SENIOR SCHOOL CURRICULUM DESIGN

GRADE 10

CHEMISTRY

KENYA INSTITUTE OF CURRICULUM DEVELOPMENT
2024

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Nurturing Every Learner's Potential

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NATIONAL GOALS OF EDUCATION

Education in Kenya should:

1. **Foster nationalism and patriotism and promote national unity.**
   Kenya's people belong to different communities, races and religions, but these differences need not divide them. They must be able to live and interact as Kenyans. It is a paramount duty of education to help young people acquire this sense of nationhood by removing conflicts and promoting positive attitudes of mutual respect which enable them to live together in harmony and foster patriotism in order to make a positive contribution to the life of the nation.

2. **Promote the social, economic, technological and industrial needs for national development.**
   Education should prepare the youth of the country to play an effective and productive role in the life of the nation.
   a) **Social Needs**
      Education in Kenya must prepare children for changes in attitudes and relationships which are necessary for the smooth progress of a rapidly developing modern economy. There is bound to be a silent social revolution following in the wake of rapid modernization. Education should assist our youth to adapt to this change.
   b) **Economic Needs**
      Education in Kenya should produce citizens with the skills, knowledge, expertise and personal qualities that are required to support a growing economy. Kenya is building up a modern and independent economy which is in need of an adequate and relevant domestic workforce.
   c) **Technological and Industrial Needs**
      Education in Kenya should provide learners with the necessary skills and attitudes for industrial development. Kenya recognizes the rapid industrial and technological changes taking place, especially in the developed world. We can only be part of this development if our education system is deliberately focused on the knowledge, skills and attitudes that will prepare our young people for these changing global trends.

3. **Promote individual development and self-fulfilment**
   Education should provide opportunities for the fullest development of individual talents and personality. It should help children to develop their potential interests and abilities. A vital aspect of individual development is the building of character.

4. **Promote sound moral and religious values.**
Education should provide for the development of knowledge, skills and attitudes that will enhance the acquisition of sound moral values and help children to grow up into self-disciplined, self-reliant and integrated citizens.

5. **Promote social equality and responsibility.**
Education should promote social equality and foster a sense of social responsibility within an education system which provides equal educational opportunities for all. It should give all children varied and challenging opportunities for collective activities and corporate social service irrespective of gender, ability or geographical environment.

6. **Promote respect for and development of Kenya's rich and varied cultures.**
Education should instill in the youth of Kenya an understanding of past and present cultures and their valid place in contemporary society. Children should be able to blend the best of traditional values with the changing requirements that must follow rapid development in order to build a stable and modern society.

7. **Promote international consciousness and foster positive attitudes towards other nations.**
Kenya is part of the international community. It is part of the complicated and interdependent network of peoples and nations. Education should therefore lead the youth of the country to accept membership of this international community with all the obligations and responsibilities, rights and benefits that this membership entails.

8. **Promote positive attitudes towards good health and environmental protection.**
Education should inculcate in young people the value of good health in order for them to avoid indulging in activities that will lead to physical or mental ill health. It should foster positive attitudes towards environmental development and conservation. It should lead the youth of Kenya to appreciate the need for a healthy environment.

LEARNING OUTCOMES FOR SENIOR SCHOOL

By the end of senior school, the learner should be able to:

1. Communicate effectively and utilise information and communication technology across varied contexts.
2. Apply mathematical, logical and critical thinking skills for problem solving.
3. Apply basic research and scientific skills to manipulate the environment and solve problems.
4. Exploit individual talents for leisure, self-fulfilment, career growth, further education and training.
5. Uphold national, moral and religious values and apply them in day to day life.
6. Apply and promote health care strategies in day to day life.
7. Protect, preserve and improve the environment for sustainability.
8. Demonstrate active local and global citizenship for harmonious co-existence.
9. Demonstrate appreciation of diversity in people and cultures.
10. Manage pertinent and contemporary issues responsibly.

THE SENIOR SCHOOL IN THE COMPETENCY BASED CURRICULUM (CBC)

Senior School is the forth level of Basic Education in the Competency Based Curriculum (CBC) that learners shall come to after the Pre-Primary, Primary and Junior School (JS). The essence of Senior School is to offer learners a Pre- University/ Pre- career experience where the learners have an opportunity to choose pathways where they have demonstrated interest and/or potential at the earlier levels. Senior school comprises three years of education for learners in the age bracket of **15 to 18 years** and lays the foundation for further education and training at the tertiary level and the world of work. In the CBC vision, learners exiting this level are expected to be ***engaged, empowered and ethical citizens*** ready to participate in the socio-economic development of the nation.

At this level, learners shall take **SEVEN (07) learning areas (LAs)** as recommended by the *Presidential Working Party on Educational Reforms* (PWPER). These shall comprise **Four Compulsory** learning areas, and Three learning areas opted for by the learner according to their choses Pathway. While English and Kiswahili are indicated as Compulsory, the learners who opt for these learning areas as their subjects of specialization shall go through a *differentiated curriculum* in terms of scope, experiences and assessment. Such learners shall; therefore, take *Advanced English* or *Kiswahili Kipevu* with additional two lessons. It is recommended that AT LEAST TWO learning areas should be from chosen Pathway. In exceptional cases, some learners may opt for ONE learning area from the chosen Pathway and a maximum of TWO learning areas from any of the three pathways; depending on the learner's career projections and with guidance by the principals at Senior School.

PROPOSED LIST OF SUBJECTS AT SENIOR SCHOOL

Compulsory Subjects	Science, Technology, Engineering & Mathematics (STEM)	Social Sciences	Arts & Sports Science
1. English 2. Kiswahili/KSL 3. Community Service Learning 4. Physical Education ***NB: ICT skills will be offered to all students to facilitate learning and enjoyment***	5. Mathematics/Advanced Mathematics 6. Biology 7. Chemistry 8. Physics 9. General Science 10. Agriculture 11. Computer Studies 12. Home Science 13. Drawing and Design 14. Aviation Technology 15. Building and Construction 16. Electrical Technology 17. Metal Technology 18. Power Mechanics 19. Wood Technology 20. Media Technology* **21.** Marine and Fisheries Technology*	22. Advanced English 23. Literature in English 24. Indigenous Language 25. Kiswahili Kipevu/Kenya Sign Language 26. Fasihi ya Kiswahili 27. Sign Language 28. Arabic 29. French 30. German 31. Mandarin Chinese 32. History and Citizenship 33. Geography 34. Christian Religious Education/ Islamic Religious Education/Hindu Religious Education 35. Business Studies	36. Sports and Recreation 37. *Physical Education (C)* 38. Music and Dance 39. Theatre and Film 40. Fine Arts

LESSON DISTRIBUTION AT SENIOR SCHOOL

The number of lessons in each of the compulsory learning areas shall be 4; while the optional areas shall be 6 lessons each. A lesson shall be 40 minutes. The "free" lessons shall be used for development of ICT skills, Pastoral Instruction Programme (PPI), projects, collaborative study and further reading.

ESSENCE STATEMENT

Chemistry knowledge is essential for comprehending the composition, properties of matter and the changes it undergoes. It is a central science that serves as the basis for competencies in science and technical fields essential for industrial and economic growth. This aligns with the African agenda 2063 and the Kenya Vision 2030's emphasis on Science, Technology and Innovation. This importance is underscored in Sessional Paper 1 of 2019, which highlights the importance of sustainable education with a focus on Science, Technology and Innovation. The Chemistry curriculum emphasises practical learning and scientific inquiry employing instructional methods such as Inquiry-based Learning, Project-based Learning, and Problem-based Learning. The specific learning outcomes guide content depth and breadth for cognitive, psychomotor and affective domains in the learner. The curriculum promotes the use of IUPAC nomenclature, terminologies and equations. The projects integrate Chemistry concepts with the environment, fostering creativity and critical thinking through connections to industrial processes and everyday life experiences. Learners are encouraged to initiate their own projects based on the scientific principles learnt. This should create interest, curiosity and fun in the learning of Chemistry. The acquired concepts form the foundation for further learning and training in medicine, engineering, agriculture, aviation and related careers in science and technical fields.

GENERAL LEARNING OUTCOMES

By the end of Senior School, the learner should be able to:

1. Acquire scientific knowledge, skills, values and attitudes for everyday use, and further education and training;
2. Conduct a range of scientific investigations, including collection of qualitative and quantitative data, analysis and interpretation of results;
3. Use scientific language in the study of Chemistry;
4. Develop skills and logical thinking in carrying out project work, field work and excursions, where chemistry can be appreciated on a larger scale;
5. Relate Chemistry in the classroom to modern industrial processes and real world situations;
6. Develop critical thinking skills to explain phenomena and address challenges in day to day life;
7. Explore, manipulate, manage and conserve the environment for learning and sustainable development;
8. Apply principles of Chemistry and acquired skills to invent, formulate, construct, produce or manufacture useful products from available resources for sustainable development;
9. Develop interest in and appreciation of Chemistry as a subject and its usefulness in the society.

SUMMARY OF STRANDS AND SUB STRANDS

Strand	Sub Strand	Suggested Number of Lessons
1.0 Inorganic Chemistry	1.1. Introduction Chemistry	6
	1.2. The Atom	24
	1.3. The periodic Table	28
	1.4. Chemical Bonding	24
	1.5. Periodicity	32
2.0 Physical Chemistry	2.1. Acids and Bases	28
	2.2. Introduction to Salts	30
3.0 Organic Chemistry		8
Total Number of lessons		**180**

Note: The suggested number of lessons per Sub Strand may be less or more depending on the context.

STRAND 1.0: INORGANIC CHEMISTRY

Strand	Sub-Strand	Specific Learning Outcomes	Suggested Learning Experiences	Suggested Key Inquiry Questions
1.0 Inorganic Chemistry	**1.1 Introduction to Chemistry** **(6 lessons)** • Definition of chemistry • Branches of chemistry • Careers in chemistry • Chemistry in our daily lives (*mention agriculture, pharmaceutical industry, medicine, manufacturing industry, food industry, entertainment industry, nuclear chemistry,*	By the end of the sub strand, the learner should be able to: a) explain the meaning of Chemistry as a field of science, b) explore the role of Chemistry in day to day life, c) examine the effects of drug and substance use in day to day life, d) promote the rights and responsibilities to a safe and healthy learning environment.	The learner is guided to: ● brainstorm on concepts covered in junior school that relate to Chemistry, ● discuss with peers the meaning of Chemistry as a field of science, ● discuss with peers the branches of Chemistry, ● brainstorm the importance of Chemistry in our daily lives, ● search for information using electronic and/or print media on the career opportunities related to Chemistry and how gender stereotyping influences career choices, ● discuss with peers the meaning of drug,	How is the study of Chemistry important in our society?

	sports industry, energy among others).		prescription, dosage and substance use, ● brainstorm on the consumer rights and protection in relation to drug prescription, substance use and side effects for awareness, **Project** ● Develop posters to sensitise the peers/community on the risks of drug and substance use.	
Core competencies to be developed: ● Communication and Collaboration: The learner explores teamwork with peers by contributing to group decision making through recognising and acknowledging the value of others' ideas during discussions. ● Self-efficacy: The learner effectively communicates while presenting the findings on career opportunities related to Chemistry and how gender stereotypes influence career choices in plenary. ● Digital literacy: The learner uses digital technology effectively to search for information on various career opportunities related to Chemistry. ● Citizenship: The learner demonstrates critical and constructive dialogue as they brainstorm with peers on the consumer rights to information on the drug prescription, substance use and knowledge on their side effects for awareness.				
Values:				

Respect: The learner shows acceptance while appreciating the opinion of each member as they discuss in groups the various branches of Chemistry.
Pertinent and Contemporary Issues (PCIs) ● Life skills (Safety and security): as the learner brainstorms with peers on the rights and responsibilities of a learner to a safe and healthy learning environment. ● Health Promotion Issues (drug and substance use): The learner discusses with peers the meaning of drug prescription, dosage, substance use and their effects in day to day life. ● Socio-Economic and Environmental issues (Consumer protection): The learner discusses with peers the information on samples of containers of manufactured products and explores the labels on them for marks of quality, expiry dates, nutritional information, preservatives and messages of caution for consumer protection awareness.

Strand	Sub-Strand	Specific Learning Outcomes	Suggested Learning Experiences	Suggested Key Inquiry Questions
1.0 Inorganic chemistry	**1.2 The Atom** **(24 lessons**) ● Structure of the atom *(Energy levels and orbitals)* ● *isotopes* ● s and p orbitals *(consider the first 20 elements**)***	By the end of the sub strand, the learner should be able to: a) describe the structure of the atom, b) determine the relative atomic mass of elements, c) write the electron arrangement of elements using *s* and *p* notation, d) develop interest in the study of structure of the atom.	The learner is guided to: ● review with peers the concept of the structure of the atom, atomic number and mass number, ● discuss with peers the relationship between atomic number, mass number and number of electrons in an atom, ● illustrate the structure of the atom using Dalton and Rutherford's models, ● brainstorm the meaning of the terms isotopes and relative atomic mass, ● calculate the relative atomic mass of elements from isotopic abundances, ● discuss the relationship between energy levels and orbitals in an atom,	How are electrons arranged in an atom?

			● carry out simple activities to illustrate the order of filling the electrons in the orbitals, ● draw the electron arrangement for the first 20 elements using *s and p* orbitals, ● watch simulation on the Rutherford Gold Foil experiment and discuss with peers.	

Core competencies to be developed:

- Digital literacy: the learner continuously learns to use digital platforms while watching animations on atomic models, isotopes and electron arrangement of atoms
- Creativity and Imagination: the learner experiments with ideas while modelling the structure of the atom using locally available materials
- Learning to learn: the learner reflects on their own work as they practise illustration of electron arrangements for the first 20 elements using *s* and *p* orbitals

Values:

- Social justice: The learner advocates for harmonious relationship in groups while discussing the meaning of isotopes and relative atomic mass
- Integrity: The learner shows self-discipline by appropriately using digital devices to watch animations, simulations or videos on electron arrangement of the atom

Pertinent and Contemporary Issues (PCIs)

- Socio-Economic and Environmental issues (Environmental conservation): the learner responsibly uses locally available materials to model the structure of the atom.
- Life skills (Self-esteem): the learner gains confidence while presenting findings on the meaning of isotopes and relative atomic mass.
- Socio-Economic and Environmental issues (global citizenship): the learner brainstorms with peers on the contributions of scientists in the development of atomic theory/models.

Strand	Sub Strand	Specific Learning Outcomes	Suggested Learning Experiences	Suggested Key Inquiry Questions
1.0 Inorganic chemistry	**1.3 The Periodic Table** **(28 lessons)** ● Development of the periodic table (Groups and periods). ● Ion formation (oxidation number, valency, radicals). ● Formulae and chemical equations. *(mention alkali metals, alkaline earth metals, halogens, noble*	By the end of the sub strand, the learner should be able to: a) relate the position of an element in the periodic table to its electron arrangement, b) illustrate ion formation of elements, c) derive the formulae of compounds, d) write balanced equations for chemical reactions, e) appreciate the role of electron arrangement in the development of the periodic table.	The learner is guided to: ● brainstorm in groups, on the development of the periodic table, ● arrange the first 20 elements of the periodic table into groups and periods ● identify the chemical families of elements using the periodic table, ● discuss with peers the stability of atoms (loss or gain of electrons), ● predict the type of ion formed from a given electron arrangement of an atom (cation and anion), ● discuss with peers the relationship between valency	Why is the study of the periodic table important?

	gases and transition elements)		and oxidation number of elements, ● write electron arrangement of ions using *s* and *p* notation ● infer the valency and oxidation numbers from electron arrangement of elements, ● discuss elements with variable oxidation numbers, ● practice writing formulae of compounds using valencies and oxidation states of elements and radicals, ● write balanced chemical equations for simple chemical reactions.	

Core competencies to be developed:

- Communication and Collaboration: the learner listens keenly and actively using open questions while discussing with peers the relationship between atomic number, mass number and number of electrons in atoms of elements.
- Critical thinking and problem solving: the learner creates new ideas while drawing diagrams of ions of selected elements using dots and/or crosses to illustrate ion formation.
- Learning to learn: the learner learns independently by writing balanced equations for chemical reactions.

● Citizenship: the learner appreciates contributions made by various scientists on the development of atomic structure and the periodic table.
Values: Peace: The learner shows compassion as they display tolerance while predicting the type of ion formed from the electron arrangement of elements with peers
Pertinent and Contemporary Issues (PCIs) ● Socio-Economic and Environmental Issues (social cohesion): as the learner discusses with peers, how atoms acquire stability. ● Life skills (analytical thinking): as the learner predicts the type of ion formed from a given electron arrangement of an atom.

Strand	Sub Strand	Specific Learning Outcomes	Suggested Learning Experiences	Suggested Key Inquiry Questions
1.0 Inorganic chemistry	**1.4 Chemical Bonding** (24 lessons)	By the end of the sub strand, the learner should be able to: a) illustrate bond types in elements, molecules and compounds, b) investigate the relationship between bond types and physical properties of elements, molecules and compounds, c) relate bond types and resultant structures to the uses of elements, molecules and compounds, d) appreciate the uses of different substances based on their bond types and structures in day to day life.	The learner is guided to: ● review the concept of stability of atoms (gaining and/or losing electrons). ● discuss in groups the role of valence electrons in bonding (*octet/duplet noble gas configuration*). ● discuss with peers, different types of chemical bonds and intermolecular forces *(ionic, covalent, dative covalent, hydrogen bond, Van der Waals and metallic).* ● draw Lewis structures dot (.) and cross (x) diagrams to show bonding in selected elements, molecules and compounds *(ionic, covalent, dative covalent,*	How do chemical bonds influence the properties of substances?

			hydrogen bond, Van der Waals and metallic bonding), ● carry out activities to investigate the physical properties of giant ionic, simple molecular, giant atomic/covalent and giant metallic compounds *(solubility, thermal and electrical conductivity, melting point, boiling point),* ● brainstorm in groups the relationship between bond type and physical properties of elements and compounds *(diamond, graphite, sodium chloride, aluminium metal, among others),* ● explore uses of elements, molecules and compounds based on their bond types and structures, ● watch animations, simulations or videos on chemical bonding and resultant structures.	

			Project: Model bonding in selected molecules or compounds. e.g.,NaCl, SiO_2, graphite, diamond among others (use locally available materials)	

Core competencies to be developed:

- Learning to learn: the learner learns independently while drawing dot and cross diagrams to illustrate bonding in elements and compounds.
- Digital literacy: the learner uses digital technology to effectively accomplish own task while watching animations, simulations, and videos on chemical bonding.
- Creativity and Imagination: The learner experiments with material to develop models to illustrate bonding in selected elements/compounds using locally available materials.
- Critical Thinking and Problem Solving: The learner interprets and infer with peers the relationship between bond types and resulting structures.

Values:

Love: the learner shows care by avoiding to hurt others as they carry out activities to investigate the physical properties of different structures.

Pertinent and Contemporary Issues (PCIs)

- Socio-Economic and Environmental issues (Environment conservation): The learner uses locally available materials to make models.
- Life skills (creative thinking): The learner models bonding in selected elements/compounds e.g., SiO_2, NaCl, graphite and diamond.
- Socio-Economic and Environmental issues (social cohesion): The learner discusses with peers different types of chemical bonds.

Strand	Sub Strand	Specific Learning Outcomes	Suggested Learning Experiences	Suggested Key Inquiry Questions
1.0 Inorganic chemistry	**1.5 Periodicity** **(32 lessons)** ● *gradation in size of atoms* and *ions*, *appearance, ionisation energy, electron affinity, melting and boiling points.* ● *ductility, malleability and electrical conductivity*	By the end of the sub strand, the learner should be able to: a) describe the trends in physical properties of elements of the periodic table; b) investigate the chemical properties of elements in group of the periodic table; c) describe the trends in properties across a period, d) outline applications of elements of the periodic table, e) appreciate applications of various elements of the periodic table.	The learner is guided to: ● discuss in groups, the trends in physical properties of elements in group I, II, VII and VIII, ● carry out experiments to investigate the physical properties of group I and II elements, ● carry out experiments to investigate chemical properties of group I and II elements (*reaction with oxygen, chlorine, cold water, steam and dilute acids*), ● collect and test for the gas produced, ● prepare chlorine gas and carry out experiments to investigate	1. Why is the study of chemical families important? 2. How does the position of an element in the periodic table influence its properties?

			the physical properties of chlorine, bromine and iodine (*appearance, smell, solubility in water and physical states*), ● carry out experiments to investigate the chemical properties of chlorine (*reaction with water, reaction with metals, displacement reactions and bleaching action*), ● discuss the trends in physical properties of period three elements (*atomic size, ionisation energy, electron affinity, electronegativity, melting and boiling point*s), ● carry out experiments on reactions of period three elements with (oxygen, water, chlorine and dilute acids), ● search for information using electronic and/or print media on the uses of selected	

			elements in groups I, II, VII and VIII and present your findings in class.	

Core competencies to be developed:

- Communication and Collaboration: as the learner discusses in groups, the trends in physical properties of elements in group I, II, VII and VIII.
- Self-efficacy: the learner confidently communicates the uses of selected elements while making presentations in plenary
- Learning to learn: The learner independently learns by practising writing balanced chemical equations for reactions involving group I, II and VII elements.
- Digital literacy: The learner uses digital devices appropriately to search for information on the uses of group I, II, VII and VIII elements.

Values:

Unity: The learner appreciates the participation of each member of the group as they carry out experiments to investigate physical and chemical properties of elements in the chemical families.

Pertinent and Contemporary Issues (PCIs)

- Learner Support Programmes (healthy inter and intra personal relationships): as the learner searches with peers for information on the uses of elements in group I, II, VII and VIII.
- Socio-Economic and Environmental issues (safety in class and school environment): The learner observes safety while preparing chlorine gas to investigate physical and chemical properties.
- Life skills (assertiveness): The learner confidently presents their findings on the uses of elements in group I, II, VII and VIII of the periodic table

Suggested Assessment Rubric

Level / Indicator	Exceeds expectation	Meets expectation	Approaches expectation	Below expectation
Ability to explain the importance of chemistry in our day to day life	Correctly explains at least four importance of chemistry in our day to day life.	Correctly explains at least three importance of chemistry in our day to day life	Correctly explains at least two importance of chemistry in our day to day life	Correctly explains at least one importance of chemistry in our day to day life
Ability to illustrate the electron arrangement of elements using *s* and *p* notation.	Correctly Illustrates the electron arrangement of all the 20 elements using *s* and *p* notation.	Correctly illustrates electron arrangement of 15-20 elements using *s* and *p* notation.	Correctly illustrates the electron arrangement of 10-*15* elements using *s* and *p* notation.	Correctly illustrates the electron arrangement of at most 10 elements using *s* and *p* notation.
Ability to write balanced equations for chemical reactions.	Correctly writes balanced equations for all chemical reactions	Correctly writes balanced equations for most chemical reactions	Correctly write balanced equations for some chemical reactions	correctly write few balanced chemical equations with prompts
Ability to investigate the relationship between bond types and	Correctly and comprehensively investigates the relationship between	Correctly investigates the relationship between bond types and physical	Correctly investigates the relationship between some bond types and physical properties of	Investigate the relationship between bond types and physical properties of

Level / Indicator	Exceeds expectation	Meets expectation	Approaches expectation	Below expectation
physical properties of elements,	bond types and physical properties of elements,	properties of elements,	elements leaving out some details	elements leaving out most details
Ability to describe the trends in properties in groups and periods	Correctly describes all the trends in properties in groups and periods.	Correctly describes most trends in properties in groups and periods.	Correctly describes some of the trends in properties in groups and periods.	Describes few trends in properties in groups and periods.

STRAND 2.0: PHYSICAL CHEMISTRY

Strand	Sub Strand	Specific Learning Outcomes	Suggested Learning Experiences	Suggested Key Inquiry Questions
2.0 Physical Chemistry	**2.1 Acids and bases (28 lessons)** • *Properties of acids and bases* • *(Reactions of acids with metals, carbonates, hydrogen carbonates, metal oxides and hydroxides).* • *Indicators* • *Universal indicator and pH scale.* • *Weak and strong acids and bases; pH scale and electrical conductivity, (use aqueous solutions*	By the end of the sub strand, the learner should be able to: a) explain the characteristics of acids and bases in aqueous solutions, b) describe the chemical properties of acids and bases, c) classify acids and bases into strong and weak using universal indicator, d) outline the uses of acids and bases in day to day life,	The learner is guided to: ● review the concept of acids and bases as learned in JS, ● observe safety when handling acids and bases, ● carry out experiment to demonstrate dissociation of acids and bases in water, ● carry out experiments on chemical properties of acids, ● perform experiments to investigate which metal oxides and hydroxides reacts with both acids and base,	What common household substances are acidic and/or basic in nature?

	of; sulphuric (VI) acid, hydrochloric acid, ethanoic acid, sodium hydroxide, sodium carbonate and ammonia of the same concentration to illustrate) • *Applications of acids and bases*	e) Appreciate the uses of acids and bases in day to day activities.	● collect and test for gases produced during the experiments, ● conduct experiments to determine strength of acids and bases using universal indicator, ● carry out activities to compare the electrical conductivity of strong and weak acids and bases ● properly dispose waste after experiments, ● search for information on the applications of acids and bases.	

Core competencies to be developed:

- Communication and Collaboration: The learner develops teamwork by contributing to group decision making while working with peers as they carry out laboratory experiments and activities.
- Digital literacy: The learner interacts with digital technology as they search for information on the applications of acids and bases

Values: Responsibility: The learner develops accountability as they take care of apparatus while using them during experiments
Pertinent and Contemporary Issues (PCIs): Environmental issues (safety in the laboratory): The learner observes safety when handling acids and bases

Strand	Sub Strand	Specific Learning Outcomes	Suggested Learning Experiences	Suggested Key Inquiry Questions
2.0 Physical Chemistry	**2.2 Introduction to Salts** (30 lessons) ● Types of salts. ● Methods of preparation. ● behaviour of salts in air ● uses of salts	By the end of the sub strand, the learner should be able to: a) classify different salts based on their properties. b) prepare salts using appropriate methods in the laboratory, c) describe the behaviour of salts when exposed to air, d) outline applications of salts in day to day life, e) appreciate applications of salts in day to day life.	The learner is guided to: • brainstorm and carry out activities in groups, to establish the meaning of salt (*samples of inorganic fertilisers/table salt/commercial salts found at home and in the school laboratory*), • discuss with peers and categorise salts as normal, acidic, basic and double • carry out experiments to determine the solubility of salts in water and classify them as either soluble or insoluble *(chlorides, carbonates, nitrates and sulphates),* • carry out experiments to prepare salts *(direct synthesis, reactions between; acids and metals, acids and bases, acids*	1. How do salts behave when exposed to air? 2. How can salts be prepared in the laboratory?

			and carbonates/hydrogen carbonates, precipitation reaction), • brainstorm on learner's rights and responsibilities to a safe learning environment when preparing salts, • write balanced chemical equations for reactions involved in the preparation of salts *(ionic equations limited to precipitation reactions),* • carry out experiments to investigate the behaviour of different salts when exposed to the atmosphere *(hygroscopic, deliquescent and efflorescent salts),* • discuss with peers, the applications of salts *(Agriculture, food industry, medicine, paper industry,*	

			paints industry, glass industry, laundry among others), • search for information using electronic and/or print media on the effects of applications of salts (inorganic fertilisers) on environmental sustainability *(water pollution-eutrophication, soil and air pollution),* • discuss with peers mitigation measures to challenges of using inorganic fertilisers for sustainable economy, health and the environment.	

Core competencies to be developed:

- Communication and Collaboration: The learner brainstorms and carries out activities with peers to establish the meaning of salt
- Learning to learn: The learner develops relationships by sharing what they have learnt while carrying out experiments to prepare salts
- Creativity and imagination: The learner makes observations as they carry out experiments to determine solubility of salts in water.

Values:

- Respect: The learner appreciates the opinion of others as they carry out activities to categorise salts as soluble or insoluble
- Unity: the learner cooperates with peers as they discuss the applications of salts

Pertinent and Contemporary Issues (PCIs)

- Socio-Economic and Environmental issues (waste management): The learner appropriately disposes of laboratory waste after preparing different salts
- Life skills (Self-esteem): The learner confidently makes presentations in plenary on the findings about the effects of excessive use of salts on environmental sustainability

Suggested Assessment Rubric

Level / Indicator	Exceeds expectation	Meets expectation	Approaches expectation	Below expectation
Ability to describe the chemical properties of acids and bases.	Correctly and comprehensively describes all the chemical properties of acids and bases.	Correctly describes most of the chemical properties of acids and bases.	Correctly describes some of the chemical properties of acids and bases,	Correctly describes few of the chemical properties of acids and bases.
Ability to prepare salts using appropriate methods in the laboratory	Correctly and systematically prepares salts using appropriate methods in the laboratory	Correctly prepares salts using appropriate methods in the laboratory	Correctly prepares salts using appropriate methods in the laboratory missing out some steps	Correctly prepares salts using appropriate methods in the laboratory missing out most steps

APPENDIX: SUGGESTED RESOURCES, ASSESSMENT METHODS AND NON-FORMAL ACTIVITIES

Strands	**Sub Strands**	**Suggested Resources**	**Suggested Assessment Methods**	**Suggested Non -Formal activities**
Inorganic Chemistry	Introduction to chemistry	• conventional laboratory resources • improvised resources from the environment • digital devices • online resources	• question and answer method, • written exercises • individual performance assessment • observations • project work	• excursions • field work • science Clubs and societies • games • science symposia
	The Atom	• conventional laboratory resources	• question and answer method, • written exercises	• excursions • field work • science Clubs and societies • games • science symposia
	The Periodic Table			

	Chemical Families Chemical Bonding Periodicity	• Improvised resources from the environment • digital devices • online resources	• individual performance assessment • observations • project work • practicals	
Physical Chemistry	Acids and Bases Introduction to Salts	• conventional laboratory resources • Improvised resources from the environment • Digital devices • Online resources	• question and answer method, • written exercises • individual performance assessment • project work • practicals	• excursions • field work • science Clubs and societies • games • science symposia

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