiosis takes place in plants and in animals
o Using diagrams identify and state what happens in each of the phases of meiosis
o Explain the importance of meiosis in the reduction of chromosome number and as a mechanism to introduce genetic variation</td>
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<td>2 weeks</td>
<td>• Explain inheritance and genetic diseases by using the following terms:
o Genes, gametes, alleles, hybrid, heterozygous, homozygous, phenotype, genotype, recessive, dominant, filial generations, mutations, segregation (with reference to meiosis)</td>
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<td>2 weeks</td>
<td>• Diseases/ disorders e.g. Down’s syndrome, Hutchinson-Gilford progeria syndrome (accelerated ageing), albinism, haemophilia, sickle-cell anaemia, etc.</td>
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<td rowspan="3">Structure, Control and Processes in Basic Life Systems</td>
<td rowspan="3">LO 1 Scientific Inquiry & Problem-solving Skills
• Structure of systems
• Investigate kidneys, hearts, eyes through dissections and/or other comparative techniques using models, charts
• Experimental investigation e.g. photosynthesis
• Design a model: e.g. Anatomy of a system such as the digestive system.
• Microscope work e.g. alveoli or stomata
• Conduct research on any of the latest medical practices</td>
<td>Total 6 weeks
2 weeks</td>
<td>LO2 Constructs and Applies Life Sciences Knowledge
Reproduction
• Human Reproductive organs
o Identify and state the function of each of the following parts of the male reproductive system: testes, germinal epithelium, penis, scrotum, epididymis, sperm duct, prostate, seminiferous tubules
o Identify and state the function of each of the following parts of the female reproductive system: ovaries (including follicles and corpus luteum), Fallopian tubes, uterus, vagina</td>
<td rowspan="3">LO3 Life Sciences, Technology, Environment & Society.
Historical developments: IKS, biotechnology, environment, legislation, social behaviour, ethics and beliefs
o Food manufacturing & preservation (IKS & industry)
o Drug influence
o Hormones like insulin
o Blood transfusion
o Life support systems e.g. dialysis, and organ transplant and ethics
o Sperm banks, surrogate motherhood, test tube babies, abortion and ethics
o ultrasound for determining sex of the child, amniocentesis.
o Sexuality, child-parental responsibility (parent as protector, provider and potential threat), ethics and beliefs</td>
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<tr>
<td>2 weeks</td>
<td>• Formation of male and female sex cells
o State that germinal epithelium of the testes and ovaries produce sperms and egg cells respectively. Testes and ovaries produce sex cells through meiosis.
o State the role played by testosterone
• State the role played by the following hormones: oestrogen, progesterone.
o The menstrual cycle
o The corpus luteum remains if fertilisation occurs and disintegrates if not; that the egg cell is released from the follicle into the fallopian tube.
• Fertilisation, embryo development and implantation.</td>
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<td>2 weeks</td>
<td>• Gestation
o Placenta, umbilical cord, amnion, amniotic fluid
o Birth, pre- and post-natal care
o Antenatal care
o The natural birth process
o The care of offspring following birth including being fed with milk from the mammary glands
• Control of human fertility – birth control, in vitro fertilisation
• Reproduction in plants
o Asexual and sexual. Focus on manufacture of food products
• Related diseases/ disorders e.g. Foetal alcohol syndrome, HIV and AIDS, gonorrhoea, herpes, syphilis, genital warts, breast, cervical and prostrate cancers.</td>
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Environmental Studies	**LO 1 Scientific Inquiry & Problem-solving Skills** • Investigate the human influences on the environment e.g. introduction of exotic species • Manage and maintain natural resources • Investigate a local environmental issue, problem solving and decision making e.g. managing rubbish dumps	**Total 8 weeks** 4 weeks	**LO2 Constructs and Applies Life Sciences Knowledge** • Local environmental issues o Outline issues using local environment and community practices that take into account biotic and abiotic components, cause and effect processes, and suggest corrective management actions o e.g. exploitation of local indigenous resources like devils claw, rooibos, fynbos, perlemoen, African potato; HIV/AIDS;	**LO3 Life Sciences, Technology, Environment & Society.** Historical developments: IKS, biotechnology, environment, legislation, social behaviour and ethics • Exploitation vs. sustainability • Exploring issues: industrialisation and impact of industry & management. • Land issues: e.g. ownership and use of land, nature and game reserves, agriculture, desertification, forestation/ deforestation, urban decay • Exploring the land issue: politically, legally, economically, ethically, environmentally and other influences
		4 week	• Effect of pollutants on human physiology and health e.g. allergies o Outline issue using local environment and community practices, that take into account biotic and abiotic corrective actions and support o e.g. effect of oil refinery waste on local communities; smoke from burning coal on local communities	

Diversity, Change and Continuity	**LO 1 Scientific Inquiry & Problem Solving Skills** • Plans and conducts an investigation on plants and animals- comparison • Analyses given data and findings to evaluate growth and behavioural issues among population	**Total 7 weeks** **3 weeks**	**LO 2 Constructs and Applies Life Sciences Knowledge** • Biological evidence of evolution of populations and fundamental aspects of fossil studies o Fossils as evidence of ancient life o Define fossilisation o Interpretation of the fossil record by means of morphological divergence- homologous, analogous structure • Origin of Species - Evolution theories, mutation, natural selection, macro evolution and speciation o Outline the Darwin theory 'Origin of species by means of natural selection' and Lamarck theory, o Define biological evolution o Describe mutations at a cellular and molecular level as lethal, neutral or fixed mutations. o Genotypic and phenotypic variations in populations by examples e.g. finches of Galapagos, cheetah or White lion. o Choose two examples (one human and one non-human) to illustrate the practice of inbreeding and out breeding in populations e.g. plants, animals and humans. o Describe formation of species at an ecological, reproductive and genetic level. o Study macro evolution as patterns, trends and rates of change among lineages over geologic times by means of fossil.	**LO 3 Life Sciences, Technology, Environment & Society** Historical developments: IKS, biotechnology, environment, legislation, social behaviour and ethics • Adaptation and survival • Sustainable development • History and nature of science • Belief about creation and evolution • Changes of knowledge through contested nature and diverse perception of evolution
		2 weeks	• Popular theories of mass extinction o Continental drift , Ice age, volcano activity, heating and cooling of the atmosphere and disease. o Extraterrestrial theories (explosion of a star, meteor collision, comets)	
		2 weeks	• Cradle of mankind - South Africa? o The difference between anthropology, palaeontology and archaeology o The possible origin of humankind on planet earth. o Illustrate a few causes for population movements.	