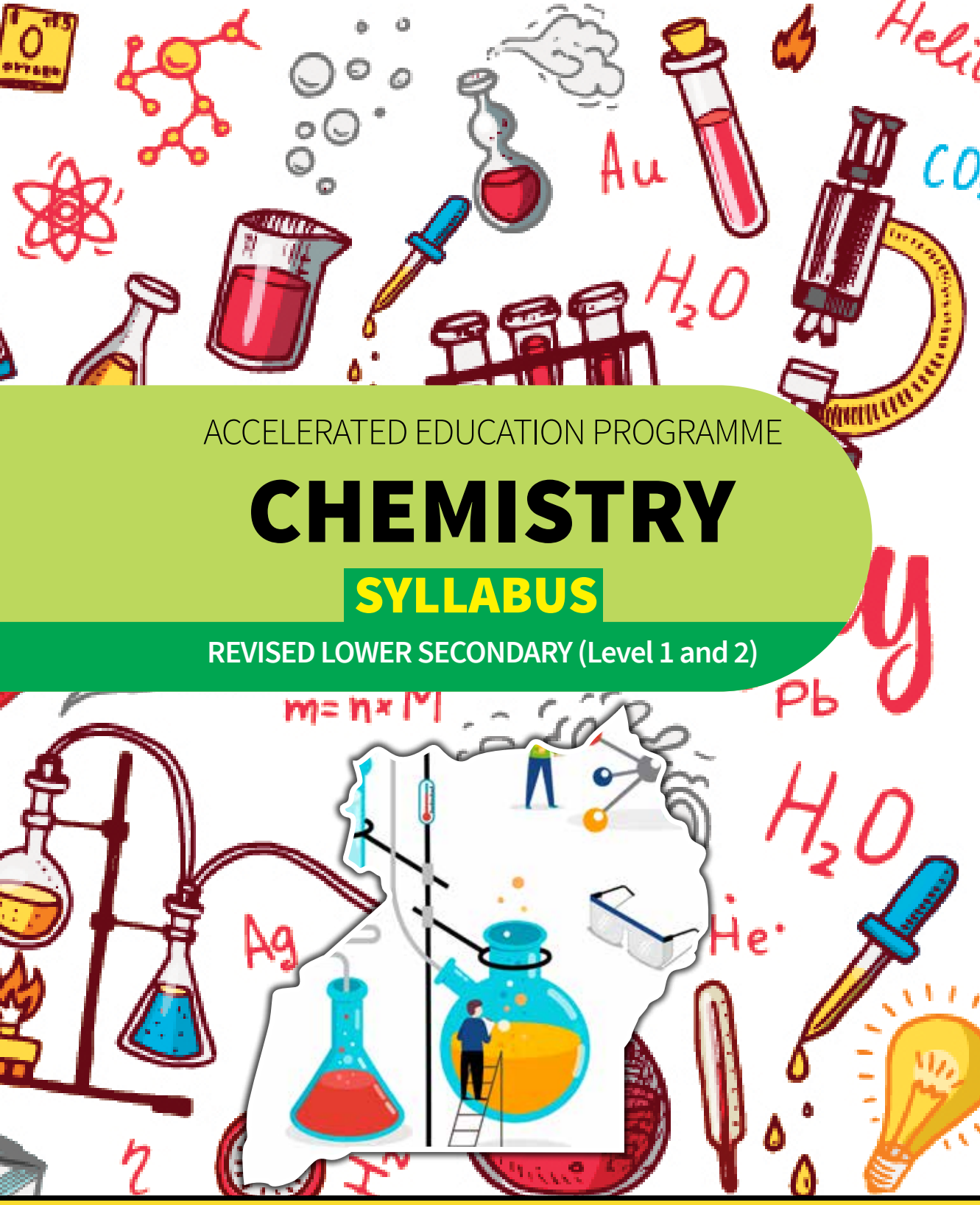
ACCELERATED EDUCATION PROGRAMME

CHEMISTRY

SYLLABUS

REVISED LOWER SECONDARY (Level 1 and 2)



REPUBLIC OF UGANDA
MINISTRY OF EDUCATION AND SPORTS

NCDC
NATIONAL CURRICULUM DEVELOPMENT CENTRE

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THE REPUBLIC OF UGANDA

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NCDC
NATIONAL CURRICULUM DEVELOPMENT CENTRE

A product of the National Curriculum Development Centre for the Ministry of Education and Sports with support from the Government of Uganda

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Content

Foreword

Education is a fundamental tool for the protection of conflict- and disaster-affected children and youth from harm and exploitation. This is a crucial part of UNESCO's advocacy messages. Under appropriate conditions of security, the provision of education can help protect children and youth from recruitment into fighting forces, forced labour, prostitution, drug abuse and other criminal activities. In post-conflict settings, education contributes to the reintegration into society of former soldiers and other children and youth associated with fighting forces.

Uganda's Education Act of 2008, in Part IX, Miscellaneous Provisions 49, clearly states that "there shall be non-formal education centres" for purposes of providing non-formal education.
Examples of non-formal education programmes include Accelerated Education Programmes (AEPs) for the conflict areas at both primary and secondary levels, Alternative Basic Education for Karamoja (ABEK), Basic Education for Urban Poverty Areas (BEUPA), Complementary Opportunity for Primary Education (COPE) and Child-Centred Alternative Non-Formal Community Based Education (CHANCE), among others.

The National Curriculum Development Centre (NCDC), in collaboration with War Child Canada, embraced the Accelerated Education Programme (AEP) and has condensed the lower secondary curriculum to come up with the Lower Secondary Accelerated Education Programme appropriate to learners in refugee camps and the host communities of secondary school age (ages 16–45+).

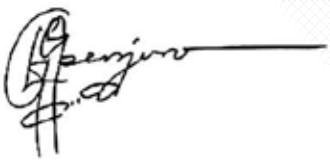
The AEP at lower secondary school level focuses on completing learning in a shorter period of time, i.e., two years. The AEP is complementary both in providing an alternative route and in matching its curriculum to the 'official' curriculum, thus allowing learners to return to formal schooling at an opportune stage.

The programme intends to promote access to education in an accelerated timeframe for disadvantaged groups, out-of-school and over-age children, and youth who missed out or had their education interrupted owing to poverty, violence, conflict or any calamity.

The goal of this programme is to provide learners with competencies equivalent to those in the formal system in an accelerated time frame, with learners either transitioning back into the mainstream education or exiting with some of the competencies required for work.

It is my hope that AEP will register considerable success in meeting the educational needs of these underserved populations not only in terms of access and equity, but also in helping them return to school and complete the education cycle, and especially in getting measurable learning outcomes.

I recommend the AEP and trust that the materials will be valuable in your endeavour to meet the educational needs of the refugee learners and other beneficiaries from the host communities.



Prof. George Openjuru
CHAIRPERSON
NCDC Governing Council

Acknowledgement

National Curriculum Development Centre (NCDC) would like to express gratitude to all those who, in one way or another contributed and worked tirelessly towards the development of this Accelerated Education Programme (AEP) syllabus. Special thanks go to War Child Canada – Uganda for the financial support, their guidance in overseeing and taking timely decisions whenever necessary during the development and production of this AEP Chemistry syllabus.

We also express our gratitude to NCDC Chemistry subject specialist and panel members for their professional guidance and technical assistance. Their efforts are invaluable towards having this curriculum and for improved quality of AEP in Uganda.

NCDC takes responsibility for any shortcomings that may be identified in this syllabus and welcomes suggestions for addressing the inadequacies. Such comments and suggestions may be communicated to NCDC through; P.O. Box 7002, Kampala, E-mail Address: admin@ncdc.go.ug or NCDC website: www.ncdc.go.ug

Dr. Grace K. Baguma
Director
National Curriculum Development Centre

Introduction

The UNESCO Education Strategy (2014 – 2021) advocates for a humanistic and holistic vision of education as a fundamental human right that is essential to personal and socio-economic development. UNESCO further recommends societies that are just, inclusive, peaceful and sustainable by 2030. Vision 2040 of Uganda aims to transform Uganda into a modern and prosperous country, while the National Development Plan III (NDPIII) recognises the existing weaknesses in education, including the low efficiency and variable quality at the Secondary level. Furthermore, NDPIII focuses on enhancement of human capital, development, strengthening mechanisms for quality, effective and efficient service delivery as well as improvement of quality and relevance of skills development.

The Sustainable Development Goal 4 advocates for inclusive and quality education. The NRM Manifesto (2016-2021), emphasises continuous assessment examination systems, strengthening soft skills, which promote self-esteem, conscientiousness and a generally positive attitude to work, promoting e-learning and computer literacy in order to enhance learning outcomes.

The above aspects are lacking and where they exist, it is at a minimum level in implementation of the curriculum.

In alignment with the above policies, the Education and Sports Sector Strategic Plan (2017/20) advocates for delivery of equitable, relevant and quality education for all. The current Secondary school curriculum for Uganda, although highly regarded, has focused on the needs of a small academically oriented elite leaving out the needs of the majority of learners. The Ministry of Education and Sports (MoES) through the National Curriculum Development Centre (NCDC) therefore, undertook a review of the Lower Secondary Curriculum, aimed at providing a learning environment, opportunities, interactions, tasks and instructions that foster deep learning by putting the learner at the centre of the learning experience. This is in line with the following aims of secondary education in Uganda:

The aims of Secondary education in Uganda are to:

- Instil and promote national unity, an understanding of the social and civic responsibilities, strong love and care for others and respect for public property, as well as an appreciation of international relations and beneficial international co-operation;
- Promote an appreciation and understanding of the cultural heritage of Uganda including its languages;
- Impart and promote a sense of self discipline, ethical and spiritual values, personal and collective responsibility and initiative;
- Enable individuals to acquire and develop knowledge and an understanding of emerging needs of society and the economy;
- Provide up-date and comprehensive knowledge in theoretical and practical aspects of innovative production, modern management methods in the field of commerce and industry and their application in the context of socio-economic development of Uganda;
- Enable individuals to develop basic scientific, technological, technical, agricultural and commercial skills required for self-employment;
- Enable individuals to develop personal skills of problem solving, information gathering and interpretation, independent reading and writing, self-improvement through learning and development of social, physical and leadership skills such as are obtained through games, sports, societies and clubs;
- Lay the foundation for further education;
- Enable the individual to apply acquired skills in solving problems of community, and to develop a strong sense of constructive and beneficial belonging to that community;
- Instil positive attitudes towards productive work and strong respect for the dignity of labour and those who engage in productive labour activities;
- Develop a positive attitude towards learning as a lifelong process.

Background to Accelerated Education Project (AEP) Curriculum

Worldwide, substantial alternative schooling programmes are developed to meet basic education needs of under-reached children. Of recent, it has been increasingly recognised that the goals of 'Education for All' cannot be achieved unless more attention is paid to educating out-of-school children (UNESCO, Global Monitoring Report, 2008). Indeed, the UNESCO, Global Monitoring Report, 2010 "Reaching Marginalized" focused on this issue. In a bid to help developing countries achieve the Millennium Development Goals, there should be initiatives to incorporate elements of accelerated learning to achieve SDG4. The Accelerated Education Programme (AEP) in Uganda is a curriculum option which combines the stronger features found in the mainstream approaches, so as to raise the success rates for refugee community learners. The AEP secondary school tier is a bigger stride to address the education gap within refugee communities not only in Uganda, but also in other neighbouring countries. Benchmarking with the Primary AEP programmes, the Secondary Department intends to infer the entire process of education and its cognitive, emotional and social components.

The AEP at secondary school level focuses on completing learning in two years, a period shorter than the normal secondary school programme. The AEP is complementary both in providing an alternative route and in matching its curriculum to the "official" curriculum, thus allowing learners to return to formal schooling at some stage. The programme intends to promote access to education in an accelerated time frame for disadvantaged groups, out of school and over-age children, and youths who missed out or had their education interrupted due to poverty, violence, conflict and crisis. The goal of this programme is to provide learners with competencies equivalent to those in the normal system in an accelerated time frame, to enable learners either transit back into the mainstream education or exit with some competencies required for work. Ideally, teaching the AEP calls for a methodology that is interactive and learner-centred, incorporating other aspects of multiple-intelligence learning.

Since the teaching and learning process is accelerated, and the curriculum content is compressed and condensed, the four 'P' elements, namely processes, psychological, physiological and physical are at the core of the accelerated learning cycle. These core elements provide the ideal space in which the learner can learn more effectively.

Alternative areas of study such as life skills, peace education, environment, HIV and AIDS which are relevant to the target learners have been purposively included in this programme. Learners of AEP need alternative knowledge and life skills to support their survival in their challenging environment and life.

It is equally important to note that this conception of accelerated learning requires extremely well-resourced classroom and exceptionally well-trained teachers. The expanded learning time from the norm is because the teaching methodology is interactive and learner-centred.

It is our hope that AEP will register considerable success in meeting the educational needs of these underserved populations, not only in terms of access and equity, but most importantly in supporting them to be able to return to school and complete their education, having received measurable learning outcomes.

To meet these requirements, the AEP reviews since this programme is the first at this level then it cannot be referred to as a review are based on:

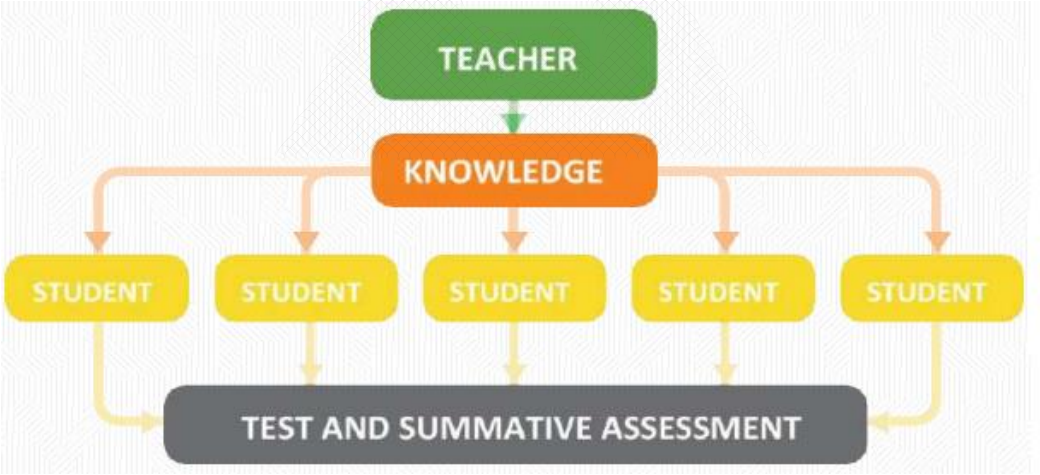
- The development of a holistic education for personal and national development based on clear shared values.
- A commitment to higher standards, deeper understanding and greater opportunities for learners to succeed.
- A focus on the key skills that are essential to work, to learning, and to life, and which will promote life-long learning.
- An integrated and inclusive approach that will develop the ability to apply learning in practical situations.

Key Changes

The key change in the revised Lower Secondary Curriculum which has been used to develop the AEP, is a move from a knowledge-based curriculum to a competency- and skill-based curriculum. It is no longer sufficient to accumulate large amounts of knowledge. Young people need to develop the ability to apply their learning with confidence in a range of situations. They need to be able to use knowledge creatively. A level of competency is the ability to use knowledge rather than just to acquire it. This requires an active, learner-centred rather than passive, teacher-centred approach.

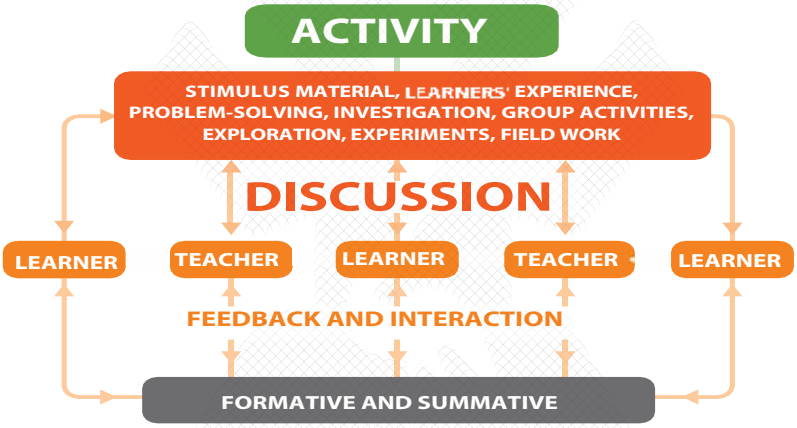
This approach to teaching and learning is in line with the Sustainable Development Goals (SDG's) also known as the Global Goals. These are a universal call to action to end poverty, protect the planet and ensure that all people enjoy peace and prosperity. The key changes in the curriculum will ensure that Uganda is making good progress towards SDG 4 in particular which aims to ensure inclusive and equitable quality education and promote lifelong learning opportunities for all. The changes in education at the secondary level, can be summarised in the following diagrams which show the old and the revised curriculum designs.

THE KNOWLEDGE-BASED CURRICULUM



Knowledge-based teaching was based on transferring knowledge from the teacher to the learner. The teacher had knowledge and transferred this knowledge to the students by lecturing, talking, asking them to read the text book or writing notes on the board for the students to copy and learn. Students acquired the knowledge, often without fully understanding it, and were tested at the end of a unit, term or school course to see if they had remembered it. The curriculum was based mainly on the knowledge in the subjects traditionally taught at university, and little attempt was made to make the curriculum relevant to young people's own lives. The whole education system was seen by many people as a preparation for university, but the vast majority of learners never reach university. The new curriculum will cater for this majority as well as those who later go on to university.

THE NEW COMPETENCE-BASED CURRICULUM



Learning Outcomes can only be achieved through active engagement in the learning process rather than simply absorbing knowledge given by the teacher.

The teacher needs to build on the learners' own knowledge and experience and create Learning Activities through which learners can explore the meaning of what is being learned and understand how it is applied in practical situations. Teaching and learning become a two-way process of dialogue between the Teacher and Learners. Learners also learn from each other through discussion. Assessment also becomes a two-way process of formative assessment; not just to give grades but to find out problems the learners may be having and help to solve them.

Key Learning Outcomes

The revised AEP curriculum sets out 'Key Learning Outcomes' that sum up the expectations of the curriculum as a whole, and set out clearly the qualities that young people will develop.

By the end of the educational process, young people will become:

Self-assured individuals who:

- Demonstrate self- motivation, self-management and self-esteem
- Know their own preferences, strengths and limitations
- Adjust their behaviour and language appropriately to different social situations
- Relate well to a range of personality types

Responsible and patriotic citizens who:

- Cherish the values promoted in the curriculum
- Promote the development of indigenous cultures and languages and appreciate diversity, equity and inclusiveness
- Apply environmental and health awareness when making decisions for themselves and their community
- Are positive in their own identity as individuals and global citizens
- Are motivated to contribute to the wellbeing of themselves, their community and the nation

Lifelong learners who:

- Can plan, reflect and direct their own learning
- Actively seek lifelong learning opportunities for personal and professional development

Positive contributors to society who:

- Have acquired and can apply the Generic Skills
- Demonstrate knowledge and understanding of the emerging needs of society and the economy
- Understand how to design, make and critically evaluate products and processes to address needs
- Appreciate the physical, biological and technological world and make informed decisions about sustainable development and its impact on people and the environment.

Values

The new curriculum is based on a clear set of values. These values underpin the whole curriculum and the work of schools. They are also the values on which learners need to base their lives as citizens of Uganda.

- Peace and harmony
- Integrity and honesty
- Patriotism
- Positive attitude towards work
- Self-Control

These values are not taught directly in lessons, nor will they be assessed, but they will inform and shape all teaching and learning.

Generic Skills

The generic skills also known by several other names, including key skills, core skills, essential skills, key competencies, necessary skills, transferable skills and employability skills are versatile skills that have wide applicability across various jobs, education, and life situations, contributing to personal and professional success and societal well-being.

Changes in the modern workplace brought about by technology, management innovations, and increased competition in the global marketplace, have led to many concerns about the adequacy of workforce skills. In response to calls to reform education to better prepare young people for the future workforce, changes to the curriculum have emphasised the teaching of general skills (e.g. problem solving, creativity, critical thinking, communication, collaboration).

For this reason, generic skills lie at the heart of every subject. Apart from enabling learners to access and deepen learning across the curriculum, generic skills allow young people to develop into lifelong learners who can adapt to change and cope with the challenges of life in the 21st Century.

Young people need to be able to think critically and solve problems at school, work and home. They need to be creative and innovative in their approach to learning and life. They must be able to communicate well in all forms, co-operate with others and also work independently. They must also be able to use functional mathematics and ICT effectively.

01 Critical thinking and problem-solving skills

a) Plan and carry out investigations
b) Sort and analyse information
c) Identify problems and ways forward
d) Predict outcomes and make reasonable decisions
e) Evaluate different solutions

02 Creativity and innovation

a) Use the imagination to explore possibilities
b) Work with others to generate ideas
c) Suggest and develop new solutions
d) Try out innovative alternatives
e) Look for patterns and make generalisations

03 Co-operation and self-directed learning

a) Work effectively in diverse teams
b) Interact effectively with others
c) Take responsibility for own learning
d) Work independently with persistence
e) Manage goals and time

04 Communication

a) Listen attentively and with comprehension
b) Talk confidently and explain opinions/ideas clearly
c) Read accurately and fluently
d) Write and present ideas coherently
e) Use a range of media to communicate ideas

05 Mathematical computation and ICT proficiency

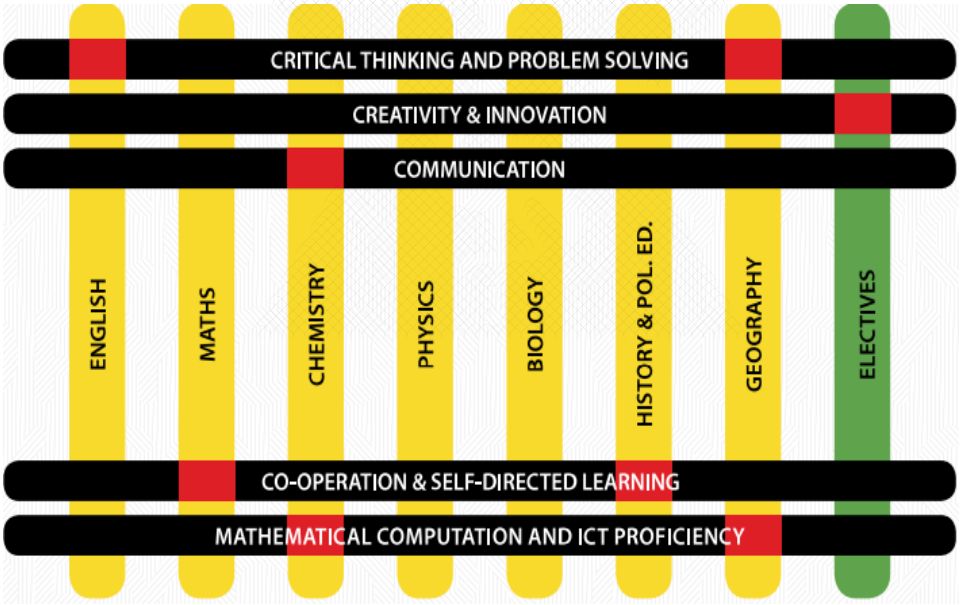
a) Use numbers and measurements accurately
b) Interpret and interrogate mathematical data
c) Use mathematics to justify and support decisions
d) Use technology to create, manipulate and process information
e) Use technology to collaborate, communicate and refine one's work

Generic Skills and the Revised AEP Chemistry

These skills are not separate subjects in themselves; they are developed within Chemistry and help learning within the subject. It is when the generic skills are deployed that learning is most effective.

Generic skills are a key part of the Chemistry syllabus. They have been built into the syllabus to provide the context for the skills development. Chemistry provides a rich context for learners to communicate, co-operate and think critically about how the world works and to understand the world from a scientific point of view. Skills progression is provided for by the increasing complexity of the subject matter within Chemistry.

For example, within the critical thinking skill, learners begin thinking critically about the relatively simple subject matter in level 1 and then progress to thinking about the much more complex matters in level 2. Thus, the progression lies in the increasing complexity of the matters being thought about.



Cross-cutting Challenges

There are some issues that young people need to learn about, but which are not confined to one Subject. These are the 'Cross-cutting Challenges' and they need to be studied across the Subjects. These issues develop learners' understanding of the connections between the Subjects, and so of the complexities of life.

The Cross-cutting Challenges identified in the curriculum are:

- Environmental awareness
- Health awareness
- Diversity and inclusion
- Socio-economic challenges
- Citizenship

These have been built into the syllabuses of each Subject. The way in which they operate within the Subject is very similar to the generic skills. Chemistry provides a very good context for considering environmental and health awareness, and to understand the complex and diverse world in which we live.

Chemistry within the AEP Curriculum

Chemistry is a compulsory subject from Level 1 to Level 2.

Rationale

The application of scientific principles and the conduct of relevant research are of significant importance in identifying, assessing and realising the potential of the resources of Uganda. A good foundation in the sciences will help the refugee learners and host community learners to respond to the challenges of a rapidly changing world using the scientific approach.

Chemistry is concerned with the physical and chemical properties of substances and the interaction of energy and matter. The study of Chemistry involves an investigation into chemical reactions and processes. The discipline seeks to explain and predict events at the atomic and molecular level. Through the principles of Chemistry, learners will understand everyday life, nature and technology, and the significance of the well-being of man and the environment.

The national Chemistry Syllabus which has been used as benchmark to develop the AEP chemistry syllabus, has been redesigned to allow learners to work individually and with others in practical, field and interactive activities that are related to theoretical concepts in the course. It is expected that learners will apply investigative and problem-solving skills, effectively communicate scientific information and appreciate the contribution that a study of chemistry makes to their understanding of the world.

The syllabus places greater emphasis on the understanding and application of chemical concepts and principles and different learning styles and needs, so that learners will develop skills that will be of long- term value in an increasingly technological world, rather than focusing on large quantities of factual information. In addition, it encourages the use of various teaching and learning strategies while at the same time catering to multiple intelligences. It contributes to the development of the ideal refugee learners and host Ugandan learners as articulated by the Education White Paper of 1992 in the following areas: respect for human life, awareness of the importance of living in harmony with the environment; demonstrates multiple literacies, independent and critical thinking and the innovative application of science and technology to problem solving. In keeping with the UNESCO Pillars of Learning, on completion of this course of study, learners will learn to do, learn to be and learn to transform themselves and society.

ICT Integration

ICT has been integrated as a learning and teaching tool across all subjects. ICT teachers should endeavour to assist other subject teachers in making ICT integration process a reality. In other subject syllabi, ICT integration guidelines have been included. The ICT integration draft framework is summarised below.

Category of a Task in the Syllabus	ICT Application (How ICT Will be Integrated for the Task Category)
Fieldwork	Use of cameras to take photos and record videos
Presentations in class	Use presentation application
Keywords and meanings	Use online dictionary or search online
Drawings/graphics	Use Publishing software, Word processor
Role-play, narrations	Use audio and video recordings
Present findings in graphic and written formats	Use Desktop Publishing software or Word processor
Showing data charts	Use Spreadsheet software
Group discussions	Mind-mapping software
Search for extra reading materials	Download files from the Internet or by sharing

ICT APPLICATION IN THE NEW CURRICULUM

Under ICT integration, ICT shall be embedded as a learning/teaching tool across all subjects. ICT teachers should endeavour to assist other subject teachers in making the ICT integration process a reality.

In other subject syllabi, ICT integration guidelines have been included. ICT integration draft framework is summarised as follows:

Category of a task in the syllabus	**ICT application (How ICT will be integrated for the task category)**
Fieldwork	Use of cameras to take photos and record videos
Presentation in class	Use projectors, relevant videos and Audio recordings
Drawing /graphics	Use publishing software, word processor
Role play narrations	Use audio and video recordings
Demonstrations	Use audio and video recordings and simulations
Locating and putting marks on an area	Use digital /online mapping
Present findings in graphic and written format	Use desktop publishing software or word processor
Showing data charts	Use spreadsheet software
Group discussions	Mind-mapping software
Search for extra reading materials	Download files on the internet or by sharing
Writing equations and formulas	Use equation editors
Carrying out academic research	Using the internet and other academic applications like; “Encarta”, “Britannica”, etc.
Sharing or learning with people across the world.	Forming learning networks, formation of blogs, social media, emails, etc.

INTEGRATION OF SPECIAL NEEDS EDUCATION (SNE)

In education system, learners of different abilities study together in the same class and in some developed countries, they are taught separately. In whatever case, the following methods are important when handling the SNE learners.

Category of impairments	SNE Teaching Methods
Blind learners: Learners who cannot see totally	• Through touching • Use of brails • Recorded / audio materials
Low vision learners: Learners who cannot see properly	• Use of large print materials • Use of bold teaching materials • Right placement of learners
Deaf learners: Learners who do not hear at all	• Use sign language • Total communication • Use of illustrations
Hard of hearing learners: Learners who fairly hear	• Total communication • Speak loudly • Right placement of learners • Use of illustrations • Being more practical
Dyslexic learners: Learners with reading difficulties	• Use less written content • Talk more than writing • Breaking tasks into simple steps • Repetition in teaching • Use of audio recordings
Time takers	• Give extra time • Use remedial classes
Hyper learners: Learners with attention deficit	• Use of timely breaks in teaching.
Gifted learners:	• Involve them in extra work • Use of suitable challenging tasks
Physically handicapped	• Use of head pointers • Training to use available limbs • Creating special sitting arrangements in class

The Aims of the AEP Chemistry Syllabus

This AEP Chemistry Syllabus is aimed at providing the teacher with guidance to teach Biology to learners who will not go through the normal four years of Ordinary level classes. It is meant to cover the most critical aspects of Chemistry without affecting its standards. It will adequately prepare learners for Uganda Certificate of Education (UCE). However, the creativity of the classroom teacher is important in this case.

This syllabus aims to:

- appreciate and understand natural phenomena and the ways in which materials behave;
- be aware of the power, impact and influence which Chemistry has in a modern scientific world and to emphasise that there is a responsibility that Chemistry be used for the good of the society and for the preservation of the environment;
- appreciate, understand and use methods of science;
- see the relevance of Chemistry to everyday life;
- appreciate and understand the role of Chemistry in enabling materials to be used in the service of mankind, in Uganda and elsewhere;
- understand basic chemical concepts in sufficient depth to provide an adequate foundation for specialisation;
- develop the spirit of inquiry and to continue the search for new ways in which materials may be used in the service of mankind;
- appreciate the inter-relationships between Chemistry, Biology, Physics, Mathematics and other subjects;
- make use of chemical data, concepts, principles and terminology in communicating chemical information;
- develop the ability to work independently and collaboratively with others when necessary;
- appreciate the significance and limitations of science in relation to social and economic development;
- integrate Information and Communication Technology (ICT) tools and skills into the teaching and learning of chemical concepts.

TEACHING AND LEARNING

The focus in Chemistry is on the development of understanding through scientific enquiry and rational thought.

The revised AEP Chemistry syllabus provides learners with a wide range of contexts in which to develop this understanding, and these contexts are designed to engage the interest of the learner and to provide opportunities to build life-related knowledge, experience and skills.
Teachers are encouraged to go beyond the textbooks and provide as many meaningful contexts as possible. The generic skills have been integrated throughout the AEP Chemistry syllabus and can only be acquired through active approaches.

The role of the teacher is to build on learners' existing knowledge and experience, but to extend that by posing problems to the learners. This makes them think about their own ideas and experiences as well as adding new knowledge and skills to it.

Learners need to interact with real situations inside and outside the classroom. They need to look at pictures or diagrams, examine statistics, or read texts from a range of sources. They need to find out knowledge and ideas for themselves. They should then be expected to express these in their own words, not those of the teacher, and so demonstrate that they have understood what they have learnt.

In this learner-centered approach, learners are encouraged to:

- Be responsible for their own learning
- Think for themselves and form their own ideas and opinions
- Become critical thinkers, ready to face new challenges and situations for themselves.

Programme Planner

Level 1	Topic	Duration (HOURS)
Term 1	Topic 1: **Chemistry and Society**	3
	Topic 2: Experimental chemistry	4
	Topic 3: States and changes of states of Matter	7
	Topic 4: Temporary and permanent changes	7
	Topic 5: Mixtures, elements and compounds	9
Term 2	Topic 6: Air water and the environment	9
	Topic 7: Rocks and minerals	5
	Topic 8: Acids, alkalis and salts	9
	Topic 9: Atomic Structure, the Periodic Table and its trends	15
Term 3	Topic 10: Carbon in Life	15
	Topic 11: Carbon in Environment	8

Level 2	Topic	Duration (HOURS)
Term 1	Topic 12: Chemical bonding and structure	9
	Topic 13: The Mole	13
Term 2	Topic 14: Chemical reaction rates	5
	Topic 15: Oxidation, Reduction, Reactivity series and Electrochemistry	16
Term 3	Topic 16: Energy Changes During Chemical Reactions	5
	Topic 17: Chemicals for Consumers	7
	Topic 18: Nuclear Processes	4

LEVEL ONE

TERM 1

TOPIC 1: Chemistry and Society

03 Hours

Competency: the learner is able to assess the application of Chemistry in everyday life and its contribution to the economy.

Learning Outcomes	Suggested Learning Activities	Sample assessment strategies
a) Know appropriate activities to explain what chemistry is (k, u). b) Understand why chemistry is studied and how it overlaps with other subjects such as biology, physics, mathematics and geology (k, u).	• In groups, learners discuss what they already know about chemistry and common chemicals in pharmaceutics and cosmetics, plastics, food and beverages, soaps and detergents, water treatment and indigenous chemistry in local environments. They produce a mind map to show their conclusions. • In groups learners brainstorm why we study chemistry and careers related to knowledge of chemistry; areas such as human and animal medicine, pharmacy,	1) Observe group interactions and engagement in field study while carrying out the given activity and through research. Offering each group guidance to ensure all are participating and learning 2) Listen to learners discuss and brainstorm on the common chemicals, the reason for studying chemistry and the careers related to chemistry. Intervene by asking questions to help

Learning Outcomes	Suggested Learning Activities	Sample assessment strategies
c) Understand the importance of chemistry and relate the knowledge of chemistry to relevant careers(u). d) Know the contribution of chemistry to Ugandan economy(k)	chemical engineering, teaching, etc. Learners produce a table to present their ideas. • Brainstorm on careers related to knowledge of chemistry; such as human and animal medicine, pharmacy, chemical engineering, teaching, etc. • Learners research how chemistry contributes to the economy of Uganda; medicines, industries, transport, agriculture, etc. • In groups, learners take a field visit and carry out research to explore the common industrial products in our country and relate their uses to the importance of chemistry The groups write a report on their research and present it to the rest of the class.	them achieve the learning outcomes. 3) Develop a rubric for assessing learners' performance, such as their ability to work collaboratively, communicate effectively, and provide well-reasoned arguments for why chemistry is an important subject to study. 4) Assess learners also on products such as: common chemicals, mind maps, tables of reasons for studying chemistry and chemistry careers, group/ individual reports and presentations on the contributions of chemistry in to Uganda's economy.

Learning Outcomes	Suggested Learning Activities	Sample assessment strategies
	• Individuals write reports of field visits to show knowledge of the importance of chemistry to Ugandan society.	5) Let learners to write an essay on the contribution of chemistry to the economy of Uganda.
ICT support Learners can: Use internet to carry find information about the concepts on contribution of chemistry to economy and careers related to chemistry during research		

Hint to the teacher

i) The field visit mentioned in this chapter means any chemical process in the neighbourhood such as welding, local beer making, agricultural farm etc. and not necessarily the big industries.

ii) Encourage the learners to use locally available materials during the learning activities

Topic 2: Experimental chemistry

04 Hours

Competency: The learner understands that chemistry is a process of evidence-based inquiry involving the collection of evidence about the natural world, the identification of trends and patterns in the evidence and the development of theories that help us to explain the evidence

Learning Outcomes:	Suggested Learning Activities	Sample assessment strategies
The learner should be able to: a) know the common laboratory rules and regulations and understand the importance of risk assessment in order to work safely. b) Know the actions required in the event of an accident(k). c) know and use common laboratory equipment	In groups, learners: • a) examine a list of laboratory rules and produce a table or diagram showing the reasons for each rule • b) Observe a demonstration of how to deal with a fire and how a fire extinguisher is used, and produce a set of guidelines. In groups, learners plan and carry out an investigation using measuring cylinders, separating funnel, a thermometer, Bunsen burner and balance to mix 5g of sand and 200 cm^3 water, separating them and recording detailed observations and measurements. Learners should:	As learners carry out the experiment observe for: 1) Safety: Ensure that learners are following appropriate safety procedures 2) Procedure: Ensure that learners are following the correct experimental procedure, including measuring accurately and recording data correctly. 3) Equipment: Ensure that learners are using the correct laboratory equipment and techniques, and that they are using it safely and effectively. 4) Data Collection: Ensure that learners are collecting accurate and reliable data, including

Learning Outcomes:	Suggested Learning Activities	Sample assessment strategies
appropriately for measuring time, temperature, mass and volume (s, k). d) understand the scientific method to carry out investigations and the importance of risk assessment to keep self and others safe(u).	• select appropriate techniques, apparatus and materials • make predictions based on prior knowledge and propose a hypothesis • record observations and measurements in a table • interpret observations and report results • compare observations and results with other groups • discuss and develop explanations • In groups, learners plan and carry out investigations, using the scientific method.	measuring and recording data correctly, taking repeated measurements to ensure accuracy. 5) Analysis: Ensure that learners are able to analyse and interpret their data correctly. 6) Communication: Ensure that learners are able to communicate their findings effectively, including writing clear and concise reports, and presenting their findings to others in a clear and understandable way.
ICT Support Learners watch animation to find out how different science equipment are used		

Hint to the teacher

i) Allow learners to explore the different equipment they will be using in conducting experiments and ensure they know how to use them

ii) Support the learners to carry out activities following the scientific method

Topic 3: States and changes of states of Matter

07 Hours

Competency: The learner uses knowledge of the arrangement and motion of particles to explain the properties of solids, liquids and gases

Learning Outcomes:	Suggested Learning Activities	Sample assessment strategies
The learner should be able to: a) Understand that matter is anything which occupies space and has mass and can exist in solid, liquid, gas and plasma form(u). b) Understand that solids, liquids and gases have different properties including shape, pouring and compressing (u, s). c) Know the kinetic theory of matter and	• Individually, learners research what is known about states of matter and kinetic theory, and in groups, they discuss where they are observed in everyday life. • In groups, learners plan and use the scientific method to investigate changes of state of matter and record observations in a table, e. g melting a candle wax, or ice, boiling water (observe the change of state with temperature), heating iodine or naphthalene. • In groups, learners investigate diffusion in gas, liquid and solid using the scientific method. Carry out experiments to show the diffusion of: a) Ammonia, from concentrated ammonia solution and hydrogen	1) Observe the group discussion, taking notes on each learner's contributions. Pay attention to how they interact with each other, whether they are engaging in active listening, and whether they are staying on topic. 2) Assess each learner's level of participation in the discussion. Are they actively contributing, or are they dominating or remaining silent? Look for balanced participation among group members.

Learning Outcomes:	Suggested Learning Activities	Sample assessment strategies
use it to explain particle arrangement, inter-particle forces, movement of particles and the properties of solids, liquids and gases (u, s). d) Understand that a change from one state to another involves either heat gain or heat loss (u, s). e) Appreciate the cooling effect of evaporation and how it contributes to maintaining constant body temperature (k, u, s).	chloride, from concentrated hydrochloric acid, to form ammonium chloride or bromine in air. b) Potassium manganate (VII) in water and in a hot gel solution. Write a report of the findings. c) In groups, learners observe Brownian motion and use the particle theory to explain the properties of solids, liquids and gases and phenomena such as gas pressure, clothes drying, rain formation and making a cup of tea, and how diffusion takes place faster in a gas than in a liquid and then explain why this is the case. d) and or a solid, and then explain why this is the case. • In groups, learners use the scientific method to investigate the heat changes as ice melts and water is heated and cooled, and	3) Evaluate their understanding of the kinetic theory. Are they using accurate and relevant information in their responses? Do they grasp the fundamental concepts and principles? 4) Assess their ability to think critically during the discussion. Do they ask thoughtful questions, challenge assumptions, and provide reasoned arguments? 5) Check whether the learners can apply the kinetic theory to real-world scenarios or related problems. Can they relate it

Learning Outcomes:	Suggested Learning Activities	Sample assessment strategies
	then produce diagrams to explain why heat is taken in during melting and boiling but given out during condensing and freezing. • In groups, learners use their knowledge of kinetic theory to discuss and explain the importance of evaporation in preventing the body from overheating on a hot day.	to everyday phenomena or scientific experiments?
ICT support The learner can: • Use internet to download or view an appropriate simulation about particulate nature of matter • Use tools such as a temperature sensor to capture temperature-time data.		

Hint to the teacher

i) Caution the learners about the danger of inhaling ammonia to avoid health problems
ii) Ask the learner to write reports of the different activities carried out in the topic.
iii) Ensure that the learners engage in discussions that are within the scope of what is stated in the learning outcomes.

Topic 4: Temporary and Permanent Changes

07 Hours

Competency: The learner recognizes and appreciates occurrence of temporary and permanent changes, and their importance in everyday life.

Learning Outcomes:	Suggested Learning Activities	Sample assessment strategies

The learner should be able to:
a) Understand that many substances undergo permanent changes when they are heated or burnt forming new materials while other substances change temporarily (u, s)
b) Recognise temporary (reversible) and permanent (irreversible) changes to matter under diffferent conditions.
	• In groups, learners identify common material which undergo permanent and temporary changes when heated.
	• In groups, learners plan and carry out a practical investigation to find out which are temporary, and which are permanent changes and record the results in a table:
	  • boiling and condensing water
	  • heating and cooling candle wax
	  • sublimation of iodine
	  • breaking a wooden stick
	  • melting of ice
	  • boiling an egg
	  • dissolving salt in water
	  • rusting an iron nail
		• Observe group interaction and engagement in the practical investigation and assess attainment of skills in making and recording observations; intervene to help them understand temporary (reversible) and permanent (irreversible) changes to matter.
		• Listen to discussions and ask questions to deepen learning.
		Assess how well learners apply their learning to explain which changes are permanent and which are temporary.

ICT Support

Use animation to observe common permanent and temporary changes. Animations that can be used to observe temporary changes in matter include:

1) Heating and cooling animations: These animations show how the addition or removal of heat can cause temporary changes in matter, such as melting or boiling.
2) Dissolving animations: These animations show how a substance can dissolve in a liquid to form a solution.
3) Elastic deformation animations: These animations show how a material can temporarily change shape when a force is applied, but then return to its original shape when the force is removed.

Animations that can be used to observe permanent changes in matter include:

1) Chemical reaction animations: These animations show how two or more substances can react to form a new substance with different properties.
2) Phase change animations: These animations show how matter can change from one state to another, such as from a solid to a liquid or a gas.
3) 3. Physical deformation animations: These animations show how a material can permanently change shape when a force is applied, such as stretching or bending.

Hints to the teacher

i) Guide learners as they plan and carry out a practical investigation emphasising environmental, health and safety concerns

ii) Let learners analyse and present their findings to the rest of the class to ensure attainment of generic skills such as communication, critical thinking.

Topic 5: Mixtures, Elements and Compounds

09 Hours

Competency: The learner recognizes and appreciates the characteristics of mixtures and compounds.

Learning Outcomes:	**Suggested Learning Activities**	**Sample assessment strategies**
The learner should be able to: a) know how to identify substances and their purity by using their melting and boiling points (k, s) b) Understand that substances can be elements, compounds or mixtures(u)	In groups, learners plan and carry out experiments to determine purity of substances using their boiling and melting points. • In groups, learners plan and carry out a practical investigation to find out whether 100g of crushed ice made from distilled water melts faster or slower than crushed ice made from tap water which contains salts; they should record their results in a table and discuss. • Individually, learners research and then discuss in groups examples of elements, compounds and mixtures and list the characteristics. These might include: • Elements: made from one type of atom • Compounds: A substance formed from different elements chemically combined	• Observe learners as they carry out their investigations, note their understanding of a fair test, and intervene to check their understanding that pure (distilled) water melts at a different rate from tap (impure) water which is a mixture. • Listen to the group discussions and intervene where appropriate to assist understanding.

Learning Outcomes:	Suggested Learning Activities	Sample assessment strategies
c) Identify different mixtures and devise ways of obtaining pure substances from them (u, s). d) Know that when liquids are added together, some mix while others form two layers	• Mixtures: made up of two or more substances that can be separated by physical means • In groups, learners research and then classify substances into compounds, mixtures or elements: e.g., carbon dioxide, hydrochloric acid, sugar, air, chlorine, gold, chlorophyll, oxygen, salt plus other examples • In groups, learners use a spatula to slowly add 10gms sugar to 150cm^3 distilled water and record their observations. Learners should discuss whether dissolving and disappearing are the same and explain their thinking. They should be introduced to the terms: solvent, solute and solution, and if necessary, revise their observations using these terms. • Individually, learners research the terms soluble and insoluble. Having been informed that rock salt is a mixture of rock which is insoluble in water and salt which is soluble in water, in groups, learners plan and implement a procedure to separate the rock from the salt.	• Assess learners' progress towards achieving learning outcomes by listening to their presentations • Listen to learners and encourage use ofthe terms: solvent, solute and solution and link their thinking to prior learning about mixtures. • Listen to learners in the process of planning the separation of salt and encourage them to use and record the process using the correct terms. • Intervene where necessary to avoid misunderstandings and gauge learners' progress towards achieving

Learning Outcomes:	Suggested Learning Activities	Sample assessment strategies
	Learners use the following terms to explain their method: filtration, dissolve, soluble, solute and solution. • Learners use their experience of evaporation to plan a procedure to separate the solute from the solvent (water) and so recover the salt by crystallisation.	learning outcomes and assess learner's products

ICT support

The learner can use:

i) the Internet to research elements compounds and mixtures.

ii) the internet to research similar experiments and their underlying principles, including the concept of boiling and melting points, how to set up the apparatus, and safety precautions to take. They can also research different types of substances and their known boiling and melting points, which can help them to identify potential sources of error or uncertainty in their results.

iii) online resources such as videos, interactive tutorials, and quizzes to provide additional information and support to help them to prepare for the experiment and identify areas where they may need additional help.

Hint to the teacher

i) Guide learners on the safety precaution to take in order to avoid harm during heating

ii) Ask learners to analyse, then interpret the changes they observed and present their findings to the rest of the class. Collect learners reports for assessment.

iii) Ensure that members in each group have a fair chance to take part/participate in the activities of the experiments.

LEVEL ONE

TERM 2

Topic 6: Air Water and the Environment

09Hours

Competency: The learner demonstrates his/her knowledge of air and water as important resources which must be well protected to ensure good quality and sustainability.

Learning outcomes	Suggested learning activities	Sample assessment strategy
The learner will be able to: a) understand that air is a mixture of different gases that can be separated and used (k, u) b) understand how air pollution can affect the atmosphere (u) c) understand and appreciate that processes such as burning and rusting/corrosion use oxygen from the air to form oxides (k, u)	In pairs or individually, learners research: • the composition of air, • the percentage of each component and draw a pie chart showing the relative composition of thecomponents. • consider what else might be in the air • In groups, learners examine a fractionating column and draw on research to discuss how different liquids have different	1) Design and administer quizzes to test knowledge and understanding of key concepts related to the composition of air and air pollution to provide you immediate feedback of learners' knowledge gaps. 2) Evaluate how learners draw on prior knowledge of burning and rusting (and breathing) to develop the idea that there is an active ingredient (oxygen) in air. 3) Listen to discussions about separation of different components of

Learning outcomes	Suggested learning activities	Sample assessment strategy
d) understand the occurrence of water as a natural resource, its physical and chemical properties and importance in everyday life (u, s) e) appreciate how water is recycled by natural processes (u, v) f) understand the process of water and sewage treatment	boiling points, and how this is used to separate them into fractions. • In groups, learners research and discuss how air pollution occurs when excessive quantities of gases and particles change the composition of air, and report on the causes and consequences • Individuals or pairs research and explain how oxygen and nitrogen can be separated from liquid air using a fractionating column, and then discuss in groups • In groups, learners discuss what is necessary for wood to burn and	air using fractional distillation and assess learners' participation in the discussion, including their engagement with the topic, their ability to listen to and respond to others' ideas, and their willingness to contribute to the discussion; Assess learners' understanding of the principles of fractional distillation, including their ability to explain how it works and how it can be used to separate different components of air; Assess their ability to apply their understanding of fractional distillation to real-world situations, such as industrial processes or environmental issues. 4) Listen to discussion about word equations and guide learners to understand that oxygen

Learning outcomes	Suggested learning activities	Sample assessment strategy
	understand that oxygen is the active ingredient in air that allows burning to take place and causes i• In groups, learners draw on prior learning to brainstorm ideas about evaporation and condensation of water, ice and steam as changes of state, and produce a chart of the water cycle to explain its physical and chemical properties and the role of the sun in providing energy to drive the cycle. • In groups, learners use their water cycle charts, and prior learning about the characteristics of	from the air combines with other element to form oxides. 5) Evaluate written reports summarizing their research on the composition of air and how air pollution occurs. 6) Evaluate learners' oral presentations on their research, discussing their findings and conclusions with the rest of the class. 7) Listen to the group discussions and encourage learners to draw on and consolidate prior learning about changes of state, solvents and solutions, and then apply it to their understanding of the water cycle, the causes and prevention of water pollution, and the treatment of sewage. 8) Assess achievement of learning outcomes by ending the lesson with an "exit ticket" where learners answer brief

Learning outcomes	Suggested learning activities	Sample assessment strategy
	water, to identify and report upon where pollution might occur, its causes, impact and possible ways to prevent it.	questions related to the day's topic. You may engage in one-on-one discussions to gauge each learner's understanding and clarify any misconceptions.

ICT support

The learner can:

i) Use digital camera to take images to show the changes that take place when oxygen reacts with iron to form rust

ii) Use mind mapping / graphic or word processing software to draw a diagram of the water cycle

iii) Use digital camera to take images showing different stages of water purification

Hint to the teacher

i) Ensure that leaners clearly understand the concept of clean and polluted environment by engaging them into as many activities and discussions as possible.

ii) Encourage learners to identify features of pollution in their environment and suggest solutions aimed at solving the problems.

iii) Encourage and guide learners to come up with a variety of models of domestic water purification.

Topic 7: Rocks and Minerals

05 Hours

Competency: The learner appreciates and applies the knowledge of physical properties to identify different types of rocks, understands how rocks and minerals are formed, and applies this knowledge to real-world situations.

<table>
<tr><th>Learning Outcomes:</th><th>Suggested Learning Activities</th><th>Sample assessment strategies</th></tr>
<tr>
<td>The learner should be able to:

a) understand how igneous, sedimentary and metamorphic rocks are formed, that they are made up of minerals, and that some minerals are useful (k, u, s)
c) identify the physical properties of rocks and distinguish between the different types (s)

d) understand the process of weathering and how weathered</td>
<td>• In groups, learners examine and discuss the general appearance of igneous, sedimentary and metamorphic rocks and record their characteristics such as colour, patterns, texture, and particle size in a chart. Individually, learners; create a dichotomous key using the information from their observations.

• Individuals or pairs research and report on the minerals found in granite, sandstone and slate, and identify any patterns and summarize their findings in a table.

<table>
<tr><td>Minerals in Granite (Igneous)</td><td>Minerals in Sandstone (Sedimentary)</td><td>Minerals in Slate (Metamorphic)</td></tr>
</table>

Learners share their research with the class and discuss uses of minerals</td>
<td>1) Observe learner's interaction and participation to find out whether they are actively contributing, or dominating or remaining silent.
2) Observe group discussion while taking notes of each learner's contributions. Pay attention to how they interact with each other, whether they are engaging in active listening, and whether they are staying on the topic.
3) Assess the accuracy of observations and words used to record the results.
4) Listen to learners' discussions and presentations on weathering and where appropriate,</td>
</tr>
</table>

Learning Outcomes:	Suggested Learning Activities	Sample assessment strategies
rock particles form the basis of soil (u, s)	• Groups discuss the role that different forms of water play in extracting the minerals from the rocks, and how these minerals are deposited in the soil. Individually, learners write a report about their understanding of weathering	make suggestions to improve clarity and understanding. 5) Assess learners on group presentation of their findings regarding predictions and prevention of soil erosion to the rest of the class. Encourage each group to create visual aids such as posters, charts, or multimedia to enhance their presentations.

ICT support

The learner can use:

i) the internet to research useful minerals and present the findings to the rest of the class

ii) Word processor to write a research report on rocks and minerals.

iii) Animation to demonstrate the formation of rocks and rock cycle.

Hint to the teacher

i) Expose learners to the different types of rocks by making them collect samples of the different types of rocks or taking them sites where the different types of rocks are found.

ii) Encourage learners to research different types of rocks and their features

Topic 8: Acids, Alkalis and Salts

09 Hours

Competency: The learner demonstrates an understanding and appreciation of the roles, properties and application of acids, alkalis and salts in everyday life

Learning Outcomes	Suggested Learning Activities	Sample Assessment Strategy
The learner should be able to: a) recognise that locally available materials' substances are either acidic or alkaline (k) b) understand the concept of pH as a measure of the strength of acids and alkalis (u) c) understand the reaction between acids and alkalis (u, s) d) be familiar with, and be able to carry out, neutralisation reactions to	i) In groups, learners brainstorm what they know about acids and alkalis and, from personal experience, identify the characteristics of some familiar substances (e.g., the sharp taste of acids such as lemon juice and vinegar, the bitter taste of alkalis such as ash filtrate from banana peel, and the soapy feel of alkalis) and record information in a chart. ii) In groups, learners drop lemon juice into a solution made from red fruit (grapes, red cabbage) and universal indicator solution, discuss and report on the colour change and	1) Before starting the experiment, assess learners' prior knowledge by asking them to define pH, explain the pH scale, and describe what makes a solution acidic or alkaline. 2) Provide learners with a clear explanation of the experimental procedure, including safety precautions, handling of materials, and how to use pH test strips. 3) Ask learners to predict the pH values of the solutions they will

Learning Outcomes	Suggested Learning Activities	Sample Assessment Strategy
prepare salts (k, u, s) e) Know and appreciate the uses of common salts in everyday life (k, s)	how this provides an indicator of acidity. iii) In groups, learners use litmus paper to decide whether a range of solutions (e.g., lemon juice, vinegar, diluted bleach, diluted liquid soap, tea, cola, tap water, carbonated water) are acid or alkali, and record their results in a chart, making note of the final colour. iv) Individually, learners record the group results and write an explanation about the level of acidity in each solution. v) In groups, learners review litmus colour charts and note that different shades of colour have a numerical value of acidity, the pH, and use this information to add a numerical value to	be testing. They should make predictions based on their understanding of the substances being tested. 4) Observe each learner's level of participation paying attention to whether they actively contributing, or are dominating or remaining silent. Ensure balanced participation among group members. 5) Observe and closely supervise learners perform the experiment to ensure they follow proper safety protocols and handle acids and bases responsibly.

Learning Outcomes	Suggested Learning Activities	Sample Assessment Strategy
	their personal report and compare it with others. Learners to agree consistency or discuss where there is inconsistency. vi) In groups, learners discuss and record their thinking about the following: vii) Finding the balance between acid and alkali (or a base) solutions where there is no change in colour this is the. neutral point viii) Observe and report on the reaction that takes place when they half-fill a plastic water bottle with vinegar and place a spatula of baking soda (sodium bicarbonate) into a balloon. They then tightly fix the balloon over the mouth of the bottle so that the	6) Evaluate how well they work as a team. Are they supporting and building on each other's ideas, or is there a lack of cooperation and respect? 7) Assess as they record their observations and the pH values of each solution. 8) After obtaining the pH values, ask learners to analyse their results and draw conclusions about the acidity or alkalinity of each solution. They should identify which solutions are acids, which are alkalis. 9) Assess the word equation to find out the level of

Learning Outcomes	Suggested Learning Activities	Sample Assessment Strategy
	baking soda mixes with the vinegar ix) Individuals research the reaction between an acid and a base and explain what happens when hydrochloric acid and sodium hydroxide react. Then they produce a word equation. x) In groups, learners discuss the word equation and use symbolic representation to predict the outcome from the chemical reaction. xi) In groups, learners make magnesium sulphate by gently heating 50cm^3 of diluted sulphuric acid in a beaker to 6^{0}C and adding magnesium oxide powder, stirring until a milky solution is formed. This is filtered, and the clear liquid or	understanding about neutralisation and forming a salt. 10) Observe groups as they prepare magnesium sulphate and listen to the discussion to check for understanding of the process, whether a risk assessment has taken place. 11) Listen to learners' use of the correct terms such as filtrate, residue, evaporation, crystallisation, solubility, soluble, insoluble and precipitation. 12) Assess the flow charts made by learners to show the sequence of

Learning Outcomes	Suggested Learning Activities	Sample Assessment Strategy
	filtrate is magnesium sulphate solution. The water can be removed by gentle heating and evaporation. xii) Individually, learners make a record in the form of a flow chart and create a word equation to explain the chemical reaction seen from the observations made. xiii) Individually, learners research the use of common salts and record their results in a table and discuss in a group. e.g., sodium chloride, sodium hydrogen carbonate (sodium bicarbonate), calcium carbonate, potassium nitrate, lead chloride, barium sulphate, potassium carbonate, sodium phosphate, ammonium chloride.	action and chemical terms 13) Listen to the discussion about the use of common salts and how they draw on prior learning and research to suggest chemical formulae. Guide learners in using the correct symbols. 14) Pose reflective questions to help learners deepen their understanding and to check their understanding of the experiment and pH concept. For example: • What did you learn from this experiment about the pH of different substances? • Can you explain why certain substances

Learning Outcomes	Suggested Learning Activities	Sample Assessment Strategy
	xiv) Groups use prior learning to suggest the chemical formulae of these salts: sodium chloride, calcium carbonate, potassium nitrate, potassium carbonate and discuss how to write a simple equation to explain how they might have been made.	were acidic or alkaline based on their pH values? • How could you use pH testing in real-life scenarios?

ICT Support

Learners can use:

i) YouTube channels that provide interactive and engaging content on salts, acids and alkalis.

ii) educational websites that offer interactive lessons, quizzes, and simulations to help them understand the properties and reactions of acids, salts and alkalis.

iii) online quizzes and tests related to acids, salts and alkalis to help reinforce their understanding of acids, salts and alkalis.

Hint to the teacher

i) Provide learners with guiding question to research acids, alkalis and salts before the lesson to save time during the lesson

ii) Guide learners on how to determine acidity and alkalinity using indicators.

Topic 9: Atomic Structure, the Periodic Table and its Trends

15 Hours

Competency: The learner demonstrates an understanding of the structure of atoms, appreciates the diversity of the elements and how their properties change across the periods and groups in the Periodic Table.

Learning Outcomes:	Suggested Learning Activities	Sample assessment strategies
The learner should be able to: a) Understand that atoms are made of sub-atomic particle which have different properties b) understand that elements can be grouped into metals and non- metals and relate the physical properties of metals and	i) In groups, learners use prior learning and research to discuss how: • they might identify a metal and a non-metal and present to other groups; • to arrange elements into a table according to whether they are metals or non-metals: e.g., iron, sulphur, copper, hydrogen, silver, aluminium, oxygen, chlorine, argon, sodium, magnesium, calcium, iodine, nitrogen, zinc. Learners present	1) Ask learners to create a concept map or diagram that illustrates their understanding of the definition of atom and the key concepts related to it. Observe individual member active participation and contribution. 2) Guide learners to form hypotheses to identify metals and nonmetals. For example: • Metals are shiny and conductive, while nonmetals are dull and non-conductive. • Metals are malleable and ductile, while nonmetals are brittle and not ductile.

non-metals to their uses (k, u, s) c) know that the Periodic Table is a classification of elements according to their atomic or proton number (k) d) relate the arrangement of electrons in the first 20 elements to their positions in the Periodic Table (u, s) e) understand the relationship between the position of elements in groups and the charge on the ions	conclusions to other groups ii) Individuals carry out research to find the chemical symbol and physical properties of each element and record their results in a chart. iii) In pairs, learners study the Periodic Table and carry out research and complete reports explaining: • the work of Mendeleev and others in classifying the elements • the meanings of the terms: proton/atomic number and mass number • the relationship between the proton (atomic) number of an element and the number of electrons. iv) In groups, learners discuss their findings and use a card activity and research to give	Listen to whether they are asking thought-provoking questions, challenging assumptions and providing reasoned arguments. 3) Listen to learners' discussions about symbols and properties of elements and observe the results recorded 4) Listen to learners' explanations of their findings on the periodic table, classification of elements, the work of Mendeleev and assess their understanding of atomic number, mass number and electrons. 5) Assess learners' findings from research and activities on the use of the cards. Listen to learners' discussions and assess their understanding of electron configuration and classification of element.

that they form (u) f) know the trends in physical properties of the elements across the periods in the Periodic Table (k) know the trends in typical physical and chemical properties of simple compounds of the elements of	each of the 13 most abundant elements in Earth's crust, listed from most to least abundant, its symbol, proton number, atomic mass, electron configuration, and element classification • oxygen • silicon • aluminium • iron • calcium • sodium • magnesium • potassium • hydrogen • phosphorus • sulphur • carbon v) In groups, learners revisit prior learning about the Periodic Table and identify patterns in the arrangement of elements in groups and across periods in terms of: • proton number • electron arrangement	6) Divide learners into small groups and assign them different positions to argue for or against, such as one group argues that electron arrangement is the primary determinant of an element's position on the periodic table, while another group argues that other factors, such as atomic mass is more important. The groups can then present their arguments and engage in a discussion with each other. As you listen, assess them for accuracy of information, clarity of explanation, use of visual aids, participation and engagement. 7) During group discussions and report presentations, evaluate the quality and depth of the research conducted by each group, how well the group has analysed the information

	• properties vi) In groups, learners research, discuss and report on: • the electron arrangement of elements in each group and across each period • the positions of the metals, non-metals and semi-metals • trends in physical properties, such as melting point, boiling point and density, across the periods • trends from metals to non-metals from sodium to argon • reactions of the elements of the third period with water, oxygen and chlorine vii) In groups, learners contribute to discussions and conclusions about trends. viii) In groups, learners research, discuss and report on group 1 elements:	gathered during their information gathering, how well the group has worked together during information gathering and discussion, and the quality of the group presentation or report. 8) Evaluate learning by asking learners to write a reflection on what they have learned about the periodic table. This can include a summary of key concepts, what they understood, how they applied prior knowledge, and what areas they feel they need additional support.

	• general physical properties of lithium, sodium and potassium • changes in the physical properties from lithium to potassium with respect to hardness, density and melting point • chemical properties of lithium, sodium and potassium • the similarities in chemical properties of lithium, sodium and potassium • the relationship between the chemical properties of Group 1 elements and their electron arrangements v) Groups contribute to class discussion and conclusions about group 1 elements	

ICT Support

Learners can use suitable websites to search for information about organisation of the periodic table, classification of elements and their abundance in nature. They can search the following:

- Interactive periodic tables
- Online tutorials and videos

- Simulations
- Online quizzes and games

Hint to the teacher

i) Provide learners with guiding question for research the periodic table before the lesson to save time during the lesson
ii) Guide learners on how to design cards and use them in the identification of elements in the periodic table
iii) Guide learners to identify materials from their environment for designing their own Periodic Table.
iv) Provide learners with materials such as graph papers and manila to enable them visualise trends of some properties in the Periodic Table.

LEVEL ONE

TERM 3

TOPIC 10: Carbon in Life

15hours

Competency: The learner analyses the diversity of carbon compounds and evaluates their uses in everyday life, as well as demonstrates an understanding of the impact these compounds have on the environment.

Learning outcomes	Suggested learning activities	Sample assessment strategy
The learner should be able to: a) Recognise that there is a diversity of carbon compounds in living things and materials derived from living things, and that these may be classified into groups (u, s) b) understand how organic compounds can be grouped into homologous series, each of	i) Individually, learners research and report on the uses of some common organic compounds derived from living things, such as ethanol, sucrose and ethanoic acid. ii) Individually, learners research the structural formulae of common homologous series (alkanes, alkenes, alcohols and carboxylic acids) and identify the functional groups responsible for their characteristic chemical properties and compare findings with other learners.	1) Assess reports from the learners' individual research by evaluating the accuracy, research skills, writing skills (e.g., use of reliable sources), critical thinking (e.g., analysis and synthesis of information to include benefits and drawbacks), and creativity (e.g., interesting or innovative uses of the compounds). Providing constructive

Learning outcomes	Suggested learning activities	Sample assessment strategy
which has similarities in structure and properties (k, u) c) Understand the types and origins of fossil fuels and why they can be used as sources of energy and useful materials. (u, s) d) understand that crude oil is a mixture of different alkanes which can be separated by fractional distillation and that these products are used in fuels and to make other useful products (k, u)	iii) In pairs, learners brainstorm and research on common fossil fuels and produce reports explaining: • why they all contain carbon • how they were formed, using diagrams (Including gas, oil and coal) • how they can be used as sources of energy and useful materials • why they are described as non-renewable and their use is unsustainable iv) In groups, learners research and explain the characteristics of alkanes, alkenes, alcohols, and carboxylic acids on a poster and then classify common carbon compounds such as ethanol, methanoic acid, butane, ethene, ethane, methanol,	feedback on these areas. 2) Assess learner understanding of homologous series and functional groups by listening to presentations and scoring research reports. 3) Listen to group discussions about methane and invite peer feedback to ensure full understanding of fossil fuels. 4) Listen to discussions about the composition of carbon compounds and the process of fractional distillation and, where appropriate, pose

Learning outcomes	Suggested learning activities	Sample assessment strategy
e) know and appreciate that natural gas deposits are found worldwide, that their main constituent is methane and that gas deposits are a useful source of fuels and chemical feedstock (k, u) f) appreciate that biogas is a carbon- based fuel useful for cooking and lighting (u, s) g) know some common synthetic and natural polymers and how their properties	butanoic acid, and propene. v) Individually, learners revisit prior learning on fractional distillation and use it to explain how crude oil can be separated into fractions by distillation. Groups discuss and list the main fractions in order of boiling point, and discuss their uses in everyday life (fuel, polymers, drugs, dyes, pesticides, explosives, and soapless detergents). vi) In groups, learners research and make a poster to explain how methane is used to make other organic compounds which in turn can be used to make a wide range of useful natural or synthetic polymers including plastics,	questions to secure understanding and assess progress toward the learning outcomes. 5) Listen to group discussion about the different homologous series named and invite peer feedback to ensure full understanding. 6) Listen and assess presentations on distillation of crude oil and properties of fractions obtained. 7) Evaluate progress of learning through assessment of learners reports and posters designed

Learning outcomes	Suggested learning activities	Sample assessment strategy
relate to their uses (u, s) h) understand and appreciate that alcohols form a group of compounds of which ethanol is a typical member and has many uses (u, s) i) understand how ethanol is made naturally by fermentation of sugars and other organic substances, and be aware of the dangers of abuse of ethanol (u, s) j) know the process of making soapy detergents from natural fats and oils and	starch, cellulose, proteins, sugars, fats and oils, and research the properties and uses of some polymers. vii) In groups learners research and discuss the chemical nature of biogas, how it is made and why it is described as a renewable fuel, before writing a report. They carry out a project to produce biogas. viii) In groups, learners design a model to show the structure of ethanol, and explain using an equation how it can be made from glucose. They also, explain the conditions necessary for successful production of ethanol by fermentation. Learners debate and report on the uses of ethanol and effects of alcohol abuse. ix) In groups, learners	explaining uses of methane as a staring material for manufacture of other chemicals. 8) Listen and assess learners' presentations by evaluating their research skills (e.g., use of reliable sources), content accuracy (e.g., relevant information), critical thinking (e.g., environmental impacts and economic feasibility of biogas as a renewable fuel), communication skills (e.g., clarity and coherence of information), and engagement (active

Learning outcomes	Suggested learning activities	Sample assessment strategy
appreciate that soaps are effective in removing oily stains (u, s) k) know that soapless detergents are made from crude oil and that soapless detergents are better cleaning agents in hard water than the soapy detergents but have a more deleterious effect on the environment (k, u, s)	• use sodium chloride, coconut oil (25cc) and 20% sodium hydroxide (30cc) to create a suspension • use 15g of salt to create a solid (soap) which is separated by filtering. • Individually, learners record the process using flow charts and scientific terminologies such as suspension, precipitation, solution. x) In groups, learners plan, carry out and report on an investigation to find out how effective different types of soap are at removing for example, food stain on a cotton fabric and research how soap emulsifies fats and oils. xi) In groups, learners research, discuss and report on why a soapless detergent is more efficient for cleaning	participation on bioga). Provide constructive feedback on these areas. 9) Observe, and converse with the learners as they model the structure of ethanol. Assess the models produced to measure their understanding of the structure of ethanol. Listen and assess the learners' presentations and reports about fermentation f glucose to form ethanol and also the effects of alcohol abuse.

Learning outcomes	Suggested learning activities	Sample assessment strategy
	than a soapy detergent in a hard water area, and explain the challenges created when soapless detergents are released into the environment. xii) In groups, learners plan, carry out and report on an investigation to compare how well a soapy and a soapless detergent form lather in soft water and in hard water.	10) Observe and discuss with the learners as they perform activities to prepare soap and detergents. Assess their ability to produce a product and their reports on the effects of soap on the environment.

ICT support

Learners use appropriate websites to carry out research on carbon compounds in life

Hint to the teacher

i) Provide learners with guiding instruction to research on carbon compound in life

ii) Ensure that learners are conversant with science process skills and can appropriately apply it process of making soap and detergents.

Topic 11: Carbon in Environment

08 Hours

Competency: The learner investigates the diversity of carbon compounds in the environment.

Learning outcomes	Suggested learning activities	Sample assessment strategy
The learner should be able to: a) know and appreciate the difference between renewable and non-renewable fuels and understand that non-renewable fuels are not sustainable (k, u) b) know and appreciate the impact of burning carbon-based fuels on the	i) In groups, learners draw on their experience and research to discuss the main uses of common carbon-based fuels in Uganda: charcoal, paraffin, petrol, firewood and diesel. ii) Individually, learners use prior learning to write a word equation to show the reaction when carbon-based fuels burn in oxygen. iii) In groups, learners discuss and report on the meaning of the terms 'renewable' and 'non-renewable' as applied to fuels, and then use data to estimate how long the world's coal, oil and natural gas reserves are likely to last at the current rates of usage.	1) Divide learners into small groups and have them engage in discussions or brainstorming sessions about carbon-based fuels. Observe their conversations, note the ideas they bring up, and assess the depth of their understanding of the topic based on their contributions. 2) Assess group discussions by moving around the classroom to monitor each group for individual contributions; finding out group members' contributions.

Learning outcomes	Suggested learning activities	Sample assessment strategy
environment (k, u) c) understand the processes of making charcoal but recognize that the d) use of charcoal as a fuel is cheap, efficient and sustainable only if it is made from wood that can be regrown easily (u, s) e) know and appreciate the physical properties and uses of carbon dioxide (k, u)	iv) Individually, learners research the idea of 'sustainability' and write a report on how the use of fuel in their locality can be made more sustainable. v) In groups, learners discuss and produce posters to explain why air pollution is a global problem and why it can only be properly controlled if all the countries of the world agree to collaborate. vi) In groups, learners research on the process of making of charcoal from waste organic material and energy-saving charcoal stoves. They carry out a project to make charcoal from waste material. They explain the effect of burning carbon containing materials in a limited supply of oxygen.	3) Ask each learner to write a brief individual reflection on his/her contribution to the group discussion, what he/she learned, and how he/she could improve. 4) Find out how well they have understood the topic by conducting a question-and-answer session, and then provide constructive feedback to the groups and individual learners, highlighting their strengths and weaknesses and suggesting areas for improvement. 5) Assess presentations or reports on charcoal making by evaluating the accuracy and relevance of

Learning outcomes	Suggested learning activities	Sample assessment strategy
f) understand how the increase in carbon dioxide in the air can cause the atmosphere and the oceans to get warmer (u) g) understand what greenhouse gases are, where they come from and how they are affecting climate (u) h) understand the origin of hard water in limestone areas and investigate how it can	vii) Groups draw on prior learning to make carbon dioxide by reacting limestone with dilute hydrochloric acid; use apparatus to collect the gas, and then explain the chemical reaction and the property when tested with a lighted splint. viii) In pairs, learners research and report how an increase in carbon dioxide in the air can cause the atmosphere and the oceans to get warmer, what this tells us about the nature of carbon dioxide, and then they compare their findings with other learners to explain the effect on climate. ix) In pairs, learners research how rainwater becomes hard as it soaks through limestone and how it affects soap.	information to demonstrate a thorough understanding of the concept, logical flow of the presentations or reports, use of supporting evidence, the delivery of presentations e.g., tone, pace, and clarity, and effective use of any visual aids, such as posters. 6) Observe and converse with learners as they prepare carbon dioxide gas. Assess the responses of the learners from the tasks in the activity. 7) Listen to presentations and assess reports by learners on effect of increase of carbon dioxide in air and also explanations on hard water from rain.

Learning outcomes	Suggested learning activities	Sample assessment strategy
be softened (u, s) i) understand the properties and uses of the allotropes of carbon (u)	x) In groups, learners, research, discuss and explain how adding washing soda (sodium carbonate) results in reducing 'hardness'. xi) Groups research and make models to explain the structures of diamonds and graphite and explain how the properties determine the uses of carbon structures such as carbon fibres and graphene.	8) Listen to presentations, and score reports from research about using washing soda to remove hardness of water. 9) Observe and converse with learners as they make models of allotropes of carbon. Assess presentations and reports from research on structure, properties and uses of allotropes of carbon.

ICT support

Learners can:

i) use appropriate websites to find out information on carbon-based materials, their uses and effects on the environment.

ii) find multimedia resources, such as videos, infographics and interactive simulations as well as case studies, and news articles to understand how carbon-based materials are used in different industries and how their use affect the environment.

Hint to the teacher

i) Provide learners with guiding questions beforehand to research carbon-based materials so as to save time.

ii) Emphasise the use of low-cost, locally available materials for the practical activities.

LEVEL TWO TERM 1

Topic 12: Chemical Bonding and Structure

9Hours

Competency: The learner demonstrates an understanding of chemical bonding and applies this knowledge to understand how molecules and compounds are formed from atoms to give the structural properties for use in everyday life.

Learning outcomes	Suggested learning activities	Sample assessment strategy
The learner should be able to: a) understand that atoms are the building blocks from which all matter is made (u) b) understand the terms 'element', 'atom', 'molecule' and 'compound', and appreciate how they are related (u) c) understand how atoms of different elements differ in their subatomic structure (u)	i) Individually, learners revisit prior learning on the names and symbols of some common elements, research the terms 'element', 'atom', ii) 'molecule' and 'compound' and the names and formulae of some common compounds. They present a report of their findings to the rest of the class. iii) In groups, learners apply what they know about e.g., water, iron, carbon dioxide, sodium chloride, aluminium, copper (II) oxide, oxygen, hydrochloric acid, chlorine, gold and organise them in a table according to whether they are elements or compounds.	1) Assess learners by engaging them in an open-ended discussion about elements, atoms, molecules, and compounds to gauge their understanding and identify any gaps or misunderstandings. 2) Listen to discussions and observe the groups, taking notes of each

Learning outcomes	Suggested learning activities	Sample assessment strategy
d) appreciate that atoms are made up of subatomic particles and know the properties of these particles (k, u) e) understands the terms relative atomic mass, proton number, nucleon number and isotopes (u, s) f) understands and appreciate that the atoms of elements join together to form compounds (u, s) g) understand the processes involved in the formation of ionic, covalent and metallic bonds (u) h) recognize the difference in the physical properties of ionic and	iv) In groups, learners research on atomic structure and use their understanding to make models of some simple atoms, showing protons, neutrons and electrons, and include the relative charges and approximate relative masses. v) Groups research the elements and write: a) the symbols of elements b) the standard representation for an atom of any element. where: X = element ${}^{A}_{Z}X$ A = nucleon number Z = proton number vi) In groups, learners discuss how the proton number and the structure of atoms can be used to explain the basis of the Periodic Table, with special reference to the elements of proton numbers (atomic number) 1 to 20 and make a model to show the build- up of electrons in 'shells,' and explain the significance of	learner's contributions . Pay attention to how they interact with each other, whether they are engaging in active listening, and whether they are staying on topic.. 3) Observe the learners as they design the posters and assess their presentations to gauge their understanding of the different structures 4) Evaluate learners' ability to create effective

Learning outcomes	Suggested learning activities	Sample assessment strategy
covalent compounds and relate them to their bonding (u, s) i) Understand the atomic, molecular and ionic structures of different materials/substances(u) j) Understand that the different physical properties of materials such as density, appearance, hardness, melting point, boiling point depend on their atomic, molecular and ionic structures (u, g s) k) Understand and appreciate that the uses of materials relate to their structures (u, v/a)	the noble gas electronic structures and of valency electrons. vii) Individually, learners research how ideas of atomic structure have developed, and then contribute to a class discussion viii) Individually, learners research the terms 'Proton number' and 'nucleon number' and then in a group, discuss the meaning of the concept of isotopes and compare the composition of isotopes of the same element in a table. ix) In groups or pairs, learners: • research and report the physical properties of giant molecular, giant ionic and giant metallic structures and explain the differences in physical properties in a poster or presentation. • Search for the atomic, molecular and ionic models and make presentations	reports, presentations, and illustrations by assessing their clarity, coherence, visual appeal, and alignment with the given topic. Focus on their capability to convey information concisely, engage the audience, and demonstrate their understanding of the subject matter through well-organised and visually appealing materials.

Learning outcomes	Suggested learning activities	Sample assessment strategy
l) Understand that heating changes the structure and properties of some materials	• Investigate the density, hardness and other physical properties and relate them to structure • Discuss how the uses of materials depend on their structure In groups, learners carry out activities to investigate the effect of heat on different materials and how this effect can apply to inform the recycling and reuse of the materials.	

ICT support

The learner can use:

i) animations to demonstrate the process of chemical bonding between atoms.

ii) digital models to illustrate the structure of atoms, molecules and compounds.

iii) appropriate websites to search for information about chemical bonding and structure.

Hint to the teacher

i) Guide learners on the appropriate websites for research on chemical bonding and structure

ii) Emphasise the use of low cost, locally available materials for the modelling of bonded and unbonded atoms to demonstrate chemical combination.

Topic 13: The Mole Concept

13 hours

Competency: The learner uses formulae and equations to determine quantities of matter that reacts or is produced in a chemical reaction.

Learning Outcomes:	Suggested Learning Activities	Sample assessment strategy
The learner should be able to: a) understand the concepts of relative atomic mass and relative molecular mass (k, u) b) analyse the relationship between the number of moles and the number of particles (k, u)	i) In groups, learners collect and interpret data concerning relative atomic mass and relative molecular mass based on carbon-12 scale and discuss its use as a standard for determining relative atomic mass and relative molecular mass. ii) In groups, learners research the mole concept; the relationship between the number of particles in one mole of a substance with the Avogadro constant, and how to convert the number of moles to the number of particles for a given substance. iii) In groups, learners collect and interpret data on molar volume of a gas and use computer simulation (where available) or graphic representation to explain the relationship between molar volume and Avogadro constant,	1) Listen to group discussion and intervene appropriately to help understanding of relative atomic and molecular mass, and the significance of the Avogadro constant and its relationship with molar mass. 2) Listen to group discussion and ask questions to identify misconceptions and to clarify understanding about particles, moles, mass of a substance and volume of gases, the chemical formulae of compounds and the construction of balanced equations. 3) Observe group activities and step in as appropriate to guide learners and build knowledge and understanding. 4) Assess the progress of learning through

Learning Outcomes:	Suggested Learning Activities	Sample assessment strategy
c) analyse the relationship between the number of moles of a substance and its mass (k, u) d) analyse the relationship between the number of moles of a gas and its volume (k, u) e) synthesise chemical	and make generalisations on the molar volume of a gas at STP or room conditions. iv) Groups: • construct a mind-map to show the relationship between number of particles, number of moles, mass of substances and volume of gases at STP and room conditions. • carry out problem solving activities involving number of particles, number of moles, mass of a substance and volume of gases at STP or room conditions. v) Individually learner carries out activities to solve problems on the volume of gases at STP (or room conditions) from the number of moles and vice versa. vi) In groups learners carry out a class demonstration t to determine the empirical and molecular formular of simple compounds such as; copper (II) oxide, magnesium oxide. They compare and contrast empirical formula with	assessment of products and presentations. 5) Group constructing mind map: **Step 1:** Introduce the concepts before learners do the mind-map activity. **Step 2:** Divide learners into small groups of 3 to 5 members and observe them for effective collaboration and participation. **Step 3:** Observe as each group creates a mind-map showing the relationship between the number of particles, number of moles, mass of substances, and volume of gases at STP. **Step 4:** Have each group present their mind-map to the class as you listen to learners articulate their understanding. **Step 5:** After presentations, facilitate a class discussion. Clarify any misconceptions and reinforce key concepts

Learning Outcomes:	Suggested Learning Activities	Sample assessment strategy
formulae (u) f) interpret chemical equations (k, u) g) practice scientific attitudes and values in investigating matter (u)	molecular formula. The learners present their results tot the rest of the class vii) Individually learner constructs chemical formulae of compounds from a given pair of ions, and state names of chemical compounds using IUPAC nomenclature. They construct balanced chemical equations for the selected reactions and display on a poster. viii) In groups, learners carry out research to identify and justify positive scientific attitudes and values practised by scientists in doing research on mole concept, chemical formulae and chemical equations. They should find out how these positive scientific attitudes and values are used for easy and systematic communication in the field of chemistry. They prepare a report and present to class.	related to the relationships between the variables at STP. 6) Observe and converse with the learners as they carry out the class demonstration. Listen to the presentations and assess the results of each group and harmonise them 7) Assess the results produced by the learners by scoring them to find out the learner's level of understanding 8) Listen to the learners' presentations and assess their understanding on positive scientific attitudes practised by scientists when carrying out research on the concept named

ICT support

The learner can use:

- animations to demonstrate the formular of compounds and process of determination of empirical and molecular formulas.
- digital models to illustrate the structure of compounds.
- appropriate websites to search for information about the formula of compounds.

Hint to the teacher

i) Guide learners on the appropriate websites for research on the mole concept formula of compounds

ii) Ensure that learners are fully engaged during a practical demonstration

iii) Ensure that learners individually carry out enough exercises involving calculations

LEVEL TWO TERM 2

Topic 14: Chemical Reaction Rates

5 Hours

Competency: The learner demonstrates understanding of the effect of external conditions on the rate of reaction and uses kinetic particle model to explain these effects.

Learning Outcomes:	Suggested Learning Activities	Sample Assessment Strategy
The learner should be able to: a) understand and appreciate that chemical reactions take place at different rates (u) b) understand the effect of various factors on the rate of chemical reactions and recognise that many reactions are reversible (u, s) c) understand the importance of reversible reactions in	i) In groups, learners plan, carry out and report on several investigations to find out how temperature, the concentration of reactants and particle size, affect the rate of chemical reactions, identifying whether reactions can be reversed or not. ii) In groups report on results and conclusions, making use of	1) Observe learners planning and carrying out scientific investigations, check that their procedures will lead to meaningful results and intervening as required. 2) Listen to groups planning and interpreting results, asking questions to ensure valid results are achieved and valid conclusions are drawn. 3) Assess learners' explanation of reversible reactions, particularly concerning the industrial manufacture of sulphuric acid including

Learning Outcomes:	Suggested Learning Activities	Sample Assessment Strategy
industrial processes (u)	graphs to show patterns. iii) Individually, learners research examples of reversible reactions, including the reversible steps in the industrial manufacture of sulphuric acid, and present their explanations using a flow chart.	evaluating their understanding of the concept of reversibility, the chemical processes involved, and their ability to articulate the steps and factors influencing the equilibrium.

ICT support

The learner can use animations to demonstrate the graphical presentation of the different factors that affect the rates of reactions.

Hint to the teacher

i) Ensure that learners are conversant with practical investigation on different factors affecting rates of reaction

ii) Emphasise elaborate scientific process skills in all the practical experimentations.

Topic 15: Oxidation, Reduction, Reactivity Series and Electrochemistry

16 Hours

Competency: The learner demonstrates an understanding of oxidation and reduction, both in terms of the gain or loss of oxygen and in terms of electron transfer.

Learning Outcomes:	Suggested Learning Activities	Sample Assessment Strategy
The learner should be able to: a) understand the processes of oxidation and reduction and their importance in the chemical industry (u, s) b) explain redox reactions in terms of electron transfer (u) c) appreciate that metals vary in their chemical reactivity and can be arranged in a reactivity series (k, u, s)	i) In groups, learners research, explain and report on the terms: 'oxidation' and 'reduction' in terms of: • loss or gain of oxygen • loss or gain of hydrogen • transfer of electrons • change in oxidation number ii) Individuals use calculations to calculate the oxidation number of an element in a compound. iii) In groups, learners: • collect and interpret data on the existence of various ores in Uganda and produce a chart to explain the contribution of metal extraction to the Ugandan economy • explain the relevance of reduction/oxidation to metal extraction iv) In groups, learners plan, investigate and report on oxidation and reduction in a selection of reactions, writing	• Listen to group discussions and intervene appropriately to check understanding of oxidation and reduction, especially in terms of electron transfer. • Ask questions to check learners' understanding of electrolytes and electrolysis in terms of discharge at the electrodes. • Observe groups engaged in activities and offer guidance to deepen learning.

Learning Outcomes:	Suggested Learning Activities	Sample Assessment Strategy
d) understand that alloys are mixtures of a metal with other metals and/ or non-metals (u,k,s) e) e. compares the properties of common metals with their alloys (u, s) f) understand the changes that take place during the electrolysis of some compounds and the applications of the changes (u, s) g) know some of the main industries that produce	ionic equations and explaining reactions in terms of electron transfer v) Groups design and carry out an investigation, using the scientific method, to compare the reactivity of calcium, copper, iron, magnesium and zinc placed in cold water and dilute hydrochloric acid. vi) Learners discuss how they to measure and record the level of 'reactivity' and evaluate the limitations of the investigation. vii) Individually, learners research how the reactivity of an element depends on its electronic structure, and they draw structure diagrams of calcium, copper, iron, magnesium and zinc to explain their level of reactivity and how this determines their uses. viii) In small groups, learners use a charcoal block and blowpipe to extract copper from copper oxide, explaining their observations and write a word equation for the process. They should research and discuss with the wider group why the	• Evaluate quality of learning through assessment of products: presentations about chemical change and equations to determine progress towards the Learning Outcomes. • Observe pairs and groups working and offer advice and guidance to aid their progress towards the learning outcomes. • Listen to learners' discussions and provide opportunities for pairs/groups to

Learning Outcomes:	Suggested Learning Activities	Sample Assessment Strategy
useful chemicals, such as the oil industry for our organic chemicals, the production of metals, the acid industry, the alkali industry, the fertilizer industry and the cement industry (k, u) h) understand the processes for obtaining useful chemicals from rocks (k, u) i) understand the processes involved in extracting and purifying metals, with particular	more reactive metals (e.g., groups I and II metals and aluminium) cannot be extracted on a charcoal block, and how gold is an uncombined metal at the bottom of the reactivity series that can be recovered in pure form from alluvial deposits. ix) In groups learners examine a collection of objects made from or containing alloys. They research and write reports on the difference in chemical composition and properties, and then explain how this determines their use. x) Write reports on chemical reactivity of elements xi) In groups discuss electrolysis and produce illustrations to explain: • the meaning of electrolyte • moving ions and electrical conductivity xii) In groups ask learners to use carbon electrodes in the electrolysis of copper (II) sulphate solution and dilute sulphuric acid and: • identify cations and anions in the aqueous solutions	present their findings. • Evaluate quality of learning through assessment of learners' products and presentations about the benefits and problems associated with industrial processes. • Observe and listen to group discussions to check: • whether their investigation is valid and reflects the scientific method • whether the recording of

Learning Outcomes:	Suggested Learning Activities	Sample Assessment Strategy
reference to processes used in Uganda (k, u) j) understand the importance of nitrates as fertilizers in food production and know how they are produced from the nitrogen in the air (k, u) k) describe some of the dangers to the community arising from these industrial processes and the steps that may be taken	• describe the electrolysis of the aqueous solutions • write half equations for the discharge of ions at the anode and the cathode xiii) Research about the production of alkali and chlorine by the electrolysis of salt solution and present a report. xiv) In pairs, learners list some common products and identify which of the main chemical industries in Uganda were involved in their production. xv) Pairs research and describe the reactions involved in the extraction and purification of metals from their ores (iron, copper and aluminium) and prepare presentation flow charts outlining the main processes. xvi) In pairs, learners research on the importance of nitrogen and show in a flow chart how nitrogen from the air is captured and eventually becomes nitrogen in nitrate fertilizer. xvii) In groups, learners research and identify four industrial processes that make use of	results is accurate and informs their learning about the reactivity series • understanding of how reactivity is related to the electronic structure of the element • Listen to learners' conversations about the extraction of copper from copper oxide, and how the level of reactivity of alloys and unreactive elements are related to their use.

Learning Outcomes:	Suggested Learning Activities	Sample Assessment Strategy
to minimise these dangers (u) l) understand the process of manufacturing lime and cement (u)	natural resources obtained in Uganda (including the manufacture of lime and cement and the production of chlorine), creating charts to: • explain the processes • identify the social benefits • identify some of the dangers to the community arising from these industrial processes • identify steps that should be taken to minimise the dangers	• Evaluate quality of learning through assessment of the learners' products, to determine their progress towards achieving the learning outcomes.

ICT support

- Learners use a suitable website to search for information about redox reactions.

Hint to the teacher

i) Provide learners with information search guidelines: internal (memory) and external (online search engines, libraries, online databases, social media, interviews or surveys, professional network, etc.) and how to evaluate the sources, organizing and analysing informationbefore the lesson and present their findings in class.

ii) Emphasise adherence to scientific process skills during practical activities

LEVEL TWO TERM 3

Topic 16: Energy Changes during Chemical Reactions

5 HOURS

Competency: The learner demonstrates knowledge of chemical reaction involving energy (heat) loss or gain and applies it in everyday life.

Learning Outcomes:	Suggested Learning Activities	Sample Assessment Strategy
The learner should be able to: a) appreciate the difference between endothermic and exothermic reactions and understand that substances store chemical energy in their bonds (k, u) b) understand and appreciate the importance of exothermic and endothermic reactions in	i) In groups, learners research, discuss and report on: • examples of important everyday reactions • (Such as fermentation, respiration, cooking, burning, etc.) in which energy is either absorbed or released • investigations of endothermic or exothermic reactions using the scientific method by dissolving substances (e.g., sodium hydroxide, sodium hydrogen carbonate, ammonium nitrate, etc.) in water and noting the temperature changes in each case as the energy stored in bonds is released. • the energy transformations in burning ethanol, paraffin or wood and the change from chemical energy to heat and light. ii) Individually, learners research on the flow of energy through an ecosystem in which reactions	1) Listen to group discussions and ask questions to gauge the level of understanding and promote critical thinking. 2) Observe learners' interactions and offer advice to improve progress and deepen learning.

Learning Outcomes:	Suggested Learning Activities	Sample Assessment Strategy
our everyday lives (u, s) c) recognise that the burning of fuels is an exothermic process producing useful energy (u, s) d) understand the concept of heat of reaction and interpret energy profiles of chemical reactions (u, s)	are endothermic (e.g., photosynthesis) and which are exothermic (e.g., respiration) and produce a chart to explain energy flow and loss iii) In groups, learners design and carry out an investigation to compare the heat given out when different fuels burn (e.g., peanuts, oils, paper, wood) iv) In groups, learners research about heats of reaction, interpret energy profiles and draw energy profiles for exothermic and endothermic chemical reactions.	3) Evaluate the quality of learning through assessment of learners' products, to determine and encourage progress towards the learning outcomes.

ICT support
Learners use a suitable website to search for information about common forms of energy changes.

Hint to the teacher

i) Provide learners with reading skills to search for information from external resources before the lesson.
ii) Equip learners with presentation skills before they present their findings in class.
iii) Provide learners with materials for carrying out practical activities and caution them on the dangers of acid burns.

Topic 17: Chemicals for Consumers

07 Hours

Competency: The learner recognises that many of the products used in daily life are composed of chemicals that can be synthesized either at home or in the laboratory.

Learning Outcomes:	Suggested Learning Activities	Sample Assessment Strategy
The learner should be able to: a) analyse properties of soap and detergent and compare and contrast the effectiveness of their cleansing action (u, s) b) evaluate the use of food additives (k, u, s) c) understand the importance of chemicals in medicine (k, u) d) appreciate the importance of the chemical	i) Groups revisit prior learning on the production of soap and its cleansing action and research and interpret data in the form of a presentation on: • the history of soap manufacturing • the chemical nature of soap and detergent • the additives in detergent such as biological enzymes and whitening agents • the preparation of detergents ii) Groups plan, carry out and report on an investigation to find the differences in the effectiveness of the cleansing action of soap and detergent. iii) In pairs, learners collect and interpret data and report on the types of chemicals used in food	1) Listen to learners' discussions on soap production and why it is an effective cleaning substance. Assess their demonstrated ability to understanding soap production and its cleaning effect; ability to articulate key concepts related to soap production and its cleaning effect; ability to engage in a productive discussion with

Learning Outcomes:	Suggested Learning Activities	Sample Assessment Strategy
industry and its contribution to our lives (u)	additives and their functions as: • preservatives and antioxidants, e.g., sodium nitrite, sodium benzoate, ascorbic acid • flavouring agents, e.g., monosodium glutamate (MSG), aspartame • stabilizers and thickening agents, e.g., gelatin, acacia gum • dyes, e.g., azo compound, triphenyl compound • the use of banned substances such as alkyl benzene sulphonate iv) In groups, learners collect and observe food labels, identify the additives used, and reporting on: • the rationale for the use of food additives • the effect of food additives on health and the environment • life without food additives v) In groups, learners use library and or online resources to prepare a presentation on types and functions of chemicals used in medicine, e.g.:	other teams; use of evidence to support arguments or claims; active listening and respectful communication with other team members. 2) Divide learners into smaller groups and assign each group to either investigate cleaning effect of soap or detergent. Provide each group with the necessary materials and enough time. Guide them to form hypotheses. During the investigation,

Learning Outcomes:	Suggested Learning Activities	Sample Assessment Strategy
	• traditional medicines derived from plants and animals • analgesics such as aspirin, paracetamol and codeine • antibiotics such as penicillin and streptomycin • psychotherapeutic medicine such as stimulants, antidepressants and antipsychotics • Reports should also focus on the side effects of modern and traditional medicines, and the importance of the correct usage of modern and traditional medicines. vi) In groups, learners carry out research and prepare a presentation on chemicals that have had a significant impact on humanity such as: • Antibiotics and detergent • side effects of chemicals on life and the environment	assess the group's ability to plan and execute a scientific investigation, design an experiment, collect and analyse data, and draw conclusions. 3) Assess learners' products such as reports and drawings.

Learning Outcomes:	Suggested Learning Activities	Sample Assessment Strategy
	vii) In pairs, learners use library and or online resources to find information and report on good practices and common traits among scientists in carrying out research, such as patience, meticulousness and perseverance.	

ICT support

- Learners use a suitable website to search for information about common forms of energy changes

Hint to the teacher

Provide learners with books or internet search engines to find information about chemicals for consumers.

Topic 18: Nuclear Processes

04 Hours

Competency: The learner develops an understanding of atomic structure and the nuclear processes by which energy is released.

Learning Outcomes:	Suggested Learning Activities	Sample Assessment Strategy
The learner should be able to: a) understand atomic structure, the processes of nuclear fission and fusion; the uses and the dangers associated with them (k, u) b) understand the spontaneous and random nature of nuclear decay and interpret decay data in terms of half-life (u, s)	i) In pairs, learners search information on the atomic structure, nuclear decay and radioactivity and produce a joint report which will include: • the structure of the atom, sub-atomic particles, nuclides and their atomic and mass numbers • nuclear fission and nuclear fusion • radioactivity and the types and properties of the particles emitted • types and properties of radiation emitted during radioactive decay and balanced equations for nuclear reactions	1) Before learners start the activities, provide resources such as textbooks, scientific articles, online databases, videos, or interactive simulations related to atomic structure, nuclear fission and radiation. After the learners have gathered information, have them reflect on their findings and share their understanding with the class. Then provide constructive feedback to enhance their comprehension. 2) Assess the reports based on the quality of learners' writing, such as the clarity and coherence of their

Learning Outcomes:	Suggested Learning Activities	Sample Assessment Strategy
c) understand and appreciate that there are significant social, political and environmental dimensions associated with use of nuclear power (u)	• interpretation and drawing of graphs showing the decay of radioactive isotopes and the concept of half-life • the applications of radioactivity, its dangers and safety precautions	ideas, their use of accurate and relevant information, their ability to use evidence to support their views. Also, assess their critical thinking skills, such as their ability to analyse and evaluate information, and their creativity in proposing new ideas or solutions.

ICT support

The learner can use:

i) a suitable website to search for information about radioactivity.

ii) animations to demonstrate nuclear fission, nuclear fusion and graphical features illustrating decay of radioactive isotopes and determination of half-life

Hint to the teacher

i) Guide learners on the appropriate websites for research on radioactivity

ii) Ensure that learners are fully engaged during research activities

iii) Emphasise graphical illustration of radioactive decay of isotopes

ASSESSMENT

Assessing the expectations for learning

The AEP curriculum sets expectations for learning with a focus on skills and deeper understanding. These Learning Outcomes require a different approach to assessment.

The "Learning Outcomes" on this syllabus are set out in terms of Knowledge, Understanding, Skills, and Attitudes. This is what is referred to by the letters k, u, s, v/a. It is not possible to assess attitudes in the same way as knowledge, understanding and skills because they are more personal and variable and are long-term aspirations. The assessment of each of them can be done based on their implications for learning and assessment as provided in the table below:

Knowledge	The retention of information to be recalled accurately
Understanding	The ability to explain in one's own words, interpret, or summarise information, facts, or concepts. ability to
Skill	The ability to perform a physical or mental act or

To assess knowledge, skills and understanding we need to look for different things. Knowledge can be assessed based on written tests such as multiple-choice questions, fill-in-the-blanks, or other forms of recall-based assessments; understanding may be assessed based on short-answer questions, essays, or other forms of application-based assessments; but the assessment of skills may use the following strategies: performance-based assessments in which learners demonstrate their skills by performing a task or activity, observation of learners as they perform a task or activity to assess skills, such as communication skills, respect of each other's opinions, time management and teamwork, and peer assessments where learners evaluate each other's skills and providing feedback especially for promoting collaboration and communication skills.

Knowledge Knowledge is the easiest to assess because it is fairly straightforward to find out whether or not a learner has retained some information: a simple question can usually find this out. We ask them to name something, or state something, or label a diagram.	**Skills** Skills are the ability to perform a mental or physical operation, so we have to observe the skill being performed or look at the product, or outcome, of the skill; for example, a piece of writing, a picture or diagram. Some skills, such as speaking or a physical education skill do not have a product so need to be observed.
Understanding Assessing deeper understanding is much more difficult, so we usually ask learners to explain, compare or outline a process. This can be done orally (in conversation) or in writing, and will give us some idea of the extent of their understanding.	**Values and Attitudes** Values and Attitudes determine how we interact with others, working in a team, meeting deadlines, being self-driven, holding democratic values, and having respect for democracy, race, gender, disability, human dignity, culture, nation, life and social justice.

Examinations

The role of the teacher in the competency-based curriculum is to create a more responsive and effective learning environment that supports the ongoing growth and development of all learners. For this reason, there will no longer be examinations or tests set at the beginning, mid and end of term. Instead, teachers will use formative assessment to sum up on-going learning in order to identify areas where learners may need additional support or intervention. This way, teachers will be able to provide them with timely and specific feedback that they can use to adjust their learning strategies and improve their performance.

Formative Assessment

Formative assessment is a process of gathering and using feedback on learners' progress and understanding to inform and adjust instruction. It is an ongoing, classroom-based process that is used to monitor and support learners' progress toward meeting learning goals. The goal of formative assessment is to help learners improve their learning by providing them with timely and specific feedback that they can use to adjust their learning strategies and improve their performance.

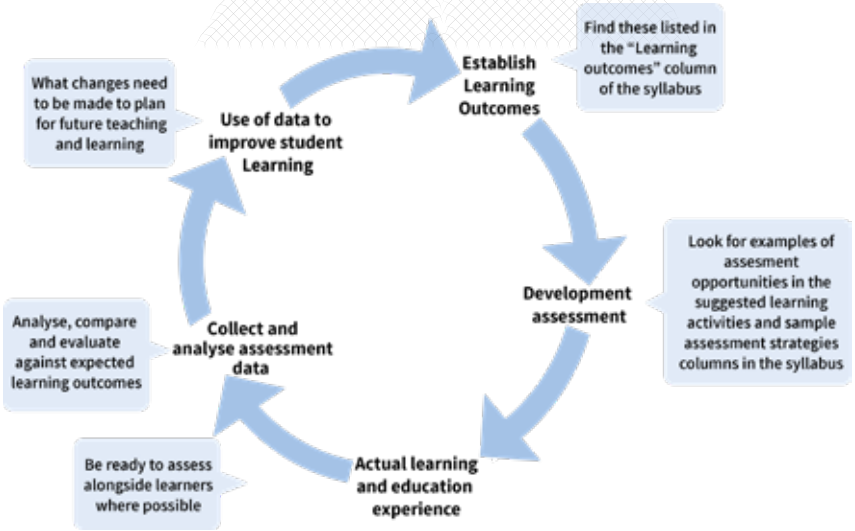
Therefore, if assessment is to make a difference to teaching and learning, teachers must use the information they gain from assessment to make some change to the teaching and learning process. The changes that can be made include decisions about:

- What needs to be learned next.
- Whether the concept/topic needs to be taught again in a different way.
- Changing teaching approaches, if necessary.
- Identifying learners who need more support, or who are making exceptional progress.
- Enabling learners to understand what they have to do to improve.

The key to the success and impact of formative assessment is to use of the data gathered throughout the assessment to improve teaching and learning. In order to support teacher, implement effective formative assessment, this syllabus has provided them with a framework for designing and implementing strategies that support learners' ongoing growth and development:

1) The syllabus sets out the learning outcomes.
2) The suggested activities seek to achieve these outcomes.
3) The suggested assessment strategies help teachers to find out whether or not the outcomes have been achieved.

The process of teaching, making formative assessments and then changing the teaching and learning in some way can be seen as a cycle:



How do we find formative assessments useful in AEP?

Formative assessment is highly relevant and beneficial in an accelerated education programme. In an accelerated education setting, learners progress through the curriculum at a faster pace than in traditional programmes, which can pose both opportunities and challenges. Formative assessment plays a crucial role in optimising the learning experience and achieving the desired learning outcomes. Here's why formative assessment is particularly relevant in accelerated education:

1) In an accelerated education programme, the pace of learning is accelerated, and learners cover more material in a shorter time frame. Formative assessment allows teachers to continuously monitor learners' progress, understanding, and performance. This real-time feedback helps identify any learning gaps or misconceptions early on, enabling timely interventions and adjustments to the teaching approach.
2) Frequent formative assessments can increase learners' engagement thereby providing them with a sense of ownership over their learning and allowing them to reflect on their progress. Quick feedback and visible growth can motivate them to stay focused and committed to their studies.
3) Formative assessment data helps teachers adjust the curriculum pace, ensuring that it remains challenging yet manageable for all learners.
4) In accelerated programmes, learners may have opportunities to advance to higher-level material once they have mastered certain topics. Formative assessment helps pinpoint areas where learners have achieved mastery, enabling them to move ahead confidently.
5) Formative assessments can be diverse, catering to various learning styles. This flexibility allows learners to demonstrate their understanding in ways that suit their strengths, promoting a more inclusive learning environment.
6) Students become more aware of their strengths and areas of improvement, enhancing their ability to self-regulate their learning.
7) Frequent formative assessments can help reduce test anxiety in learners. Since they are continuously assessed throughout the learning process, the pressure of a single high-stakes exam is lessened.

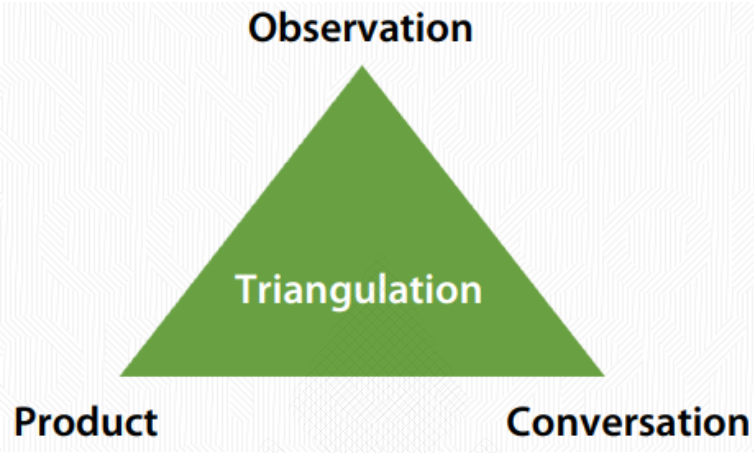
Generally, formative assessment is part of the normal teaching and learning process, and so the assessment opportunities will also occur during this process.

Teachers can employ various strategies, including observation, conversation, and product assessment, to conduct formative assessments in an accelerated education programme:

- Observation – Teachers can observe learners during classroom activities, discussions, and group work to gauge their understanding, engagement, and learning behaviours. By paying close attention to how learners approach tasks and interact with the material, teachers can identify areas where learners may need additional support or extension.
- Conversation – Engaging in one-on-one or small group conversations with learners allows teachers to assess their comprehension, clarify misconceptions, and address any questions or concerns. These informal discussions provide valuable insights into individual learner progress and help personalise instruction to meet their specific needs. Product – appraising learners' work (writing, report, translation, calculation, presentation, map, diagram, model, drawing, painting etc.) provide tangible evidence of their learning and understanding.

Teachers can use these products to assess how well learners have grasped the concepts and whether they are meeting the learning outcomes. Analysing the quality and depth of the products can guide instructional adjustments to cater to learners' needs.

When all three are used, the information from any one can be checked against the other two forms of assessment strategies (e.g., evidence from "observation" can be checked against evidence from "conversation" and "product"). This is often referred to as "triangulation".



Triangulation of assessment strategies

Triangulation of assessment refers to the practice of using multiple strategies of assessment to gain a comprehensive understanding of a learner's performance, progress and learning needs. By combining data from various assessment strategies, teachers can develop a more accurate and well-rounded picture of a learner's abilities and challenges. In this syllabus, triangulation of assessment has been provided in the form of expected learning outcomes, suggested activities and suggested assessment strategies:

i) Learning outcomes define what learners are expected to know or be able to do by the end of the learning period. They act as a reference point for assessing learners' progress and understanding.

ii) Learning activities show the intended learning outcomes. By observing how learners engage with these activities, teachers can gain insights into their learning process and understanding.

iii) Assessment strategies, such as quizzes, projects, discussions and presentations, provide diverse perspectives on learners' learning. By using a mix of assessment strategies, teachers can obtain a more holistic view of learners' abilities and identify any gaps or areas for improvement.

By combining these three elements in an integrated manner, teachers can effectively monitor learner progress, adjust their instructional approach, and ensure that learners are achieving the intended learning outcomes in an accelerated education programme.

Record Keeping

Keeping detailed records of learners' individual progress is always difficult with very large numbers of learners. For the purposes of school-based formative assessment, it is not even always necessary to keep such detailed records anyway. If feedback is given immediately and action is taken, then learning is changed and the record would soon become out of date and redundant.
Most formative class-based assessments are dynamic in that they feed straight back into the teaching and learning process. Therefore, detailed records of these are not appropriate.

What is needed is record of assessments of learners' learning made in terms of each topic. This means recording the on-going summative assessments of each topic. There is no need to make separate records of each of the learning outcomes because this would be very time-consuming and also unnecessary. It is much more useful to make an overall assessment about whether or not each learner met the learning outcomes for each topic as a whole. Each topic is made up of a number of learning outcomes. Therefore, teachers need to consider all the learning outcomes when making an overall judgement about the topic as a whole. By looking at the learning outcomes within each topic, it is possible to identify four broad groups of learners in terms of their achievements:

Some LOs achieved, but not sufficient for overall achievement
Most LOs achieved and is enough for overall achievement
All LOs achieved with ease

There is no need to set a test to find this out.
These overall assessments should be made on the basis of the many formative assessments that the teacher has made during the course of teaching the topic. If teachers have been working with learners over the course of the topic, they will be able to make a broad judgment about which learners have achieved or have failed to achieve the topic's overall learning expectation. These"authentic assessments" will be more valid and valuable than a test set by the school.

Recording these overall assessments will be simple, manageable and yet valuable, and can be recorded on a sheet such as the one below in which the categories are indicated with a number.

Although a very simple process, these three categories will give rich data when a comparison is made between learners in each category for different subjects and topics. They will also identify easily those learners who need extra support or who may not be ready to move on to the next grade at the end of a year.

If records are kept of the learning outcomes of each syllabus unit through the year, there will be no need for an end of year test. Teachers will already have a record of those learners who have met the learning outcomes, and those who have not done so. Therefore, teachers will know if there were any learners not ready to progress to the next grade.

An overall record should be made of the individual topic assessments by subject in terms of the 3 descriptors. If numbers (1–3) are used as identifiers, it will be possible to arrive at an overall number for a year by aggregating the identifiers for each unit.

Descriptor	**Identifier**
Some LOs achieved, but not sufficient for overall achievement	1
Most LOs achieved and is enough for overall achievement	2
All LOs achieved with ease	3

In the example below, the table shows the end-of-unit assessment for six learners.

Chemistry										
Topic	**T1**	**T2**	**T3**	**T4**	**T5**	**T6**	**T7**	**T8**	**T9**	**T10**
Learner A	3	3	2	3	3	3	3	2	3	3
Learner B	2	2	3	2	3	2	2	2	3	2
Learner C	1	1	2	1	1	2	2	3	2	3
Learner D	1	1	2	1	1	2	1	1	2	1

This method will give much more information than using a tick. For example, at a glance it can be seen that learners A & B are achieving much higher than learners C & D. It can be seen that Learner C has improved during the year. We can even see that more learners achieved success in Topic 9 than Topic 7.

All of this is very valuable assessment information and can be used to improve learning.

Activities of integration (AoI) and projects in AEP chemistry will also be part of the assessment, contributing to the 20% classroom-based assessment. Then, 80% will be from the end of cycle.

This summative teacher assessment will contribute to the final grade of the School Leaving Certificate.

Glossary of Key Terms

TERM	DEFINITION
Competency-based Curriculum	focuses on specific skills, knowledge and abilities that learners should acquire. It is learner-centred and adaptive to the changing needs of learners, teachers and society.
Differentiation	The design or adaptation of learning experiences to suit an individual learner's needs, strengths, preferences, and abilities.
Formative Assessment	refers to a wide variety of methods or strategies that teachers use to conduct in-process evaluations of learners' comprehension, learning needs, and academic progress during a lesson or topic to help teachers identify concepts that learners are struggling to understand, skills they are having difficulty acquiring, or learning standards they have not yet achieved so that adjustments can be made to the lessons and instructional techniques.
Generic skill	also known as transferable skills, are essential skills that can be applied across various subjects, occupations and contexts. They are not specific to a particular subject area but are essential in contributing to a learner's overall success in the learning of all subjects.
Inclusion	An approach to planning learning experiences which allows each learner to feel confident, respected and safe and equipped to learn at his or her full potential.

TERM	DEFINITION
Learning Outcome	refers to a statement which specifies what the learner should know, understand, or be able to do within a particular aspect of a subject.
Process Skill	is a capability acquired by following the programme of study in a particular Learning Area; enables a learner to apply the knowledge and understanding of the Learning Area.
Sample Assessment Activity	refers to an activity which gives a learner the opportunity to show the extent to which she/he has achieved the learning outcomes. This is usually part of the normal teaching and learning process, and not something extra at the end of a topic.
Suggested Learning Activity	refers to an activity that is designed to support learners in achieving specific learning outcomes. It is typically provided by the teacher or educational resource as a way to guide learners in their learning and help them achieve their goals.

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