REPUBLIC OF CAMEROON
Peace – Work - Fatherland

REPUBLIQUE DU CAMEROUN
Paix – Travail – Patrie

MINISTRY OF SECONDARY EDUCATION
MINISTERE DES ENSEIGNEMENTS SECONDAIRES

INSPECTORATE GENERAL OF EDUCATION
INSPECTION GENERALE DES ENSEIGNEMENTS

CHEMISTRY TEACHING SYLLABUS FOR SECONDARY GENERAL EDUCATION

Forms 3, 4 and 5







Observing the environment in order to make informed choices on training options for a successful future.

INSPECTORATE OF PEDAGOGY IN CHARGE OF SCIENCES
INSPECTION DE PEDAGOGIE CHARGEE DE L'ENSEIGNEMENT DESSCIENCES

December 2014

REPUBLIQUE DU CAMEROUN
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MINISTRY OF SECONDARY EDUCATION

INSPECTORATE GENERAL OF EDUCATION

Order N° 419/14 /MINESEC/ IGE ..... - 9 DEC 2014

To outline the syllabuses for Form III, Form IV and Form V of Secondary General Education.

THE MINISTER OF SECONDARY EDUCATION,

Mindful of the Constitution;
Mindful of the Law N° 98/004 of 14 April 1998 to lay down Guidelines for Education in Cameroon;
Mindful of Decree N°2011/408 of 9 December 2011 to reorganise the Government;
Mindful of Decree N°2011/410 of 9 December 2011 to form the Government;
Mindful of Decree N°2012/267 of 11 June 2012 to organise the Ministry of Secondary Education;

HEREBY ORDERS AS FOLLOWS:

Article 1: The syllabuses for Form III, Form IV and Form V of Secondary General Education shall be outlined as follows:

PREFACE

SYLLABUSES FOR 21ST CENTURY CAMEROON

At the beginning of this millennium, as Cameroon chooses to become an emerging nation by the year 2035, its secondary education sector faces many challenges. It should:

- Offer quality training and education to most young Cameroonians within a context marked by large classes in primary education;
- Prepare them for smooth insertion into a more demanding job market worldwide, through a pertinent teaching /learning process.

In addition, training tools have significantly evolved in their conception and implementation. A school that was mostly based on contextualised knowledge acquisition has given room, all over the world, for a school that aims at empowering learners to help them cope with complex and diversified real life situations. Instead of a school cut off from society, we now have a school deeply rooted in a society that takes into account sustainable development, local knowledge and cultures.

The implementation of this new school ,prescribed by the Law to lay down guidelines for education in Cameroon, and the necessity for socio-professional insertion require the adoption of a pedagogic paradigm for the development of syllabuses relating to **"The competence based approach with an entry through real life situations ".**

In this perspective, new syllabuses for Secondary General Education, those of Teacher Education and Training Referentials for Technical Education are part of this great change for the re-dynamisation of our education system. They are in line with the implementation of the provisions of Growth and Employment Strategy Paper (DSCE) which, by the year 2020, specifies the minimum amount of knowledge which each Cameroonian is supposed to possess by the time they leave the first cycle of secondary education.

These syllabuses define essential competencies that should be acquired by learners within the first cycle of secondary education, in terms of knowledge, know how and attitudes. They equally define the framework that will enable teachers to organise their pedagogic activities.

While congratulating all those who designed these syllabuses, I hereby exhort all the members of the education family, notably teachers, to acquaint themselves with the new paradigm, to effectively implement it and make the Cameroon education system successful.

The Minister of Secondary Education

Louis Bapes Bapes

FIRST CYCLE SYLLABUS REVIEW

A PARTICIPATORY AND INNOVATIVE APPROACH

The syllabuses that were drawn up by the Inspectorate General of Education in the Ministry of Secondary Education since 2012 are in accordance with the major guidelines for education in general and secondary education in particular as they are enshrined both in the 1998 law to lay down guidelines for education in Cameroon and in the 2009 Growth and Employment Strategy Paper(DSCE) .

These orientations could be summarised, amongst others, to train within the framework of an emerging Cameroon in the year 2035, citizens that will have a good mastery of the two official languages (English and French), deeply rooted in their cultures but open to a world in search for sustainable development and dominated by Information and Communication Technologies.

Conceived in the various Inspectorates of Pedagogy, and later introduced for trialling in secondary and high schools during the 2012/2013 school year, these syllabuses were developed with the contributions of classroom teachers and teacher trade unionists.

The new syllabuses had to undergo many changes:

- a shift from a skill based approach to a competence based approach through real life situations;
- a shift from a school cut off from society to one that prepares citizens for a smooth insertion into socio-cultural and economic activities ;
- a shift from an evaluation of knowledge to that of competences necessary to sustainable development.

When these new changes and orientations were taken into account, they naturally led to a shift of paradigm within the curriculum reform process. The option we have adopted is the competence based approach through real life situations.

The syllabuses of the first cycle of Secondary General Education are broken down into 5 areas of learning, each of them containing a given number of disciplines as shown in the table below.

Areas of learning	Disciplines
1- Languages and Literature	- French - English - Living Languages II - Ancient Languages - Literature(in English and in French)
2- Science and Technology	- Mathematics - The Sciences(Physics, Chemistry, Technology, Life and Earth Sciences) - Computer Science
3- Social Sciences/Humanities	- History - Geography - Citizenship Education
4- Personal Development	- Sports and Physical Education - Manual Labour
5- Arts and National Cultures	- National Languages - National Cultures - Arts

For 6e and 5e (Francophone sub -system of education), the weekly workload and the quota as compared to the total number of hours on the time table (32 h) are displayed in the table below.

Domaines d'apprentissage	Volume horaire	Quota
Langues et Littératures	10 h	30%
Sciences et Technologies	08 h	25%
Sciences Humaines	06 h	20%
Arts et Cultures Nationales	04 h	15%
Développement Personnel	03 h	10%

One hour is allotted for preps.

For the Anglophone sub-system of education (Form I and Form II) the same information is summarised in the table below.

Areas of Learning	Weekly workload	Quota
Languages and Literature	10 h	30%
Science and Technology	08 h	25%
Social Sciences	06 h	20%
Arts and National Cultures	04 h	15%
Personal Development	03 h	10%

The Inspector General of Education

Dr. Mrs Evelyne Mpoudi Ngolle

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END - OF - FIRST CYCLE LEARNER'S EXIT PROFILE

The first cycle of Secondary General Education admits young graduates from primary schools aged between ten and fourteen. Its general objectives are not only to build intellectual, civic and moral skills in these children but also competences and fundamental knowledge which will either enable them to foster their education in the second cycle, or to prepare them for a smooth insertion into the job market after professional training.

Thus, within the framework of these new syllabuses, the learner is expected , after the first cycle of secondary education, to be able to use his/her competences to solve problems through family of situations relating to domains of life as indicated in the table below:

N°	Domains/Areas of life	Families of situations to be treated in the 1st cycle
1	Family and social life	• Participation in family life • Healthy professional relationships • Social integration
2	Economic life	• Discovery of income generating activities • Discovery of the job market, social roles, jobs and professions • Self confidence, aspirations, talents, self potential • Practising healthy eating habits
3	Environment , health and well being	• Preservation of the Environment • Quest for a healthy life style • Choosing and practising a healthy life style
4	Citizenship	• Mastery of rules and regulations governing the Cameroonian society • Discovery of cultural values and customs of the Cameroonian society
5	Media and Communications	• Discovery of the media world • Discovery of Information and Communication Technologies

In order to achieve these objectives, the learner should be able to mobilise , within the various disciplines and constructive areas of learning of the syllabuses, all the pertinent resources in terms of knowledge, know how and attitudes.

The next table gives you a general overview of the afore-mentioned objectives, while the syllabus for each subject unfolds, in details, all the expected competences per level and at the end of the 1st cycle.

Areas of Learning	Disciplines	Expected outcomes at the end of the 1st cycles
1-Languages and Literature	**Living languages:** English, French , German, Italian, Spanish, Chinese, Etc.	**French and English , L1** Receptive skills: reading and listening Read in an autonomous way, different types of texts related to areas of life as defined in the syllabus; Listen and understand various texts related to the above mentioned areas of life Productive skills: speaking and writing Produce various types of texts , of average length related to these areas of life; Language tools: appropriate use of various language tools in order to produce and read types of texts related to that level;
	English to Francophone learners French to Anglophone learners	Communicate accurately and fluently using all four basic skills in language learning; Be able to transfer knowledge learnt in class to real life situations out of the classroom; Be able to cope and survive in problem solving situations;

		Living languages II Receptive skills: reading and listening Read and understand simple texts on social life, citizenship, the environment, well being and health, media etc.. Listen and get oral information in order to simply interact during communication situations related the various domains of life. Productive skills: speaking and writing Sing, recite, dramatise , orally answer questions related to the various domains of life as defined in the syllabus; Write short passages on various familiar topics.
	Ancient languages: Latin, Greek **National languages** **Literature** Cameroon Literature; French Literature; Francophone Literature; Other literatures	Develop general knowledge through ancient languages and cultures; know the origins of the French language for linguistic mastery; Carry out elementary tasks in translation.
2-Science and	Mathematics,	Use mathematic knowledge skills and values with confidence to solve real life problems within the different

Technology	The Sciences Computer Science	domains of life; Communicate concisely and unambiguously and develop power of mathematical reasoning (logical thinking, accuracy and spatial awareness).
		The Sciences: Acquire the fundamentals of sciences in order to understand the functioning of the human body, the living world, the earth and the environment; Acquire methods and knowledge to understand and master the functioning of technical objects made by man to satisfy his needs; Demonstrate attitudes to protect his/her health and environment.
		Computer Science : Master the basics of Information and Communication Technologies; Exploit and use ICTs to learn.
3- Social Sciences /Humanities	**History** **Geography** **Citizenship Education**	Possess cultural references to better locate events in time and space within a democratic system and become a responsible citizen. **History:** Acquire a common culture ; be aware of heritage from the past and current challenges; **Geography :**

		Develop one's curiosity and knowledge of the world; Get acquainted with landmarks to find your way and fit in the world. **Citizenship Education:** Possess essential knowledge in rights and duties in order to fulfil his/her citizenship.
4- Personal Development	**Moral Education;** **Home Economics;** **Sports and Physical Education** **Health Education**	Develop his / her physical abilities/skills ; Get ready for physical challenges , save and regain energy after physical efforts; Identify risk factors; possess basic knowledge and principles in hygiene and health education; Demonstrate a sense of self control and appreciate the effect of physical activities. Conceive and draw up sports and cultural animation projects; Acquire methods and develop a high sense of efforts; Conceive, draw up and implement projects that will enable one to project his/her image and feel the well being inspired by self-confidence.
5- Arts and National Cultures	**Arts/Artistic Education;** **National Cultures**	**Artistic Education:** Observe and appreciate works of art; Carry out an artistic activity; Gradually acquire the love for personal expression and

		creativity; Possess a mastery of creativity in music, plastic arts and the performing arts. Dramatise, recite texts (poems, tales, proverbs, etc.) relating to various areas of society; Practise the different dramatic genres: sketches, comedy, tragedy, drama, etc. **National languages and Cultures** Demonstrate a mastery of Cameroon cultures; Visit the various cultural areas of the country in order to discover their characteristics; Demonstrate a mastery of basic rules in writing Cameroonian languages as well as basic grammatical notions applied to these languages; Demonstrate a mastery of one of the national languages at 3 levels: morpho-syntax, reception and production of simple oral and written texts.
Even though the learners acquires skills in different disciplines, these competences are accompanied by other skills known as cross curricular competences related to intellectual, methodological, social and personal areas of learning.		
6- Cross curricular competences	Intellectual and Methodological domains	Solve Problem in a given situation; Use knowledge skills and values with confidence in order to solve real life problems within the different domains of life; With confidence, find useful information to solve problems he/she is faced with; Give his/her opinion ; Support his/her opinion with strong arguments ;

		Assess him/herself with a view to remediation; Demonstrate basic knowledge in note taking ; Conceive and realise individual projects; Analyse and summarise information, give feedback and report orally or in writing. Develop problem solving approaches; Exploit and use ICTs in his/her activities.
	Social and Personal Domains	Interact positively and assert his/her personality while respecting that of other people; Join team work, fit in a common initiative project /group; Demonstrate interest in cultural activities ; Develop a sense of effort, love for work, perseverance in tasks or activities carried out ; Understand and accept others in intercultural activities; Accept group assessment.

The resources to be mobilised by the learner are found in many disciplines and areas of learning. So it is important to implement these syllabuses not in isolation but as interrelated subjects. These remarks hold both for subject and cross curricular competences. They are so called to show that they should be developed through teaching/learning activities of the different subjects. The development of subject and cross curricular competences concern the entire education family as they are capable of inspiring an educative project and the putting in place of extra curricular activities. The ultimate training goal of these syllabuses, at the end of the first cycle, is to enable the learner to be self reliant, to be able to keep on learning through out his/her life, to contribute to sustainable development and become a responsible citizen.

TABLE OF CONTENTS

General Statement:
This Chemistry Teaching Syllabus is a statement of a defined course work to educate young Cameroonians in the third, fourth and fifth years of Chemistry in Secondary Education. It has been developed as an integrated course which aims to contribute towards a mixing of new and old materials so that the new concepts permeate the whole.
This syllabus also aims at creating awareness in the student of the importance of chemistry in the society in which he/she lives. It is conceived to provide a smooth transition from the daily realities of chemistry in the student's life to more concrete concepts without creating a barrier.

It caters for the student whose previous education in Chemistry is based on the aspects of chemistry studied in Form 1 and Form 2 and prepares the student to the acquisition of the Ordinary Level Certificate and/or vocational training. It therefore covers the requirements of the Cameroon G.C.E. Board Examination Syllabus.

The Goals
The general aims and objectives for the whole Chemistry course are broken down to specific goals and aims which are progressive. For Forms 3, 4 and 5, they are as follows:

1. Identify patterns in the physical and chemical behaviour of substances;
2. Use experimental techniques and design of experiments;
3. Understand and apply Principles of Chemistry;
4. Handle problems in everyday life by using ideas, concepts and skills developed in the Chemistry course;
5. Create an awareness of chemistry in the Cameroonian society and the world and an application of the social and environmental aspect of chemistry.

The entire syllabus is done based on the Competency-Based Approach with daily life situations as the focal point, using the student-centred experimental approach to the teaching of the subject in each of the classes. The experimental resources to be used at all levels of the teaching syllabus include:

- simple materials in the environment;
- conventional laboratory chemicals and equipment;
- microchemistry equipment.

Time allocation
To cover this syllabus, the recommended **weekly** time allocation for each of Forms 3, 4 & 5 is:

CLASS	TIME ALLOCATION (A period is 50 minutes)	Theory, demonstrations, experiments.
Form 3	One double period and one single period	50 min. x 3
Form 4	One double period and one single period	50 min. x 3
Form 5	One double period and one single period	50 min. x 3

Profile of learner at the end of the first cycle

By the end of the first cycle the programme of study is expected to inculcate (promote) in the learner responsible behaviour, knowledge and competencies, which should enable him/her to be able to:

- explain natural phenomena ;
- meet with the challenges of life, through the use of scientific approach in problem solving;
- manage the environment in a sustainable manner;
- safeguard his/her health and that of all others in his/her surrounding;
- imbibe the scientific method;
- use process skills to acquire knowledge;
- read security notices;
- communicate his/her results.
- apply scientific reasoning to solve real life situations.

Evaluation

The evaluation of this syllabus will aim to test the knowledge and competencies (skills, abilities) in different areas:

- Ability to apply the understanding in solving problems, the ability to use the scientific information given, for example in graphical or tabular form.
- Ability to organize material and present ideas in a clear and logical manner.
- Ability to handle patterns in chemical knowledge and show critical, imaginative and inferential thinking skills.
  All forms of evaluation will place emphasis on the specific aptitudes outlined at the beginning of each topic.
- Practical skills will be evaluated with respect to:
  - Use of and care for equipment
  - Design and use of experiments
  - Quantitative and/or qualitative analyses.

- By the end of the three years of studies in Forms 3, 4 and 5, the learner will be required to have shown proof of the acquisition of a specified number of competencies. See Table on minimum expected competencies below to guide you.

All forms of evaluation will place emphasis on the specified competencies/aptitudes outlined for each topic/module.

GENERAL PRESENTATION OF MODULES

MODULE II: MATTER: PROPERTIES AND TRANSFORMATION

1. TIME ALLOCATION: 177 (75 + 60 + 42) PERIODS

2. GENERAL PRESENTATION:

Most of the core content of Chemistry in Forms 3 to Form 5 comprises matter, its characteristics and some reactions (i.e. transformation).This module consists of the following topics:

- Atoms.
- Structure of the atom in relation to the Periodic Table.
- Structure and Bonding.
- Acidic and alkaline solutions.
- Chemistry of the elements: The Halogens.
- Chemistry of the elements: Oxygen.
- Chemistry of the elements: Sulphur.
- Chemistry of the elements: Nitrogen.
- Chemistry of the elements: Phosphorus.
- Chemistry of the elements: Carbon.
- Chemistry of the elements: Hydrogen.
- Principles of Chemistry: Formulae, Moles and Equations.
- Principles of Chemistry: Electrochemistry and Redox reactions.
- Principles of Chemistry: Solutions and acid-base titration.
- Chemistry of the elements: Alkali metals and alkaline earth metals.
- Chemistry of the elements: Transition metals.
- Chemistry of the elements: Identification of ions.
- Salts.
- Organic Chemistry.
- Principles of Chemistry: Gaseous state.
- Principles of Chemistry: Energetics.
- Principles of Chemistry: Rates of reaction.
- Principles of Chemistry: Reversible reactions
- Chemistry in society: Extraction of metals.
- Chemistry in society: Heavy chemical industries.

After looking at some basic notions of matter in Form 1 and Form 2, more emphasis is laid on the properties and transformation of matter. In this regard the atom is studied in more detail, the periodic table is introduced and the chemistry of the elements is then treated. Notions of quantity

chemistry (mole concept) and organic chemistry are introduced with transformations being represented by appropriate equations; without minimizing chemistry in society. To achieve this, the teacher has to sharpen the curiosity of the learner in such a way as to permit him/her to recognise, describe and interpret some phenomena that occur in his/her environment on a daily basis, and to use the knowledge acquired to solve daily-life challenges; and also to carryout, observe and interpret simple chemical reactions.

3. CONTRIBUTION OF THE MODULE TO THE GOALS AND OBJECTIVES OF THE CURRICULUM

This module seeks to help learners improve their relationship with and knowledge of the material world by deepening their knowledge acquired in the primary school and latter on during the first two years of secondary education.

4. CONTRIBUTION OF THE MODULE TO THE CURRICULUM AND TO AREAS OF LIFE.

To enable learners improve on their relationship with the material world, the teacher should stimulate the learner so as to tap from him/her the ability to read, calculate, manipulate, estimate and interpret.

To achieve this, the learner needs skills in languages (English and French), Mathematics, Chemistry, Physics, Technology and Biology.

In this module, the learner is required to take decisions that affect his/her health, physical and social environments.

MODULE III: ENERGY: APPLICATIONS AND USES

1. TIME ALLOCATION: 24 PERIODS

2. GENERAL PRESENTATION:

This module presents basic concepts in energy based on the Principles of Chemistry already introduced Form 1 and Form 2, with emphasis on heat and electricity. It is subdivided into two topics as follows:

- Principles of Chemistry: Electrochemistry.
- Principles of Chemistry: Energetics.

3. CONTRIBUTION OF THE MODULE TO THE GOALS AND OBJECTIVES OF THE CURRICULUM

The study of energy helps in the construction of reasoning and familiarity with resources around us. The study of energy will enable the learner to develop the ability to visualize, interpret, justify, classify, clarify, appreciate, quantify, project, and describe the world through the availability of the different energy resources, their location, and relationships. This will also develop in the learner the spirit of initiative, creativity and enterprise. All these competencies enable the learner to become autonomous and independent to carryout different activities in the environment.

4. CONTRIBUTION OF THE MODULE TO THE PROGRAMME OF STUDY AND TO THE AREAS OF LIFE.

The content of this module has as objective to reinforce the capacity of the learner in carrying research and integrating himself/herself into the social milieu. On the other hand, this module initiates the learner into project development and enables him/her to acquire knowledge of technological and methodological approaches. The acquisition of this scientific knowledge will need aspects of Mathematics, Geography, Information / Computer technology, etc.

In this module the basic notions of energy are given, how it is handled and used. This calls on the learner to make reference to daily actions vis-a-vis the energy in the following areas of life: media and communication, social and family life, citizenship, health care, environmental protection, welfare and economic life.

MODULE VI: ENVIRONMENTAL EDUCATION AND SUSTAINABLE DEVELOPMENT

1. TIME ALLOCATION: 30 PERIODS

2. GENERAL PRESENTATION:

This module takes into consideration the notion of chemistry in the society and handles extraction of metals and heavy chemical industries; and comprises two topics as follows:

- Chemistry in society: Extraction of metals.
- Chemistry in society: Heavy chemical industries.

The industrial preparation processes involved eliminate various waste products and the disposal of these products needs to be handled with care, as waste disposal has become a serious environmental hazard within the last few years. It is necessary to create awareness in learners as to the presence of these waste products and to sensitize them on the challenges of their sustainable management.

The treatment of the proposed family of situations in this module should help learners acquire investigative skills, refine their observation skills, implement techniques of data collection and organization, as well as methods of quantitative and qualitative data analysis, to help them adopt responsible behavior concerning the protection of their environment. The treatment of the families of situations also ought to help learners to take note of the evolving nature of solutions related to the challenges faced in our environment.

3. CONTRIBUTION OF THE MODULE TO THE GOAL AND OBJECTIVES OF THE CURRICULUM:

The skills the learner will acquire in this module will better equip him/her to sustainably manage his/her environment. This module would also invoke the love for careers like medicine, agronomy, teaching environmental education etc.

4. CONTRIBUTION OF THE MODULE TO THE PROGRAMME OF STUDY AND TO AREAS OF LIFE.

This module will develop in the learner skills linked to communication and interpersonal relations, decision making, critical thinking, scientific mind, self esteem. These skills are indispensible in all the science subjects and other areas of learning.

This module also provides essential resources for the appropriation of the content on environmental education and sustainable development, and health education.

The importance of this module lies in the fact that the learner who permanently lives in a more or less hostile environment whereby the different natural resources are a source of socio-economic challenges, should know that only sustainable management of these resources can lead not only to a comfortable life but also to social peace. The family, social and economic life, the environment, well-being and health depend on man's behavior in his environment.

COMPREHENSIVE TABLE SHOWING THE MODULES FOR FORM 3, FORM 4 AND FORM 5

The Competency-Based Approach (CBA) paradigm requires that the syllabus be written in modules. The syllabus for these three years of secondary education in Chemistry comprises three of the six modules in Science and Technology (Matter: Properties and Transformation, Energy and Environmental Education); having eleven topics in Form 3,eight in Form 4 and five in Form 5.

a) The modules.

Cycle	Level	Title of module	Topic	Family of situations	Duration/ (Periods)
First Cycle	Form 3	Matter: Properties and Transformation	1. Atoms.	Structure of the atom. Identification of tiny invisible subatomic particles	06
			2. Structure of the atom in relation to the Periodic Table.	Understanding the structure of the atom. Significance of valence electrons	06
			3. Structure and Bonding.	Identification of the forces holding particles together and the structures of substances.	11
			4. Acidic and alkaline solutions.	Classification of solutions based on their behavior with indicators.	05
			5. Chemistry of the elements: The Halogens.	Chemistry of the elements	13
			6. Chemistry of the elements: Oxygen.	Chemistry of the elements	06
			7. Chemistry of the elements: Sulphur.	Chemistry of the elements	08
			8. Chemistry of the elements: Nitrogen.	Chemistry of the elements	09
			9. Chemistry of the elements: Phosphorus	Chemistry of the elements	01
			10. Chemistry of the elements: Carbon.	Chemistry of the elements	08
			11. Chemistry of the elements: Hydrogen.	Chemistry of the elements	06-80
	Form 4	Matter: Properties and Transformation	1. Principles of Chemistry: Formulae, Moles and Equations.	Amounts of substances	12
		Energy	2. Principles of Chemistry: Electrochemistry. Redox reactions	Action of electricity	15
		Matter: Properties and Transformation	3. Principles of Chemistry: Solutions and acid-base titration.	Volumetric analysis	09
			4. Chemistry of the elements: Alkali metals and alkaline earth metals.	Chemistry of the elements	07
			5. Chemistry of the elements: Transition metals.	Chemistry of the elements	06
			6. Chemistry of the elements: Identification of ions.	Chemistry of the elements	03
			7. Salts.	Salts	06
			8. Organic Chemistry.	Organic compounds	17
	Form 5		1. Principles of Chemistry: Gaseous state.	Principles of Chemistry	06
		Energy	2. Principles of Chemistry: Energetics.	Principles of Chemistry	10
		Matter: Properties and Transformation	3. Principles of Chemistry: Rates of reaction. Reversible reactions	Principles of Chemistry Principles of Chemistry	0603 03
		Environmental Education	4. Chemistry in society: Extraction of metals.	Chemistry in Society	08
			5. Chemistry in society: Heavy chemical industries.	Chemistry in Society	22
			6. General revision		≥ 23

b) The matrix : The table is made up of three major columns:

- The **Contextual framewo**rk embodies the families of situations and examples of real life situations where the knowledge and skills (competencies) can be applied.
- The **Competencies** are made up of categories of actions and examples of actions: These are groups of some actions which are related to the mastery of the competencies expected for the module.
- The **Resources** have the essential or core knowledge which gives all the set of cognitive and affective resources which the learner needs to mobilize to successfully treat a family of situations. It is divided into four components: the subject content, the aptitude (skills or know-how), attitudes to be disposed or displayed as well as other resources (material, human, finances, etc.) necessary for the acquisition of the competencies.

c) Competencies: The table below shows the various competencies to be acquired at the end of each topic and consequently by the end of the Sub-cycle. The teacher is expected to use the resources available in his/her local environments to impact these competencies unto the learners.

Cycle	Level	Title of module	Topic	Competencies
First Cycle	**Form 3**	Matter: Properties and Transformation	1. Atoms.	Demonstrate Brownian motion and diffusion. Identify, locate and characterise subatomic particles. Calculate RAM from isotopic abundances.
			2. Structure of the atom in relation to the Periodic Table.	Write the shell electronic configuration of the first twenty elements. Determine the period and group of an element from its electronic configuration. Relate valence electrons and chemical properties.
			3. Structure and Bonding.	Illustrate ionic, covalent and metallic bond formation using suitable examples. Use molecular models to illustrate shapes of simple molecules. State the properties of each bond type.
			4. Acidic and alkaline solutions.	Identify common indicators and their colour changes in different mediums. Use indicators to verify and classify simple solutions. React acids with alkalis, metals, metal oxides and carbonates. Prepare indicator from plant extract.
			5. Chemistry of the elements: The Halogens.	Give the colour of the halogens as well as their physical states at room temperature. Prepare halogens and hydrogen halides from suitable reagents. Identify/distinguish halide ions using $AgNO_3$.
			6. Chemistry of the elements: Oxygen.	Prepare and test for oxygen. Prepare oxides of some common elements, dissolve the oxides in distilled water and test solutions with blue and red litmus papers.
			7. Chemistry of the elements: Sulphur.	Identify yellow stones in the local market as sulphur. Describe the laboratory preparation of H_2S, S^{2-}, SO_2, H_2SO_4 and state their uses and that of sulphur. Add dilute HCl to FeS and smell the gas produced. Carry out a simple chemical test for the sulphate ions.
			8. Chemistry of the elements: Nitrogen.	State the physical properties of nitrogen. Describe the laboratory

Cycle	Level	Title of module	Topic	Competencies
First Cycle	Form 3			preparation and manufacture of ammonia and state its properties; do same for nitric acid. State uses of nitrogen and its compounds.
			9. Chemistry of the elements: Phosphorus	State the physical properties of white and red phosphorus. Describe the reaction of phosphorus with air, oxygen and chlorine. State some uses of phosphorus and its compounds.
			10. Chemistry of the elements: Carbon.	Identify the different structural forms of carbon and relate properties to the structure. Draw and state the uses of each allotrope of carbon. Produce CO_2 from varied carbon compounds and test the gas using lime water. Give uses of carbon compounds.
			11. Chemistry of the elements: Hydrogen.	State the physical properties of hydrogen. Prepare hydrogen in the laboratory, and test using a glowing splint. Titrate dil. HCl against $NaOH_{(aq)}$. Pass H_2 gas over CuO on heating and observe. Describe the reaction of hydrogen with oxygen and chlorine.
	Form 4	Matter: Properties and Transformation	1. Principles of Chemistry: Formulae, Moles and Equations.	Memorize simple definitions and statements of laws. Carry out an experiment to determine formula of a simple binary compound; CuO or MgO. Write and balance simple chemical equations and do calculations involving aspects of the mole concept. Weigh a mass equivalent to a mole of a substance.
		Energy	2. Principles of Chemistry: Electrochemistry. Redox reactions	Memorize definitions of terms and state laws. Establish the electrochemical series using displacement reactions in electrochemical cells. Set up simple electrolytic cells for electrolysis of molten NaCl, $PbBr_2$, $NaCl_{(aq)}$, $CuSO_{4(aq)}$ (using inert and reactive electrodes), acidified H_2O.Write and balance ionic equations. Do calculations involving Faraday's laws. State some uses of electrolysis. Describe the use of aqueous KI, acidified $KMnO_4$ and $K_2Cr_2O_7$ to test for oxidizing and reducing agents from the resulting colour changes
		Matter: Properties and Transformation	3. Principles of Chemistry: Solutions and acid-base titration.	Memorize definitions of terms. Prepare standard solutions. Carry out acid-base titrations. Write balanced equations for acid-base titration reactions. Do calculations using titre values and equations.
			4. Chemistry of the elements: Alkali metals and alkaline earth metals.	List at least three members of each group. Carry out the reactions of metals with cold water and oxygen. Prepare and investigate the effect of heat and water on hydroxides, halides, sulphates, nitrates, carbonates of Li, Na, K. Carry out reactions of Mg, Ca with cold water and steam and acid. Use reactions to compare reactivity and derive trends. Prepare and investigate properties of oxides, hydroxides, carbonates, chlorides of Ca and Mg. Use soap to distinguish hard and soft water. State the types and explain causes and effects of hardness. Carry out simple procedures to soften hard water.
			5. Chemistry of the elements: Transition metals.	Investigate physical properties of Fe and Cu. State characteristic properties of transition metals. Study some reactions of the above metals and/or their compounds.

Cycle	Level	Title of module	Topic	Competencies
	Form 4		6. Chemistry of the elements: Identification of ions.	Carry out flame tests. Carry out test tube reactions using NaOH, NH_3 and other reagents to identify and distinguish between various ions.
			7. Salts.	Prepare salts using various methods. Heat salts and observe. Draw and use solubility curves. Memorize definitions of the terms deliquescence, hygroscopy and efflorescence and cite a concrete example of their respective compounds.
			8. Organic Chemistry.	Memorize definitions of basic terms. Construct models to show covalent bonding in simple alkanes (C_1-C_3) and alkenes (C_2-C_3). Investigate physical properties of organic compounds. Describe fractional distillation of crude oil. Test for unsaturation and for –OH group. Prepare ethanol from ethene and starchy food. Investigate physical and chemical properties of ethanol. Prepare an ester from an alcohol and an organic acid.
	Form 5		1. Principles of Chemistry: Gaseous state.	State the kinetic theory. Carry out experiments to demonstrate Brownian motion and diffusion. State Boyle's law and Charles' law. Explain these laws in terms of the kinetic theory. Use gas law expressions and combined gas law expression in calculations. Define molar heat of evaporation and molar heat of fusion. Use molar heat of evaporation and fusion to predict structures.
		Energy	2. Principles of Chemistry: Energetics.	Define heats of combustion, neutralization, solution, reaction and precipitation. Construct simple energy level diagrams. Carry out experiments to determine the heat of combustion of ethanol or methanol; heat of neutralization of HCl by NaOH. Calculate heat changes. State Hess's law.
		Matter: Properties and Transformation	3. Principles of Chemistry: Rates of reaction. 4. Reversible reactions	Define rate of reaction. Investigate the effect of Temperature, concentration, surface area, catalyst and light on the rate of a reaction, e.g. HCl/Mg; $CaCO_3$(s)/dilute HCl; $KClO_3/MnO_2$, HCl(aq)/$S_2O_3^{2-}$(aq), etc. Predict the effect of changing reaction conditions on the yield of products e.g production of ammonia and sulphuric acid
		Environmental Education	5. Chemistry in society: Extraction of metals.	Describe the Extraction Al, Fe, Cu and titanium from their typical ores. State some physical properties of these metals. State economic uses of the metals and relate the use to properties.
			6. Chemistry in society: Heavy chemical industries.	Describe the industrial preparation of ammonia, nitric acid, sulphuric acid, sodium hydroxide etc. Produce soap and detergents. Identify different types of fertilizers and their constituents. NPK composition and calculation of fertilizer components. Identify sources of energy for industries (coal, oil, electricity, etc). Know the products arising from the fractional distillation of crude oil and their uses. Identify natural polymers (carbohydrates and proteins). Bring some common synthetic polymers to class (polythene, nylon polystyrene, Perspex, etc.).

FORM 3

GENERAL CHEMISTRY

CONTEXTUAL FRAMEWORK		COMPETENCIES		RESOURCES			
FAMILIES OF SITUATIONS	**EXAMPLES OF SITUATIONS**	**CATEGORIES OF ACTIONS**	**EXAMPLES OF ACTIONS**	**CONTENT (CORE KNOWLEDGE)**	**APTITUDES (SKILLS)**	**ATTITUDES**	**OTHER RESOURCES**
Structure of the atom. Identification of tiny invisible subatomic particles	-Properties and composition of the atom. -Drawing the structures of simple atoms -Distinguishing between Brownian motion and Diffusion. -Identifying isotopes. -Finding the average mass of isotopes of elements	-Defining terms -Identifying subatomic particles -Writing the notation of isotopes. -Calculations. -Experimentation -Carry out experiment to illustrate diffusion of gases and crystals in solutions. -Explaining the characteristics of sub-atomic particles. -Representing isotopes using $^{A}_{Z}X$.	-Carry out experiments to demonstrate Brownian motion and diffusion. -Draw an atom, locate proton, neutron and electrons and identify their properties. Identify isotopes and calculate RAM. -Grind chalk or sugar. -Describe experiments to show that matter is made of very tiny particles -Perceive the smell of any smelling substance (e.g. perfume). -Drop a crystal of $KMnO_4$ or "BLUE" in a glass of water and observe. -Draw and fill a table of name, mass and charge of the sub-atomic particles. - Represent specific atoms using the $^{A}_{Z}X$ notation. -Use percentage relative abundances of isotopes to calculate the RAM of elements e.g. Chlorine.	**Topic 1: Atoms** 1.1 Revision of the simple structure of an atom. Simple experiments to illustrate diffusion (mixing of two gases – HCl and NH_3 e.g. dilution of coloured substances). Brownian motion: Explanation in terms of simple kinetic theory. 1.2 Charge and approximate mass of: a proton, a neutron and an electron. Definition of atomic number of an element and the mass number of an atom. Isotopy: definition and examples. Conventional representation of an isotope where A is the mass number and Z atomic number. Examples. Isotopic abundances. Calculation of atomic mass of chlorine from its isotopic abundances. Definition of relative atomic mass of an element on the hydrogen scale and on the carbon-12 ($^{12}_{6}C$) scale. 1.3 A mole of atoms: explanation of the Avogadro's constant *L*. Definition of a mole of particles.	-Recall the composition and structure of an atom in terms of protons, neutrons and electrons. -Carry out experiments and explain diffusion and the simple kinetic theory, the Brownian motion. -Appreciate the smallness of particles and their motion -Give the charge and appropriate mass of a proton, neutron and an electron. -Define the atomic number of an element, and the mass number of an atom. -Explain what is known by isotopes of an element. -Use and interpret the conventional symbolism for representing an isotope. -Calculate the atomic mass of an element from its isotopic abundance. -Define the relative atomic mass of an element with respect to the hydrogen scale; ^{12}C scale. -Explain what is meant by Avogadro's constant. -Explain what a mole of atoms or particles means.	- Awareness of existence of Atoms. - Awareness of the existence of subatomic particles. -Care when handling smelling gases and chemicals.	-Sulphur powder, -water -microscope, -perfume -$KMnO4_{(s)}$, -Picture chart of the atom. -Chalk, -Sugar. -Mortar &pestle -Blue -Volatile liquids (perfume, ammonia, etc.) -odorous gases e.g. H_2S -Beaker or glass cups. -Pollen grains. -The periodic chart.

CONTEXTUAL FRAMEWORK		COMPETENCIES		RESOURCES			
FAMILIES OF SITUATIONS	**EXAMPLES OF SITUATIONS**	**CATEGORIES OF ACTIONS**	**EXAMPLES OF ACTIONS**	**CONTENT (CORE KNOWLEDGE)**	**APTITUDES (SKILLS)**	**ATTITUDES**	**OTHER RESOURCES**
Understanding the structure of the atom. -Significance of valence electrons	-Atomic structure and the periodic table. -Drawing the structures of atoms. -Distinguishing between core, valence and non-valence electrons. -Identifying electrons that take part during chemical reactions	-Drawing representative structures of atoms. Distribution of electrons in shells and writing shell electronic configuration. -Relating chemical properties of elements to electronic configuration -Using valence electrons to determine the chemical properties of elements	-Draw an atom. -Use number of valence electron to classify elements in groups. -Draw concentric circles on a card board to represent shells or energy levels (1,2,3… or K, L, M…). -Roll Plasticins into small balls to represent electrons and place them on the circles. -Write the electronic configuration of the first 20 elements on the Periodic Table. -Identify the core and valence electrons. -Use the energy level to determine the period of the element and the valence electrons to determine the group to which the element belongs in the Periodic Table. -Explain the link between valence electrons and chemical properties.	**Topic 2: Structure of the atom in relation to the Periodic Table.** 2.1 Structure of the atom: Nucleus and electrons; the atom as a neutral particle (balanced charge of protons and electrons). Energy levels (n = 1, 2, 3…) Definition of valence electrons, core electrons and non-valence electrons. Building up the Periodic Table for the first twenty elements on the basis of the energy levels. The electronic configuration of the first twenty elements. 2.2 Valence electrons and the Periodic Table. Valence electrons and the position of the element in the Periodic Table e.g. chlorine has 7 electrons and is in Group VII. 2.3 Electronic configuration and chemical properties (use alkali metals and halogens to bring out the relationship).	-Describe the structure of the atom. Describe, with the aid of diagrams, the structure of an atom as containing protons and neutrons (nucleons) in the nucleus and electrons arranged in shells -Deduce the numbers of protons, neutrons and electrons in atoms and ions from proton and nucleon numbers -Write and explain the electron arrangement (configuration) of the atom in terms of principal energy levels (n = 1, 2, 3…). -Identify core electrons, valence electrons and non-valence electrons and explain. -Write the electronic configuration of the first twenty elements (2: 8: 8 etc.) -Describe how the number of valence electrons in an atom relates to the position of the element in the Periodic Table. -Describe how the valencies of atoms of the elements vary with the position of the element in the Periodic Table. -Relate electronic configuration to chemical properties.	-Awareness of electronic structure of atoms. -Devotedness, steadiness and keenness.	-The Periodic chart of the elements. -Plasticines -Bold makers. -A pair of compass. -Pencil and eraser. -Pins -Card board or A4 paper. -etc.

CONTEXTUAL FRAMEWORK		COMPETENCIES		RESOURCES			
FAMILIES OF SITUATIONS	**EXAMPLES OF SITUATIONS**	**CATEGORIES OF ACTIONS**	**EXAMPLES OF ACTIONS**	**CONTENT (CORE KNOWLEDGE)**	**APTITUDES (SKILLS)**	**ATTITUDES**	**OTHER RESOURCES**
Identification of the forces holding particles together and the structures of substances.	-Differentiating between the various forces holding particles together in substances. -Explaining the properties of substances (compounds and metals).	Demonstration of the formation of the different types of chemical combinations. Drawing and naming shapes of molecules and crystals -Choosing two elements on the Periodic Table that can form ionic bonds. -Selecting two elements on the Periodic Table that can form covalent bonds. -Selecting elements on the Periodic Table that can form metallic bonds.	Use diagrams and models to explain the formation of ionic, covalent and metallic bonding. Use models to show various shapes of simple molecules or molecular crystals. *Illustrate the following: -Ionic bonding between Sodium and Chlorine -Covalent bonding between carbon and hydrogen atoms in a methane molecule. *Demonstrate the conductivity of: -ionic compounds (e. g. in solid, aqueous and molten states) -covalently formed compounds. *Heat: ice, NaCl and copper wire and note the effect of heat on them. -Use molecular models to illustrate shapes of simple molecules. -Identify forces that hold particles together in ionic, molecular, atomic and metallic crystals.	**Topic 3: Structure and Bonding** 3.1 The chemical bond: The significance of the noble gas configuration. Definition of the chemical bond. Formation of chemical bond and the noble gas configuration (the octet rule); valence electrons and the chemical bond. Effect of bond type on properties of compound 3.2 The ionic bond: Formation of ions by loss or gain of electrons. Formation of ionic crystals as shown by sodium chloride. The attraction between oppositely charged ions leading to the ionic crystal as a giant three-dimensional structure. Properties of ionic compounds. 3.3 The covalent bond. Formation of molecules by sharing electrons; illustrated by Cl_2,CH_4, NH_3, H_2O,HCl, N_2, CO_2, C_2H_4 Shapes of these simple molecules Giant molecules e.g. SiO_2 Simple molecular crystals: ice, solid carbon dioxide, iodine. Weak forces between molecules leading to low melting and boiling points. Giant molecular covalent crystals: diamond and graphite. Strong covalent bonds and high melting point. 3.4 The metallic bond: Formation and properties of metals.	-Explain what a chemical bond is. -Give the reason for formation of a chemical bond. -Describe the role of the valence electrons in the formation of a chemical bond. -Describe and illustrate the formation of an ionic bond. -State the properties of ionic compounds. -Describe and illustrate the formation of a covalent bond. -State some properties of covalent compounds. -Illustrate ionic and molecular compounds by “dot and cross” diagrams. -Draw the shapes of some simple molecules. -Give examples of simple molecular crystals. -Relate the melting points and boiling points of molecular substances to the weak forces between molecules. -Give examples of giant molecular covalent crystals. Describe the metallic bond and relate it to properties of metals (conductivity: heat & electricity, malleability etc.) -Types of crystals: ionic, covalent crystals (giant molecular covalent	-Knowledge of how compounds are formed. -Awareness of composition of compounds. -Care in handling glass ware. -Care in handling heat source	-PeriodicTable -Atomic models -Manila paper -Bold makers -Plasticines. -Water. -Ice -NaCl -Iron or Cu wire. -Diamond -Heat source -beaker -Matches -Kerosene -Iodine crystal. -Molecular models. Pens and pencils.

CONTEXTUAL FRAMEWORK		COMPETENCIES		RESOURCES			
FAMILIES OF SITUATIONS	**EXAMPLES OF SITUATIONS**	**CATEGORIES OF ACTIONS**	**EXAMPLES OF ACTIONS**	**CONTENT (CORE KNOWLEDGE)**	**APTITUDES (SKILLS)**	**ATTITUDES**	**OTHER RESOURCES**
				3.5 Crystals: Definition and types.	crystals: diamond and graphite), metallic crystals. -Relation to bond types and structure.		
Classification of solutions based on their behavior with indicators.	Acids and Bases in everyday life and in the laboratory -Preparing an indicator using red cabbage. -Use the indicator and other indicators to test their behavior in solution like vinegar, water, lemon juice, limestone solution, soapy water etc.	-Defining terms -Identifying solutions -Writing chemical equations. -Experimentation -Using indicators to verify acidity and alkalinity of common solutions. -Using indicators to classify various solutions as acidic, alkaline or neutral solutions. -Using the pH scale to classify some solutions as acidic, alkaline or neutral solutions -Reacting acids with alkalis and other substances.	Identify common indicators and their colour changes in different mediums. Use indicators to verify and classify simple solutions. React acids with alkalis, metals, metal oxides and carbonates -Prepare dilute solutions of HCl, H_2SO_4, & NaOH -Squeeze lemon juice. -Prepare limestone solution. -Prepare indicator from plant extract. -Put blue and red litmus papers in various solutions and note or observe the change in colour of the litmus paper. -Read and interpret the pH scale	**Topic 4: Acidic and alkaline solutions.** 4.1 Some acid-base indicators Litmus, phenolphthalein, methyl orange as indicators. Simple definition of an indicator. 4.2 Acids, alkalis and neutralisation Use the universal indicator to classify the following as acidic, alkaline and neutral solutions: aqueous ammonia, sodium hydroxide, sodium chloride, vinegar (white), water. 4.3 Neutralisation reaction: simple definition, example: sodium hydroxide with hydrochloric acid. Some properties of acidic solutions: Action on metals Action on metal oxides Action on carbonates 4.4 Classify oxides as acidic, basic or amphoteric, based on metallic/non-metallic character	-Give examples of acid-base indicators. Identify those properties that place the elements in the same group. -State a simple definition of acid-base indicator -Classify some simple solutions as acidic, alkaline or neutral. -Define acidic, alkaline and neutral solutions based on the pH scale. -Describe qualitatively the difference between strong and weak acids in terms of the extent of ionisation -Describe some properties of acidic solutions. -Describe neutralization reaction. -Describe the importance of controlling the pH in soils and how excess acidity can be treated using calcium hydroxide, calcium/magnesium carbonate	- Great care in handling acids and alkaline solutions. - care in handling equipment. -Keen observation. -Care when handling solutions and chemicals in the laboratory. -Never taste solution in the laboratory. -Use only small quantities of solutions and indicators.	- Orange,lime,grape ,lemon and tomatoes juice. -H_2SO_4, -sour milk, -$HCl_{(aq)}$. -Baking powder -tooth paste, -NaOH, $NH_{3(aq)}$. Distilled water NaCl. Litmus, methyl orange, phenolphthalein -Red cabbage -HCl, H_2SO_4, ethanoic acids. -Litmus papers. -Universal indicator. -beakers, -$CaCO_3$, CuO. -pH scale. -Vinegar, -Soap. etc.
Chemistry of the elements	-Properties of the halogens -Preparation, properties and uses of some halogens.	-Writing the electronic configurations of the halogens. -Explaining the change in colour, physical states,	Compare the physical states of the halogens. Prepare Chlorine -Hydrogen chloride and alkali metal halide. Use appropriate reagents to test for halide ions.	**Topic 5: Chemistry of the elements: The Halogens.** 5.1 The elements fluorine, chlorine, bromine, iodine. The melting and boiling points, colour and state at room temperature. Exist as diatomic molecules at	-Identify the elements, their symbols and physical properties. -Identify those properties that place the elements in the same group. -Describe chlorine, bromine and iodine in	-Care in handling poisonous substances like halogens. Care in handling laboratory	Periodic Table of elements. -Round and flat bottom flasks, Delivery tubes -Gas jar, -test tubes, -$KMnO_4$,

CONTEXTUAL FRAMEWORK		COMPETENCIES		RESOURCES			
FAMILIES OF SITUATIONS	**EXAMPLES OF SITUATIONS**	**CATEGORIES OF ACTIONS**	**EXAMPLES OF ACTIONS**	**CONTENT (CORE KNOWLEDGE)**	**APTITUDES (SKILLS)**	**ATTITUDES**	**OTHER RESOURCES**
	-Preparation, properties and uses of some compounds of halogens. -Identification of halide ions -Uses of halogens and their compounds.	melting & boiling points as the group is descended. -Preparation and reactions of chlorine and hydrogen halides. -Displacement reactions of the halogens. -Testing for halide ions.	-Write the electronic configuration of the halogens, and give the group to which the belong using the number of valence electrons. -Give the colour of the halogens as well as their physical states at room temperature. -Produce Chlorine from a mixture of $KMnO_4$ & conc. HCl; or a mixture of NaCl, MnO_2, and conc. H_2SO_4 acid. -Combine HCl acid with NaOH, K_2CO_3, or CaO to obtain the corresponding metal halides. -Pass chlorine gas through solutions of NaBr and NaI and observe. - Pass bromine gas through solution of KI and observe. -Pass bromine or iodine solutions through NaCl	room temperature. High reactivity (Not found free in nature). Electronic configuration of the elements. 5.2 Preparation and properties of chlorine: Preparation by reaction of concentrated hydrochloric acid with potassium permanganate or manganese (IV) oxide. Reaction with: - Hydrogen, - Metals (sodium, magnesium and iron), - Non-metals (sulphur, iodine and phosphorus), - Iodides and bromides. - Bleaching action. 5.3 Preparation and properties of hydrogen chloride: Preparation by reaction of sodium chloride with conc. sulphuric acid. Properties and reactions: Physical properties: state, smell, colour Reaction with: ammonia (gas); water Aqueous solution of hydrogen chloride i.e. hydrochloric acid. Reaction with metals, carbonates, and hydrogen carbonates. 5.4 Obtaining chlorine from sodium chloride and sodium chloride from chlorine. Simple description of the process of electrolysis. Electrolysis of aqueous sodium	Group VII (the halogens) as a collection of diatomic nonmetals showing a trend in colour, state and their displacement reactions with solutions of other halide ions -Describe and explain preparation and properties of chlorine and hydrogen chloride. -Describe how chlorine can be obtained from sodium chloride and sodium chloride from chlorine. -Describe preparation of chlorides of common elements and other halides of alkali metals. -Describe the displacement reaction of one halogen by another. -Describe a simple chemical test to identify the presence of chloride, bromide and iodide ions. -State some uses of halogen-containing compounds.	equipment. Great care in handling reagents. Keenness in observation -Great care in handling glassware. - Carry out all reaction in a fume cupboard. -Put on safety goggles	- MnO_2 -HCl, -NaCl, -KI, -KBr/ NaBr -$AgNO_3$, -HNO_3 -conc. H_2SO_4 & HCl. -Water -bromine water, -Iodine. - heat source -HNO_3 acid solution. $NH_{3(aq)}$ -etc.

CONTEXTUAL FRAMEWORK		COMPETENCIES		RESOURCES			
FAMILIES OF SITUATIONS	**EXAMPLES OF SITUATIONS**	**CATEGORIES OF ACTIONS**	**EXAMPLES OF ACTIONS**	**CONTENT (CORE KNOWLEDGE)**	**APTITUDES (SKILLS)**	**ATTITUDES**	**OTHER RESOURCES**
			solution and observe. -Add some acidified $AgNO_3$ into a test tube containing solutions of NaCl, KBr and KI separately; and then observe.	chloride solution (brine) to obtain chlorine. Obtaining sodium chloride from reaction of chlorine with sodium metal. 5.5 Preparation of other halides of the alkali metals (reactions similar to preparation of chlorides). 5.6 Displacement reaction of one halogen by another. Fluorine will displace chlorine, bromine and iodine from aqueous solutions of corresponding halides. Chlorine and bromine will do similarly to the halogens below them. The displacement reaction indicates the decrease of reactivity down the group. 5.7 Tests for chlorides, bromides and iodides in: -solid state by reaction with sulphuric acid -aqueous solutions with aqueous silver nitrate and aqueous ammonia 5.8 Some uses of halogens and their compounds. Uses in the home, medicine, agriculture and industry.			
Chemistry of the elements.	-Preparation and test for oxygen. -Identifying the physical and chemical properties of oxygen. -Reacting	Preparation of oxygen using appropriate equipment. Burn or heat some metals and non metals in air. Reactions of oxides with water,	Set up simple apparatus and prepare oxygen from $KClO_3$. Heat H_2,Na,Mg,Al,C,S,Fe,Cu, Zn in air. Place oxides in water, observe and test with litmus.	**Topic 6: Chemistry of the elements: Oxygen.** 6.1 Physical properties: state, colour, odour and solubility. 6.2 Simple description of a laboratory preparation of oxygen from potassium chlorate (V) or some common reagent. Chemical test for oxygen.	-State the physical properties of oxygen. -Describe a laboratory preparation of oxygen. -Describe the preparation of oxides of common elements. -Describe the reactions of common oxides with water.	Care in handling laboratory glassware and chemicals; and when heating. Awareness of presence of oxygen in air. Be keen in	-$KClO_3$, MnO_2 -conc. H_2SO_4 -H_2O_2, H_2, Na, Mg, Al, C, S, Fe, Cu, Zn, etc -Water. -Boiling tube, -Bunsen burner -Clamp & stand

CONTEXTUAL FRAMEWORK		COMPETENCIES		RESOURCES			
FAMILIES OF SITUATIONS	**EXAMPLES OF SITUATIONS**	**CATEGORIES OF ACTIONS**	**EXAMPLES OF ACTIONS**	**CONTENT (CORE KNOWLEDGE)**	**APTITUDES (SKILLS)**	**ATTITUDES**	**OTHER RESOURCES**
	oxygen with some common metals and non-metals. -Reduction of some oxides using some reducing agents.	hydrogen and carbon -Decomposing $KClO_3$ or H_2O_2 in the laboratory. -Testing the presence of oxygen. -Reacting oxides with water. - Classifying oxides as soluble, insoluble, acidic, basic or neutral. -Reacting oxides with CO, coke, or hydrogen.	-Heat a mixture of MnO_2 and $KClO_3$ to produce oxygen. -Mix H_2O_2 and MnO_2 to produce oxygen. -Dry the gas using Conc.H_2SO_4 or fused $CaCl_2$. -Insert a glowing splint into the gas jar of oxygen and observe. -Burn H_2, Na, Mg, Al, C, S, Fe, Cu, Zn in oxygen to obtain their respective oxides. -React the oxides with water; and use red and blue litmus papers to test the resulting solutions. -Use CO and H_2 to reduce ZnO and PbO respectively. -Use hot coke to reduce H_2O to water gas.	6.3 Preparation of oxides of common elements and their reaction with water: - Preparation of oxides of: hydrogen, sodium, magnesium, aluminium, carbon, sulphur, iron, copper, zinc by direct combination. Define oxidation as addition of oxygen. - Through experiments on methods of preparation establish order of reactivity of elements in reacting with oxygen. - Physical states of oxides. - Reaction of oxides with water and classification as soluble or insoluble and as acidic, neutral or basic. 6.4 Reduction of oxides of common elements: with hydrogen or carbon. Definition of reduction as removal of oxygen.	-Identify the order of reactivity of common elements based on their reactions with oxygen. -Identify an oxidation reaction as addition of oxygen. -Identify a reduction reaction as a loss of oxygen. -Describe the reduction of the oxides of common elements.	observation.	-delivery tube, -glass trough -gas jar, -crucibles -Flat bottom -flask, -U-tube -Fused $CaCl_2$, -beaker -Periodic Table of elements. -Hazardous signs. -Matches -etc.
Chemistry of the elements	-Extracting sulphur from its ores. -Identifying the physical and chemical properties of sulphur. -Identifying the different allotropes of sulphur.	-Extracting suphur from underground deposits by the Flasch Process. -Stating the physical and chemical properties of sulphur. -Reacting sulphur with other	-Identify yellow stones in the local market as sulphur. -Draw the sulphur pump used in the Frasch process. -Draw and distinguish between rhombic and monoclinic sulphur. -Give the colour, melting point and boiling point of	**Topic 7: Chemistry of the elements: Sulphur.** 7.1 Occurrence: extraction of sulphur by the Frasch process. Allotropes of sulphur. Physical and chemical properties of sulphur. Structural forms of sulphur allotropes. 7.2 Sulphur dioxide a) Preparation from (i) Sulphites (ii) Burning sulphur b) Properties: (i) Physical:	-Describe the extraction and state properties and uses of sulphur. -Identify the different structural forms of sulphur. -Describe a simple chemical test to identify sulphur dioxide. -Describe the preparation of sulphides of sodium and iron. -Describe the effect of acids on sulphides. -Identify the products on	-Keenness in observation. -Care in handling equipment and chemicals, especially acids. -Ability to describe. -Care in handling poisonous	Chart of Frasch process, S, air,O2,Fe,Zn,NaOH,CuCO3,C, H2,Acids water, sugar, fume cupboard -Yellow stones -Sulphur powder -Periodic chart of elements.

CONTEXTUAL FRAMEWORK		COMPETENCIES		RESOURCES			
FAMILIES OF SITUATIONS	**EXAMPLES OF SITUATIONS**	**CATEGORIES OF ACTIONS**	**EXAMPLES OF ACTIONS**	**CONTENT (CORE KNOWLEDGE)**	**APTITUDES (SKILLS)**	**ATTITUDES**	**OTHER RESOURCES**
	-Preparing the sulphides of metals and non-metals. -Identifying the chemical properties of sulphides.	substances, -Distinguishing between the crystalline forms of sulphur. -Preparing SO_2, H_2S, FeS, CuS, ZnS & MgS.	sulphur. -Compare the solubility of sulphur in water with that in liquid CS_2. -Describe the laboratory preparation of H_2S, S^{2-}, SO_2, H_2SO_4 and state their uses and that of sulphur.(e.g. in the treatment of ring worm, eczema) -Smell a rotten egg. -Add dilute HCl to FeS and smell the gas produced. -Heat a mixture of dilute HCl and Na_2SO_3 and test gas evolved with acidified dichromate paper. -Mix dilute HCl acid and $BaCl_2$ with $CuSO_4$ solution and describe the precipitate. formed. -React dilute H_2SO_4 acid with Mg, Fe & Zn. -React conc. H_2SO_4 with Cu.	Colour, smell, density (method of collection of SO_2) (ii) Chemical: -acid character, reaction with alkali and indicators -reaction with acidified permanganate -combination with oxygen (oxidation). 7.3 Sulphides and hydrogen sulphide. a) Preparation of sulphides of sodium and iron b) Properties: (i) Physical: state and colour (ii) Chemical reaction with dilute acid to produce hydrogen sulphide. Identification of H_2S (smell). c) Burning hydrogen sulphide in air. 7.4 Reactions of sulphuric acid: a) Concentrated acid: (i) Dilution (ii) Reaction with copper (iii) Action of sulphur b) dilute acid: (i) reaction with copper (ii) reaction with basic oxides or carbonates (iii) reaction with magnesium, iron, zinc. c) Uses: food and clothe	burning hydrogen sulphide in oxygen. -Describe the effect of acids on sulphites -Describe the dilution of concentrated sulphuric acid to obtain the diluted one. -Describe a simple chemical test for sulphate ions. -Describe a laboratory preparation of common sulphates. State uses of sulphur and some compounds of sulphur.	gases. -Waft gas towards nostrils to smell. -Care when handling glassware.	-Chart of the Frasch Process -Rotten egg. -HCl acid - FeS -Flat & round-bottom flasks. -Source of heat -Gas jar, -Conc. H_2SO_4 -Copper -Na_2SO_3 $BaCl_2$ Fe , Zn, Mg, Na -etc.

CONTEXTUAL FRAMEWORK		COMPETENCIES		RESOURCES			
FAMILIES OF SITUATIONS	**EXAMPLES OF SITUATIONS**	**CATEGORIES OF ACTIONS**	**EXAMPLES OF ACTIONS**	**CONTENT (CORE KNOWLEDGE)**	**APTITUDES (SKILLS)**	**ATTITUDES**	**OTHER RESOURCES**
				industry. Drugs and agriculture.			
Chemistry of the elements	-Identifying nitrogen as the most abundant component of air. -Identifying techniques of preparing nitrogen and its compounds. -Differentiating the physical and chemical properties of nitrogen and its compounds. -Stating the uses of nitrogen and its compounds.	-Identify Nitrogen as the inert part of air. -Carry out experiments on the laboratory preparation of nitrogen and its compounds. -Reacting compounds of nitrogen prepared with acids ,alkalis ,other substances and elements. -Manufacturing some nitrogen compounds on large scale. -Explaining the physical and chemical properties of nitrogen and it compounds. -Heating nitrates	-Recall the inactive part of air and its percentage composition. -Draw laboratory set ups and describe the laboratory methods for the preparation of N_2 , NH_3, HNO_3, NO, NO_2. -Pass some NH_3 gas over heated CuO and test gas evolved. -Heat NH_4NO_2 to decompose. -State the physical properties of nitrogen. -React nitrogen with Mg, Li, or oxygen. -Heat a mixture of $Ca(OH)_2$ & NH_4Cl solid to obtain NH_3. -State the physical properties of NH_3. -Carry out reaction of NH_3 with other substances like oxygen, dilute HCl, H_2SO_4, HNO_3 CuO & H_2O. -Describe the industrial manufacture of NH_3 and the importance of the use of finely divided iron. -Heat a mixture of KNO_3& Conc. H_2SO_4 acid to get HNO_3 acid. -React Cu with dilute & Conc.HNO_3 and observe the gas evolved in each case.	**Topic 8: Chemistry of the elements: Nitrogen.** 8.1 Physical properties of nitrogen: density and solubility; main source of air 8.2 Ammonia : Laboratory preparation and properties of ammonia. Collection, solubility in water, reaction with hydrogen chloride, reaction with oxygen (catalysed and uncatalysed) Action on indicators and diluted acids. 8.3 Nitric acid: laboratory preparation and properties of nitric acid. a) Preparation from potassium nitrate and concentrated sulphuric acid. b) Properties: (i) Dilution of concentrated nitric acid (ii) Action on indicators and metals (iii) Action on bases, carbonates and metal oxides. 8.4 Action of heat on nitrates of some common elements. Action of heat on sodium nitrate, lead nitrate, magnesium and copper nitrates. 8.5 Preparation and properties of nitrogen oxide and nitrogen dioxide. a) Preparation of: nitrogen	-State and physical properties of nitrogen -Describe the laboratory preparation of ammonia and state its properties. -Describe the reaction of ammonia with simple acids -Describe the preparation and properties of nitric acid -Describe the action of heat on some nitrates of common elements -Describe and state properties of nitrogen dioxide and nitrogen oxides -Describe the nitrogen cycle. -State uses of nitrogen and its compounds.	-Care in handling laboratory equipment . -Keen observation care in handling and using chemicals. -Awareness of nitrogenous products in agriculture. -Care when heating.	-Laboratory equipments for the preparation of nitrogen,NH_3, HNO_3,NO, NO_2. -Heat source -$NaNO_3$, $Pb(NO_3)_2$, $Mg(NO_3)_2$, $Cu(NO_3)_2$, -Acids, alkalis water, air. -NH_3, CuO, -Clamp & stand, -Gas jar, -round & flat bottom flasks, -litmus papers, -CaO, U-tube, -Conc. H_2SO_4 - $CuSO_4$(s), -Pyrex test tubes -test tube holders. -A splint, -Nitrogen fertilizers, -HNO_3 acid, -NaOH, $CaCO_3$ -$FeSO_4$, -Cu, Ca, NH_4Cl, Mg, $Ca(OH)_2$, KNO_3 -Charts for the industrial preparation of ammonia.

CONTEXTUAL FRAMEWORK		COMPETENCIES		RESOURCES			
FAMILIES OF SITUATIONS	**EXAMPLES OF SITUATIONS**	**CATEGORIES OF ACTIONS**	**EXAMPLES OF ACTIONS**	**CONTENT (CORE KNOWLEDGE)**	**APTITUDES (SKILLS)**	**ATTITUDES**	**OTHER RESOURCES**
			-Heat $NaNO_3$,$Pb(NO_3)2$, $Mg(NO_3)2$, $Cu(NO_3)2$. Identify importance of nitrogen in agriculture.- Explain the nitrogen cycle. -State uses of nitrogen, HNO_3, NH_3, NH_4NO_3 etc.	oxide (NO); nitrogen dioxide (NO_2) b) Properties: physical and chemical properties. 8.6 The nitrogen cycle. Uses of nitrogen and its compounds in agriculture.			-etc.
Chemistry of the elements	-Observing the structural forms of phosphorus. -Reactions and uses of phosphorus and its compounds.	Identification of the different forms of phosphorus. Setup equipment to carry out reactions involving phosphorus. Identifying uses of phosphorus.	-State the physical properties of white and red phosphorus. -Burn phosphorus in limited and excess oxygen and observe the gas evolved in each case. -Carry out a reaction between phosphorus and chlorine. -State some uses of phosphorus and its compounds.	**Topic 9: Chemistry of the elements: Phosphorus** 9.1 Structural forms of phosphorus: white, red, black. 9.2 Reactions of phosphorus with: air, oxygen and chlorine. Uses of phosphorus and its compounds.	-Identify the different structural forms of phosphorus -Describe the reaction of phosphorus with air, oxygen and chlorine. -State some uses of phosphorus and its compounds.	-Care in handling dangerous substance like phosphorus. -Keen observation -Care when handling glass ware.	-Red, white and black phosphorus. -Oxygen, air -Chlorine. -Glassware -Source of chlorine gas.
Chemistry of the elements	-Identifying the crystalline forms of carbon, their structure and properties. -Preparing the oxides of carbon. - Identifying the physical and chemical properties of the oxides of carbon. -Preparing	-Distinguishing between diamond and graphite in terms of structure and properties. -Explaining the laboratory preparation of CO_2 and CO. -Describing the physical and chemical properties of CO_2 and CO. - Explaining the uses of CO_2 and	-Draw the structures of diamond and graphite. -Explain the physical properties of diamond and graphite. -State the uses of each allotrope. -Carryout the reactions between Fe_2O_3 and coke; CuO and carbon or coke. -React $CaCO_3$ (marble chips) with dilute HCl acid. -Heat $CaCO_3$, $CuCO_3$ or $KHCO_3$ and observe effect of gas evolved on	**Topic 10: Chemistry of the elements: Carbon** 10.1 Structural forms of carbon: graphite, diamond, charcoal… Structure, physical properties and uses. 10.2 Reaction of carbon with metal oxides: carbon acting as reduction agent. 10.3 Preparation, properties and reactions of carbon dioxide: a) Preparation in the laboratory, properties and test for CO_2. b) Reactions of carbon dioxide	-Identify the different structural forms of carbon (polymorphism) and relate properties to the structure. -Describe the reaction of carbon with metal oxides. -Describe the preparation and properties of carbon dioxide. -Describe the reaction between carbon and ca Explain the physical and chemical properties of carbon monoxide. -Describe preparation and reactions of carbonates.	-Awareness of the importance of protecting the environment. -Awareness of hazards of CO and CO_2. -Keen observation. -Care handling chemicals, glassware, burning and heating substances.	-Diamond, -Graphite -Wood, -Charcoal, -Soot, -Kerosene, , -Heat source -ZnO - Fe_2O_3 -CO_2 -Steam -Paper -glassware. -$CaCO_3$. -NaOH -CH_3COOH.

CONTEXTUAL FRAMEWORK		COMPETENCIES		RESOURCES			
FAMILIES OF SITUATIONS	**EXAMPLES OF SITUATIONS**	**CATEGORIES OF ACTIONS**	**EXAMPLES OF ACTIONS**	**CONTENT (CORE KNOWLEDGE)**	**APTITUDES (SKILLS)**	**ATTITUDES**	**OTHER RESOURCES**
	carbonates and explaining their chemical properties.	CO. -Heating carbon with some metal oxides: ZnO, Fe_2O_3, CO_2, steam. -Preparing carbonates and giving their reactions.	limewater. -Pass CO_2 over hot coke and test gas evolved. -Use conc. H_2SO_4 acid to dehydrate oxalic ($H_2C_2O_4$) acid. -React CO with Cl_2, Fe_2O_3, PbO or CuO. -Pass CO_2 into KOH or NaOH and observe. -Heat $NaHCO_3$ and identify the products. -Give the advantages and disadvantages of CO_2 in the environment.	- with alkali - with carbon. 10.4 Preparation and properties of carbon monoxide a) Preparation by -reaction of carbon and carbon dioxide -reaction of concentrated sulphuric acid on formic acid b) Properties: -physical properties, -chemical properties. 10.5 Preparation of carbonates and reaction of carbonates. a) Preparation of: -soluble carbonates, -insoluble carbonates. b) reaction of carbonates: -reaction with acids -action of heat. 10.6 Uses of: -carbon dioxide (soft drinks, cooling, fire extinguishing, etc.) -carbon monoxide (fuel, reduction action, etc.) Hazards of : -carbon monoxide (poisonous) -carbon dioxide (green house effect).	-State the more common uses of carbon dioxide and carbon monoxide.	-Use of fume cupboard when preparing toxic gases.	-Conc. H_2SO_4 -Water. -Lime water. ($Ca(OH)_2$) -Litmus papers. -HCl acid. -Charcoal. -Coke. -Soot -Marble chips -pyrex test-tubes -etc.
Chemistry of the elements	-Preparing and identifying the properties of hydrogen. - Identifying the reaction of Hydrogen with Oxygen &	-Explaining the laboratory preparation of Hydrogen. -Stating the properties of Hydrogen. -Describing the reaction of	-Prepare hydrogen in the laboratory. -React dilute HCl with Zn, Mg, Fe, Al, Cu etc. -Bring a lighted splint near the gas and obtain a pop sound confirming H_2 -The gas(H_2) is passed over CuO, colour	**Topic 11: Chemistry of the elements: Hydrogen** 11.1 Laboratory preparation of hydrogen and properties a) Preparation from action of either diluted hydrochloric or sulphuric acid on zinc, magnesium, iron, …	-Describe the laboratory preparation of hydrogen -Describe the effect of diluted acids and alkalis on some metals. -Describe acid-base reactions and titration -Describe the reactions of hydrogen with oxygen and	-Great care when handling chemicals especially acids and alkalis, - Care when handling glassware.	Lab. equipment for preparation of H_2. -Dil. HCl/H_2SO_4 -Dilute NaOH or KOH -Zn, Mg, Fe,Cu, Al, etc. powder -steam

CONTEXTUAL FRAMEWORK		COMPETENCIES		RESOURCES			
FAMILIES OF SITUATIONS	**EXAMPLES OF SITUATIONS**	**CATEGORIES OF ACTIONS**	**EXAMPLES OF ACTIONS**	**CONTENT (CORE KNOWLEDGE)**	**APTITUDES (SKILLS)**	**ATTITUDES**	**OTHER RESOURCES**
	Chlorine. -Identifying the effect of acids & alkalis on metals.	Hydrogen with Chlorine and with Oxygen. -Describe the reaction of dilute acid on some metals. -Describe the reaction of dilute alkali on some metals.	changes from black to brown. -Pass H_2 over oxygen and chlorine. -Titrate dil. HCl against $NaOH_{(aq)}$ -State the physical properties of Hydrogen. -Describe the chemical properties of Hydrogen. -Describe the reaction of Hydrogen with Chlorine. -Use litmus to test for HCl gas. -React hydrogen with oxygen and test product formed with red and blue litmus papers. -React dilute HCl, H_2SO_4, or HNO_3 with Cu, Zn, Fe, Al, -React dilute NaOH or KOH with Mg, Zn, Fe, Cu and Al. -Mix dilute HCl and NaOH and test resulting solution with blue and red litmus papers. -Define an acid, a base, a salt, and neutralisation	b) Properties of hydrogen: (i) Physical (ii) Chemical. 11.2 Effect of diluted acids and alkalis on some metals a) Effect of diluted acids on: copper, zinc, iron, aluminium. b) Effect of diluted alkalis on: magnesium, zinc, iron, copper, aluminium. c) Amphoteric metals from (b). 11.3 Acid-base reactions a) Definition of: -an acid, -a base, -a salt. b) Definition of a neutralisation reaction. 11.4 Reaction of hydrogen with oxygen and chlorine. a) Reaction with oxygen to give water b) Reaction with chlorine to give hydrogen chloride (gas).	chlorine.	-Care in handling laboratory equipment . -Keen observation	-splint or broomstick -Fe filings -water. -source of heat. -Combustion tube. -Fused $CaCl_2$. -etc.

FORM 4

PRINCIPLES OF CHEMISTRY : PART 2

CONTEXTUAL FRAMEWORK		COMPETENCIES		RESOURCES			
FAMILIES OF SITUATIONS	**EXAMPLES OF SITUATIONS**	**CATEGORIES OF ACTIONS**	**EXAMPLES OF ACTIONS**	**CONTENT (CORE KNOWLEDGE)**	**APTITUDE (SKILLS)**	**ATTITUDES**	**OTHER RESOURCES**
Amounts of substances	Measuring quantities of substances	-Defining terms -Writing chemical equations -Calculations -Experimentation	-Memorize simple definitions and statements of laws. -Carry out an experiment to determine formula of a simple binary compound; copper oxide or magnesium oxide. -Write and balance simple chemical equations using the mole concept. -Do calculations involving aspects of the mole concept. -set up and carry out simple experiments to demonstrate the gas laws. -Weigh a mass equivalent to a mole of a substance. -Balance equations. -Carry out calculations based on chemical equations. - Calculate limiting reagent and theoretical yield	**Topic 1: Principles of Chemistry: Formulae, Moles and Equations** 1.1 Definition of the mole and its application to atoms, molecules and ions. The Avogadro's number, L, and what it represents. 1.2 Experimental determination of: a) Formula of water by electrolysis, b) Formula of copper oxide or magnesium oxide by mass differences. 1.3 Definitions: relative atomic mass, relative molecular mass, molecular mass, molecular volume 1.4 Boyle's law; the combined gas law and application. Avogadro's law and application. 1.5 Calculations involving: a) Percentage composition by mass b) Determination of empirical and molecular formulae c) Limiting reagents d) Theoretical and percentage yield e) Molecular volumes 1.6 Balancing chemical equations using the mole concept. Stoichiometry of chemical reactions; full formula equation. Write equations including state symbols.	-Recall the mole, the Avogadro's number, L, and what it represents -Determine experimentally the formula of a simple binary compound. -Define relative atomic mass, relative molecular mass and molecular mass. -Determine molecular mass (molecular weight and formula weight) -Apply the combined gas law. -State the Avogadro's law (principle) and define molecular volume. -Determine the percentage composition of substances by use of formula. -Derive the right formulae from either a known percentage composition or from known amounts of constituent elements. -Write balanced equation, using moles relationship including state symbols for	Curiosity -Observe laboratory safety rules. -Curiosity -Observe laboratory safety rules. -Diligence in balancing equations and in calculations.	-Balance -Calculators -Copper oxide -Magnesium oxide Mg ribbon -Combustion tube -syringes -balloon or ball -source of heat -Crucible -etc.

CONTEXTUAL FRAMEWORK		COMPETENCIES		RESOURCES			
FAMILIES OF SITUATIONS	**EXAMPLES OF SITUATIONS**	**CATEGORIES OF ACTIONS**	**EXAMPLES OF ACTIONS**	**CONTENT (CORE KNOWLEDGE)**	**APTITUDE (SKILLS)**	**ATTITUDES**	**OTHER RESOURCES**
					liquid, solid, gases and aqueous solutions.		
Action of electricity	Electrolysis	-Defining terms -Writing and balancing ionic equations -Calculations. -Experimentation	-Memorize definitions of terms and state laws -Establish the electrochemical series using displacement reactions in electrochemical cells. -Set up simple electrolytic cells for electrolysis of molten NaCl, $PbBr_2$, $NaCl_{(aq)}$, $CuSO_{4(aq)}$ (using inert and reactive electrodes), acidified H_2O. -Write and balance ionic equations. -Do calculations involving Faraday's laws. -State some uses of electrolysis.	**Topic 2: Principles of Chemistry: Electrochemistry** 2.1 Formation of ions: Revision. Define electrolyte, non-electrolyte electrolysis, electrodes, anode, cathode, anion, cation, electrolytic cell. 2.2 Electrolysis of: a) Molten electrolyte - Sodium chloride or lead bromide - Cathode reaction: reduction - Anode reaction: oxidation - Overall reaction b) An aqueous electrolyte (i) copper sulphate solution with inert electrodes (platinum, graphite). copper sulphate solution with active electrodes (copper) (ii) acidified water (dil. H_2SO_4) with inert electrodes. Indication of direction of flow of electrons and current. The role of water in electrolysis. Explain the preferential discharge of H_2 gas and O_2 gas from electrolysis of aqueous H_2SO_4 and aqueous NaCl. Factors influencing preferential discharge of ions. 2.3 Quantitative treatment of electrolysis. Faraday's laws. Statement of laws; mathematical expression, related calculations. 2.4 Electrochemical series. Definition of electrochemical cell, description of a simple electrochemical cell; half reaction.	-Recall the formation of ions -Define electrolyte and non-electrolyte, electrolysis, electrodes, anode, cathode, anion, cation, electrolytic cell (voltammeter) -Describe the electrolysis of an electrolyte in the molten state. -Describe the electrolysis of an aqueous electrolyte. -Explain the reactions at the electrodes. -Identify the direction of flow of electrons and current. -State Faraday's laws of electrolysis and carry out calculations. Establish the activity series (electrochemical series) from displacement reactions of metal/metal ions. -Explain an electrochemical cell in terms of electron transfer processes. -Establish an electrochemical series from cells. -Uses of electrolysis. - Describe the use of aqueous potassium	-Curiosity -Keen observation -Diligence in handling equipment and hot objects. -Infer from observations.	-Heat source -Electricity source -electrodes (Cu, Pt, C) -$CuSO_4$, NaCl, H_2SO_4, $PbBr_2$ -Battery -Cu wire -Crocodile clips/cellotape -etc.

CONTEXTUAL FRAMEWORK		COMPETENCIES		RESOURCES			
FAMILIES OF SITUATIONS	**EXAMPLES OF SITUATIONS**	**CATEGORIES OF ACTIONS**	**EXAMPLES OF ACTIONS**	**CONTENT (CORE KNOWLEDGE)**	**APTITUDE (SKILLS)**	**ATTITUDES**	**OTHER RESOURCES**
				Displacement reactions as a method of establishing electrochemical series. Electrochemical series attained from electrochemical cells. Uses of electrolysis: electroplating. 2.5 Redox reactions. Define and identify redox reactions in terms of oxygen/hydrogen, and/or electron gain/loss.	iodide, and acidified potassium manganate(VII) and acidified potassium dichromate(VI) in testing for oxidising and reducing agents from the resulting colour changes		
Volumetric analysis	Standard solutions, mineral acids, titration	-Defining terms -Preparing solutions -Titrating solutions. -Calculations	-Memorize definitions of terms. -Prepare standard solutions -Carry out acid-base titrations -Write balanced equations for acid-base titration reactions. -Do calculations based on titre values - Calculations of concentration from amount and volume; amount from concentration and volume; and concentration from mass of solute and volume.	**Topic 3: Principles of Chemistry: Solutions and acid-base titration.** 3.1 Definitions: standard solution, molar solution, acid, base, weak acid, strong acid, weak base, strong base (acid as proton donor, base as proton acceptor). 3.2 Preparation of standard solutions from solid; from liquid; by dilution; concentration expressed in mol. dm^{-3}. 3.3 Titration technique: burette, pipette, volumetric flask, conical flask, acid-base indicator. Calculations based on titration results for monobasic and dibasic acids. Acid salts: preparation of $NaHSO_4$ and $NaHCO_3$ by titration. 3.4 Calculations: a) concentration from amount and volume. b) amount from concentration and volume. c) concentration from mass of solute and volume.	-Define standard solution, molar solution, acids: weak and strong, bases: weak and strong. -Explain the difference between solutions of strong and weak acids, strong and weak bases. -Prepare standard solutions -Determine the concentration of solutions by titration Calculate: concentration from amount and volume, amount from concentration and volume, concentration from mass of solute and volume.	-Care in handling chemicals and equipment especially glassware . -Curiosity. -Keen observation. -Observing laboratory safety rules. - Accuracy in preparing standard solutions and in titrating.	-Volumetric flask -Balance - Weighing bottles - Salts (bases). - Distilled water - Stirrer -Indicators (methyl orange, phenolphthalein) -Burette -Pipette -Conical flask -Clamp and stand -Acid solutions; HCl, H_2SO_4.
CHEMISTRY OF THE ELEMENTS							
Chemistry of the elements	Alkali metals and alkaline earth metals**.**	-Testing/ Experimenting -Preparation	-Carry out the reactions of Li, Na, K with cold water and oxygen	**Topic 4: Chemistry of the elements: alkali metals and alkaline earth metals.**	-Establish the alkali elements as a family of elements from their	-Care in handling Chemicals and	-Periodic Table chart -Chemicals

CONTEXTUAL FRAMEWORK		COMPETENCIES		RESOURCES			
FAMILIES OF SITUATIONS	**EXAMPLES OF SITUATIONS**	**CATEGORIES OF ACTIONS**	**EXAMPLES OF ACTIONS**	**CONTENT (CORE KNOWLEDGE)**	**APTITUDE (SKILLS)**	**ATTITUDES**	**OTHER RESOURCES**
		-Description	-Prepare hydroxides, halides, sulphates, nitrates and carbonates of Li, Na, K -Investigate the effect of heat and water on hydroxides, halides, sulphates, nitrates, carbonates of Li, Na, K -Carry out reactions of Mg, Ca with cold water and steam and acid -Use reactions to compare reactivity and derive trends -Prepare MgO and $Mg(OH)_2$ -Prepare CaO, $Ca(OH)_2$, $CaCl_2$, $CaCO_3$ -Investigate properties of oxides, hydroxides, carbonates, chlorides of Ca and Mg -Use soap to distinguish hard and soft water. -State types of hardness. -Explain causes and effects of hardness. -Carry out simple procedures to soften hard water.	4.1 Group I: alkali metals (lithium, sodium, potassium). a) Action of metal on water and oxygen. b) Preparation of hydroxides, halides, sulphates, nitrates and carbonates. c) Properties (solubility and stability to heat) of hydroxides, halides, sulphates, nitrates and carbonates. 4.2 Group II: alkaline earth metals (magnesium and calcium). a) Action of metals on water and action of magnesium on acid. b) Preparation of oxide, hydroxide, carbonate and chloride. c) Properties of oxide, hydroxide of magnesium; and oxide, hydroxide, carbonate and chloride of calcium. d) Hardness of water: Causes, effects, methods of removal (boiling, distillation, precipitation, washing soda and use of ion exchange. Industrial uses of calcium carbonate.	reactivity with oxygen and water. -Establish the alkaline earth metals as a family of elements from their reactivity with water and acid. -State qualitatively the trends in reactivity within the family. -State simple preparation and properties of hydroxides, halides, sulphates, nitrates, carbonates of the alkaline earth metals. -State simple preparation and properties of oxides and hydroxides of magnesium; and oxides, hydroxides, carbonates and chlorides of calcium. -Explain the causes of hardness of water and its removal. State some industrial uses of calcium carbonate.	equipment -Keen observation. -Respect of lab safety rules -Accuracy in making inferences and drawing conclusions. -Awareness of the preferential use of soft water for washing.	(Li, Na, K, Mg, Ca) -Cold water -Oxygen -HCl, HNO_3, H_2SO_4, H_2CO_3, -Spring water -Soap -Rain water -Heat source -Distillation apparatus -Beakers -Test tubes -etc.
Chemistry of the elements	Transition metals	-Experimenting -Preparation -Description	-Investigate physical properties of Fe and Cu -State characteristic properties of transition metals. -React Fe with steam, hydrogen chloride and chlorine.	**Topic 5: Chemistry of the elements: Transition metals.** 5.1 Position of transition metals in the Periodic Table, as apart from main group elements. 5.2 Physical properties of iron and copper. Properties that set transition metals apart from main group elements (metals with	-Identify the position of the transition metals on the Periodic Table. -State the specific properties of transition metals which place these metals together. -Describe the reaction of iron with steam,	-Care in handling Chemicals and equipment -Keen observations. -Respect of lab safety rules. -Accuracy in	-Periodic Table chart -Piece of Fe, Cu -Source of heat and -Electricity -Simple electrical

CONTEXTUAL FRAMEWORK		COMPETENCIES		RESOURCES			
FAMILIES OF SITUATIONS	**EXAMPLES OF SITUATIONS**	**CATEGORIES OF ACTIONS**	**EXAMPLES OF ACTIONS**	**CONTENT (CORE KNOWLEDGE)**	**APTITUDE (SKILLS)**	**ATTITUDES**	**OTHER RESOURCES**
			-Prepare $Fe(OH)_2$ and $Fe(OH)_3$ using $NaOH_{(aq)}$ and $NH_{3(aq)}$ -React HNO_3 with Cu metal and $Cu(OH)_2$ -Prepare nitrate, oxide, sulphate, carbonate and hydroxide of Cu(II). -Reduce Cu(II) to Cu(I) using Iodide or boiling an acidic $CuCl_2$ and Cu metal.	variable valency, coloured compounds, act as catalysts: restricted examples on iron and copper). a) Reaction of iron with steam, hydrogen chloride and chlorine. Preparation of iron (II) hydroxide and iron (III) hydroxide with alkali and ammonia. b) Reaction of nitric acid with copper, type of reaction. Preparation of oxide, nitrate, sulphate, chloride, carbonate and hydroxide of copper (II). Reduction of copper (II) to copper (I) compounds.	hydrogen chloride and chlorine. -Describe the preparation of the hydroxides of iron. -Describe and explain the action of nitric acid on copper metal and hydroxide of copper (II). -Describe the reduction of copper (II) to copper (I) compounds	making inferences and drawing conclusions.	circuit -$CuSO_4$ -$FeSO_4$ -$FeCl_3$ -HNO_3 -H_2SO_4 -NaOH -HCl -Oxygen -KI
Chemistry of the elements	Identification of ions**.**	-Testing/ Experimentation	-Carry out flame tests -Carry out test tube reactions using NaOH and NH_3 to identify and distinguish between various ions.	**Topic 6: Chemistry of the elements: Identification of ions.** Use the flame test, physical properties and appropriate reagents. The observations and inferences should lead to the identification of the ions: lithium, sodium, potassium, calcium, barium, ammonium, copper (II), iron (II), iron (III), chloride, bromide, iodide, sulphate, nitrate, carbonate and sulphite.	-Identify the following cations: lithium, sodium, potassium, calcium, barium, ammonium, copper (II), iron (II), iron (III) using simple laboratory tests. -Identify the following anions: chloride, bromide, iodide, sulphate, nitrate, carbonate and sulphite by simple laboratory tests.	-Keen observation. -Accuracy in making inferences and drawing conclusions. -Diligence in respect of laboratory safety rules.	- Heat source -Nichrome wire/pencil lead -Conc. HCl -Salts containing ions: Li^+, K^+, Na^+, Ca^{2+}, Ba^{2+}, NH_4^+, Cu^{2+}, Fe^{2+}, Fe^{3+}, Cl^-, Br^-, I^-, SO_4^{2-}, NO_3^-, CO_3^{2-}, SO_3^{2-}. -NaOH -NH_3 -etc.
Salts	Preparation of soluble and insoluble salts	-Preparing -Heating -Experimenting -Explaining -Separation	-Prepare salts by neutralization, direct combination, double decomposition/ precipitation, action of acid on metal and metal	**Topic 7: Salts.** 7.1 Preparation of salts a) Soluble salts by action of acids on metals, metal hydroxides, metal oxides and metal carbonates.	-Identify soluble and insoluble salts. -Select an appropriate method of preparing a soluble and an insoluble salt.	-Care in handling Chemicals and equipment. -Keen observation	-Na, Cl_2, Zn, HCl, NaOH, $CaCO_3$, CuO, HNO_3, H_2SO_4, $AgNO_3$, NaCl, etc.

CONTEXTUAL FRAMEWORK		COMPETENCIES		RESOURCES			
FAMILIES OF SITUATIONS	**EXAMPLES OF SITUATIONS**	**CATEGORIES OF ACTIONS**	**EXAMPLES OF ACTIONS**	**CONTENT (CORE KNOWLEDGE)**	**APTITUDE (SKILLS)**	**ATTITUDES**	**OTHER RESOURCES**
			oxide and metal carbonate -Heat salts and observe - State and explain terms -Draw and use solubility curves -Memorize definitions of the terms deliquescence, hygroscopy and efflorescence and cite a concrete example of their respective compounds.	b) Insoluble salts by precipitation. 7.2 Solubility of some salts, sulphates, chlorides, nitrates, carbonates. Solubility curves. 7.3 Action of heat on salts: carbonates, nitrates sulphates, hydrated salts and ammonium salts. Definitions and examples of deliquescent, hygroscopic and efflorescent compounds.	-Explain the terms saturated solution, crystallisation and precipitation. -Establish and use solubility curves. -Explain the terms deliquescence, hygroscopy, efflorescence. Describe and explain, from experimental observation, the action of heat on various salts.	-Respect of laboratory safety rules. -Correct use of separation techniques. -Correct use of appropriate language.	-Heat source -$FeCl_3$ -$CaCl_2$ -etc.
Organic compounds	-Fractionation -Cracking	-Describing -Experimenting/ testing -Drawing -Preparing	-Memorize definitions of terms. -construct models to show covalent bonding in simple alkanes (C_1-C_2) -Investigate physical properties of organic compounds. -Describe fractional distillation of crude oil. -Draw fractionating column. -State fractions and uses of each fraction. -Prepare ethane. -Investigate physical and chemical properties of ethane. -Test for unsaturation. -Prepare ethanol from ethene and starchy food. -Test for –OH group. -Investigate physical and chemical properties of ethanol. -Prepare an ester from an	**Topic 8: Organic Chemistry.** 8.1 Definition of organic chemistry. Formation of covalent bond in methane, tetrahedral distribution of bonds and use of models to construct structure of alkanes up to four carbons. Names and trends in physical properties: state, melting point, boiling point, solubility in water. Definition of a homologous series and general physical properties. 8.2 Fractional distillation of crude oil, physical properties of products, uses of products, combustion of products. Cracking. 8.3 Alkanes: Saturated hydrocarbons with General formula C_nH_{2n+2}. (C_1 to C_4). Methane and ethane as generally unreactive compounds except halogenation (chlorination) and burning, Changes in physical state of homologous series. Isomerism in	-Define what organic chemistry is. -Recall the formation of covalent bonds. -Name and draw the structure of simple organic compounds. -State the main features of a homologous series and examples of homologous series. -Draw the structures of branched and unbranched alkanes, C_1 to C_4 and name the unbranched alkanes, methane to butane -Describe a homologous series as a group of compounds with a general formula, similar chemical properties and	-Awareness of petroleum products and uses. -Care in handling equipment and chemicals. -Keen observation. -Observe laboratory safety rules.	-Chart of fractionating column -Soda lime -Sodium ethanoate -Heat source -Water -Ethanol -H_2SO_4 -Bromine water -PCl_5 -Cotton wool -Al_2O_3 -etc.

CONTEXTUAL FRAMEWORK		COMPETENCIES		RESOURCES			
FAMILIES OF SITUATIONS	**EXAMPLES OF SITUATIONS**	**CATEGORIES OF ACTIONS**	**EXAMPLES OF ACTIONS**	**CONTENT (CORE KNOWLEDGE)**	**APTITUDE (SKILLS)**	**ATTITUDES**	**OTHER RESOURCES**
			alcohol and an organic acid.	butane. 8.4 Alkenes: General formula C_nH_{2n} preparation of ethene. Addition of bromine and hydrogen chloride. Test of unsaturation. Addition polymerization and importance of products. Unsaturation. Burning: acetylene (ethyne) and its local use. 8.5 Alcohols: physical properties, gradual change in physical properties of the homologous series of primary alcohols (C_1 to C_4). Identify the – OH functional group. Preparation of ethanol: combustion, reaction with phosphorus pentachloride, oxidation to ethanoic acid. Esterification.Polyesters as examples of polymerization of esters. Importance of ethanol in society. Industrial production of ethanol (fermentation and cracking of petroleum). Formation of ethanol by the catalysed addition of steam to ethene and by fermentation of glucose. 8.6 Carboxylic acids (C_1 to C_4) carboxylic acids as a homologous series containing the $–CO_2H$ group. Structures of carboxylic acids, methanoic acid to butanoic acid and name the unbranched acids, methanoic to butanoic acids. formation of ethanoic acid	showing a gradation in physical properties as a result of increase in the size and mass of the molecules, e.g. melting and boiling points; viscosity; flammability -Describe distillation of crude oil and give physical properties, uses and combustion of products. State that the naphtha fraction from crude oil is the main source of hydrocarbons used as the feedstock for the production of a wide range of organic compounds. Describe the issues relating to the competing uses of oil as an energy source and as a chemical feedstock -Describe and explain the physical and chemical properties of alkanes, alkenes, alcohols. -Describe the manufacture of alkenes and hydrogen by cracking hydrocarbons and recognise that cracking is essential to match the demand for		

CONTEXTUAL FRAMEWORK		COMPETENCIES		RESOURCES			
FAMILIES OF SITUATIONS	**EXAMPLES OF SITUATIONS**	**CATEGORIES OF ACTIONS**	**EXAMPLES OF ACTIONS**	**CONTENT (CORE KNOWLEDGE)**	**APTITUDE (SKILLS)**	**ATTITUDES**	**OTHER RESOURCES**
				by the oxidation of ethanol by atmospheric oxygen or acidified potassium dichromate(VI) . Carboxylic acids as weak acids, reacting with ethanol, carbonates, bases and some metals	fractions containing smaller molecules from the refinery process. State some uses of ethanol, e.g. as a solvent; as a renewable fuel; as a constituent of alcoholic beverages -Explain the concept of isomerism in alkanes and alcohols. -Give an example of addition polymerization and use of product. Identify a functional group.		

FORM V

PRINCIPLES OF CHEMISTRY

CONTEXTUAL FRAMEWORK		COMPETENCIES		RESOURCES			
FAMILIES OF SITUATIONS	**EXAMPLES OF SITUATIONS**	**CATEGORIES OF ACTIONS**	**EXAMPLES OF ACTIONS**	**CONTENT (CORE KNOWLEDGE)**	**APTITUDE (SKILLS)**	**ATTITUDES**	**OTHER RESOURCES**
Principles of Chemistry	-Kinetic theory of matter -Brownian motion -Gas laws	-Defining terms -Stating the gas laws -Calculations -Experimentation	-State the kinetic theory -Carry out experiments to demonstrate Brownian motion and diffusion. -State Boyle's law and Charles' law. - Explain these laws in terms of the kinetic theory. -Use gas law expressions and combined gas law expression in calculations. -Define molar heat of evaporation and molar heat of fusion. -Use molar heat of evaporation and fusion to predict structures.	**Topic 1: Principles of Chemistry: Gaseous state.** 1.1 Changes of state: solid, liquid, gas. Kinetic theory (particle theory, diffusion and Brownian motion explained in terms of kinetic theory). 1.2 Molar enthalpies of evaporation and fusion. Use of values to compare energy needed to separate molecules of substances. Molar enthalpies and structure. 1.3 Boyle's and Charles' laws. Calculations on the combined gas law: $\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$	-State the kinetic theory. -Explain the diffusion and Brownian motion in terms of the kinetic theory. -Describe melting and evaporation in terms of the kinetic theory. -Define molar heats of evaporation and fusion and use these to compare the energy needed to separate the same number of different molecules. -Use molar heat values to predict structures. -State Boyle's law and Charles' law and explain these in terms of the kinetic theory. Carry out simple calculations on gas laws.	-Keen observation.	-Perfume -Sulphur -$KMnO_4$ -Water -Microscope -etc.
Principles of Chemistry	Determination of enthalpy changes. -Calculations involving energy changes	-Defining terms -Stating some laws -Calculations -Experimentation	-Define heats of combustion, neutralization, solution, reaction and precipitation -Construct simple energy level diagrams. -Carryout experiments to determine the heat of combustion of ethanol or methanol; heat of neutralization of HCl by	**Topic 2: Principles of Chemistry: Energetics.** 2.1 Latent heat: molar heat of fusion and evaporation as evidence of inter-particle forces. Enthalpy notation (ΔH) for exothermic and endothermic reactions. 2.2 Heat of reaction and calculations. Quantitative determination of enthalpies of: a) Combustion e.g. ethanol and methanol	-Define exothermic and endothermic reactions. -Explain that energy changes in reactions are due to bond formation and bond breaking. -Define standard heat changes for a reaction and energy changes for different types of reaction. -Carry out experiments	-Care in handling equipment. -Keen observation.	-Spirit lamp -windshield -water bath -thermometer -plastic cups -ethanol -methanol -HCl/H_2SO_4 -NaOH -NaCl -$AgNO_3$ -etc

CONTEXTUAL FRAMEWORK		COMPETENCIES		RESOURCES			
FAMILIES OF SITUATIONS	**EXAMPLES OF SITUATIONS**	**CATEGORIES OF ACTIONS**	**EXAMPLES OF ACTIONS**	**CONTENT (CORE KNOWLEDGE)**	**APTITUDE (SKILLS)**	**ATTITUDES**	**OTHER RESOURCES**
			NaOH. -Calculate heat changes. -State Hess's law.	b) Neutralisation c) Solution d) Reaction e) Precipitation 2.3 Simple energy level diagrams. Hess's law. (Principle of conservation of energy)	to determine the heat of combustion and heat of neutralization. -Calculate or graphically determine enthalpy changes.		
Principles of Chemistry	-Rates of reaction - Factors affecting rates of reactions.	-Defining rate of reaction. -Stating and explaining factors affecting rates of reactions. -Measuring the rate of a reaction.	-Define rate of reaction. -Investigate the effect of Temperature, concentration, surface area, catalyst, light on the rate of a reaction, e.g. HCl/Mg; $CaCO_3$(s)/dilute HCl; $KClO_3/MnO_2$, HCl(aq)/$S_2O_3^{2-}$(aq), etc.	**Topic 3: Principles of Chemistry: Rates of reaction.** 3.1 Factors which affect rate of reaction: surface area, concentration, temperature, catalyst. Examples of specific reactions with corresponding factors. Homogeneous and heterogeneous reactions. 3.2 Experiments to show effects of factors: a) Surface area (i) Reaction of aqueous hydrochloric acid with magnesium chips (or ribbon) and powdered magnesium (zinc, iron). (ii) Reaction of aqueous hydrochloric acid with marble chips and powdered calcium carbonate. b) Concentration: aqueous hydrochloric acid on aqueous thiosulphate. c) Temperature: acidified potassium permanganate and oxalate ions. d) Catalyst: heating potassium chlorate(V) with manganese(IV) oxide.	-State the factors which influence the rate of reaction. -Identify homogeneous and heterogeneous reactions. -Carry out experiments to show the influence of each factor on the rates of reactions. -Describe the idea that some chemical reactions can be reversed by changing the reaction conditions, -Describe the idea that some reversible reactions can reach dynamic equilibrium and predict the effect of changing the conditions: concentration/pressure, temperature: e.g. manufacture of ammonia (Haber process) and sulphuric acid (Contact process).	-Care in handling equipment. -Keen observation	-Dilute HCl -Dilute H_2SO_4 -Mg ribbon -Mg powder -$CaCO_3$ chips -$CaCO_3$ powder -$KClO_3/MnO_2$ -thermometer -$Na_2S_2O_3$ -$KMnO_4$ -$C_2O_4^{2-}$.
Chemistry in Society	Extraction of some metals	- State some	Describe the Extraction Al, Fe, Cu and titanium	**Topic 4: Chemistry in society: Extraction of metals.**	-Name the chief ores from which the metals	Care of the different	Charts

CONTEXTUAL FRAMEWORK		COMPETENCIES		RESOURCES			
FAMILIES OF SITUATIONS	**EXAMPLES OF SITUATIONS**	**CATEGORIES OF ACTIONS**	**EXAMPLES OF ACTIONS**	**CONTENT (CORE KNOWLEDGE)**	**APTITUDE (SKILLS)**	**ATTITUDES**	**OTHER RESOURCES**
		methods used in extracting metals. -Explain some methods used in extracting metals.	from their ores.	4.1 General methods of extraction: electrolysis, chemical reduction and thermal decomposition (chemical reduction – relate to electrochemical series). 4.2 The electrolytic production of aluminium, extraction of iron, copper and titanium. Relate the extraction to local industries (aluminium: Alucam; Titanum: Akonolinga; Iron: local blacksmith). 4.3 Physical properties of aluminium, iron, titanium, copper and related uses. Uses of these metals and their alloys.	iron, aluminium, copper and titanium are extracted. -Describe and explain the general methods used in the extraction of metals from their ores. -Select and describe a suitable method for the extraction of iron, aluminium, copper and titanium from the corresponding ore. State some physical properties of the metals. -State economic uses of the metals and relate the use to properties.	methods involved.	
Chemistry in society	-Sources of raw materials used to produce some heavy chemicals -Industrial preparations of some compounds. -Fertilizers. -Fractional distillation of crude oil. -Polymers.	-Description of some industrial processes. -Identification of some processes and products. -Production of some products e.g. soap and detergents.	-Describe the industrial preparation of ammonia, nitric acid, sulphuric acid, sodium hydroxide etc. -Produce soap and detergents. -Identify different types of fertilizers and their constituents. NPK composition and calculation of fertilizer components. -Identify sources of energy for industries (coal, oil, electricity, etc) -Know the products arising from the	**Topic 5: Chemistry in society: Heavy chemical industries.** 5.1 Sources of material: air, water, the sea, nitrates, limestone, iron oxides, sulphur, silicates, phosphates. 5.2 Industrial preparation of ammonia, nitric acid, sulphuric acid, sodium hydroxide, chlorine, soap and detergents. Uses and effect on environment. Coal, oil and electricity as sources of energy for obtaining industrial products. 5.3 Fertilizers: nitrogenous and phosphatic, composition and calculation of components. 5.4 Fractional distillation of crude oil a) Propane, butane, petrol and paraffin as fractions. b) Cracking and	-Identify the local industrial products that can be obtained from the raw material air, water, the sea, rock salt, nitrates, limestone, sulphur, silicates, phosphates and crude oil. -Identify coal, oil and electricity as sources of energy for industries. -Describe the industrial production of ammonia, nitric acid, sulphuric acid, sodium hydroxide, chlorine, soap and detergents and state uses. -Identify different types of fertilizers and their constituents.	Curiosity	-Charts -Fertilizer bag -Synthetic polymers -etc.

CONTEXTUAL FRAMEWORK		COMPETENCIES		RESOURCES			
FAMILIES OF SITUATIONS	**EXAMPLES OF SITUATIONS**	**CATEGORIES OF ACTIONS**	**EXAMPLES OF ACTIONS**	**CONTENT (CORE KNOWLEDGE)**	**APTITUDE (SKILLS)**	**ATTITUDES**	**OTHER RESOURCES**
			fractional distillation of crude oil and their uses. -Identify natural polymers (carbohydrates and proteins). -Bring some common synthetic polymers to class (polythene, nylon polystyrene, Perspex, etc.).	dehydrogenation to obtain ethene. c) Uses of ethene for the production of polythene, ethanol and ethane-1,2-diol. 5.5 Synthetic polymers: polystyrene, Perspex, polythene and nylon. a) Monomers and their structures b) Linkages in nylon and terylene c) Depolymerisation (i) polystyrene (ii) Perspex Naturally occurring polymers (macromolecules) carbohydrates and proteins. Breakdown of carbohydrates, yielding starch and glucose. carbohydrates, proteins and fats as natural macromolecules . Hydrolysis of proteins to amino acids and carbohydrates (e.g. starch) to simple sugars.	-Identify products of fractional distillation of petroleum (crude oil). -Describe how ethene is obtained from distillation product of petroleum (crude iol). -State some important uses of ethene. -Identify monomers, block diagrams and state uses of synthetic polymers. -Identify carbohydrates and proteins as natural polymers. -State some typical uses of man-made fibres such as nylon and Terylene, e.g. clothing; curtain materials; fishing line; parachutes; sleeping bags -Describe the pollution problems caused by the disposal of non-biodegradable plastics Identify carbohydrates, proteins and fats as natural macromolecules -Describe proteins as possessing the same amide linkages as nylon but with different monomer units -Describe fats as esters possessing the same linkages as Terylene but with different monomer units		

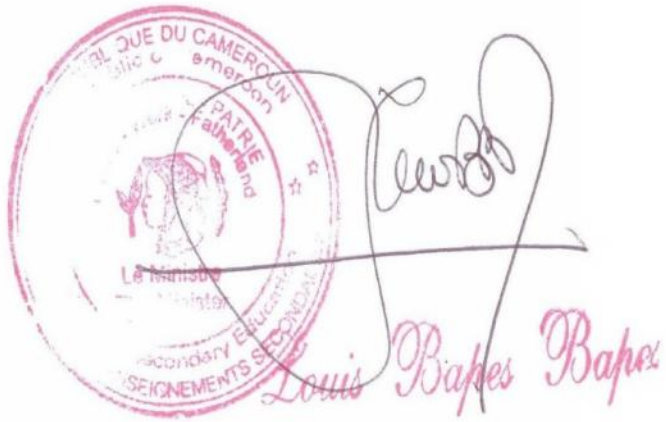
Article 2: The syllabus presented in article one here above shall be implemented as from the beginning of the 2016-2017 school year;

Article 3: All previous provisions repugnant hereto are hereby repealed;

Article 4: Inspectors Coordinator General, the Director of General Secondary Education, the Director of Examinations and Certification, Regional Delegates of Secondary Education, Divisional Delegates of Secondary Education, Education Secretaries of various Private Educations Agencies, Principals of public and private schools, each in their own sphere shall be charged with the strict implementation of this order which shall be inserted and published in the Official Gazette in English and French.

Yaoundé, - 9 DEC 2014

THE MINISTER 0F SECONDARY EDUCATION



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