

GENERAL CHEMISTRY**THEORY III SPECIFIC****CONTEXT ISSUES:**

This course is mounted to equip year 3 student-teacher with basic concepts in chemistry. The topics to be studied in this course include oxidation reduction reactions, chemistry of industry and environment, and biotechnology, cement and glass production and polymers. This concept will make student-teachers appreciate chemistry in their daily lives. It will also inculcate into learners how to be conscious of their environment.

Course Title	General Chemistry Theory III						
Course Code	EBS 302	Course Level: 300		Semester 1		Credit value: 2	
Pre-requisite	Student teachers have knowledge in elective chemistry at the senior high school level.						
Course Delivery Modes	Face-toface: [v]	Practical activity: []	Work-Based Learning:[v]	Seminars: []	Independent Study: [v]	e-learning opportunities: [v]	Practicum: []
Course Description for significant learning (indicate NTS, NTECF, BSC GLE to be addressed)	This chemistry course is designed to consolidate and expand on the content students have acquired from their lessons in the elective chemistry course at the senior high school level. The course treats some aspects of organic and inorganic chemistry. Topics studied in this course include periodicity, oxidation reduction reactions, chemistry of industry and environment, and biotechnology, cement and glass production and polymers. NTECF, NTS 2c, pg.14, 3d,3i, 3j, 3k pgs.15, and 22						
Course Learning	On successful completion of the course, student teachers will be able to:			Indicators			

Outcomes	CLO 1. Demonstrate basic knowledge and understanding of the concept of periodicity. NTECF, NTS, 3i, pg15 & 3j, pg 15).	1.1 Identify the various categories of elements on the periodic table. 1.2. Explain the basic rule that brought about the various categories of elements on the periodic table.
	CLO 2. Demonstrate knowledge and understanding of the concepts of oxidation–reduction processes. (NTECF, NTS 2c, pg14, 3d, pg15).	2.1 Describe the chemical processes involve in oxidation-reduction processes. 2.2. Identify the agents of oxidation–reduction processes. 2.3. Write chemical equations illustrating

		oxidation reduction reactions as simultaneous events.
	CLO 3. Demonstrate knowledge and understanding of chemistry of industry and environment. NTECF, NTS 2c, pg14, 3j, pg15).	3.1. Describe the Occurrence, extraction/refining processes (electrolytic refining) of the following: Au, Al, Fe and crude oil. 3.2. Identify the uses of Au, Al, Fe and crude oil. 3.3. Discuss the effects of aluminium, gold, and iron mining and crude oil extraction on the environment (land/soil, water bodies and air) 3.4. Explain why glass is not a true solid 3.5. Discuss Environmental effects of open disposal of glass materials
	CLO 4. Demonstrate knowledge and understanding of the processes involve in the production of cement. NTECF, NTS 14c, 15i).	

	<p>3.6. Identify the chemical composition of cement – major and minor constituents.</p> <p>3.7. Describe the processes involved in cement manufacturing.</p> <p>3.8. Discuss the environmental effects of cement production.</p>
<p>CLO 5. Demonstrate basic knowledge and understanding of biotechnology and its various branches and applications. NTECF, NTS, 3i, pg15 & 3j, pg15).</p>	<p>4.1 Explain biotechnology.</p> <p>4.2. Describe the chemical and technological situations concerning biotechnology.</p> <p>4.3. Identify the branches and applications of Biotechnology.</p> <p>4.4. Discuss the effects of biotechnology on humans and the environment.</p>
<p>CLO 6. Demonstrate knowledge and understanding of the processes involve in the production of cement. NTECF, NTS 14c, 15i).</p>	

	CLO 7. Demonstrate understanding and knowledge of natural and artificial polymers. NTECF, NTS, 2c, pg 14, 3d, pg15 & 3j, pg15,).		6.1. Explain the following terms ‘ monomer and polymers’ 6.2 Identify the sources, uses, and tests of the following natural and artificial polymers: a) carbohydrates b) proteins c) rubber d) fats and oil as ester.	
	Units	Topics:	Sub-topics (if any):	Teaching and learning activities to achieve learning outcomes:
	1	Periodicity	<ul style="list-style-type: none"> • The periodic table: <ul style="list-style-type: none"> - the position of elements in the periodic table • Identification of metals, semi- metals and nonmetals on the periodic table. <ul style="list-style-type: none"> - Identifying the different categories of elements in the periodic table: Metals (alkali metals, alkaline earth metals and transition metals.), semi- metals, and non-metals (halogens, noble gases and other nonmetals). • Physical properties of some representative elements. <ul style="list-style-type: none"> - Physical and chemical properties of some elements: Na, K, Mg, Al, Ca and the halogens. <ul style="list-style-type: none"> ○ Hardness, density, melting point, boiling point and state of the alkali, alkaline Earth and the halogens. • The terms “<i>group</i>” and ‘<i>period</i>’. <ul style="list-style-type: none"> - Explain the terms “groups” and “periods” of the periodic table. 	<p>Use game, animations and simulations from YouTube and other online resources to develop the concepts</p> <p>Concept cartoon, Panel/pyramid discussion for presenting the concepts.</p> <p>Find someone who can’ as a strategy for presenting and discussion of the concept ‘Group and Periods’.</p>

			<p>- Discuss the similarities in chemical nature of elements in the same group.</p> <p>Use the following reactions for your discussions: Alkali metals, Li, Na and K with water</p>	
Course Content: General Chemistry Theory	2	Oxidation–reduction processes and oxidizing–reducing agents	<ul style="list-style-type: none"> • Definitions/explanations of oxidation and reduction in terms of <ul style="list-style-type: none"> i. hydrogen ii. oxygen iii. electron. • Examples of typical oxidising agents i.e. O_2 $KMnO_4$ etc. and reducing agents i.e. H_2, H_2S etc. • Chemical equations illustrating oxidation reduction reactions as simultaneous events • Identifications of species oxidised or reduced and corresponding oxidation or reduction agents. 	<p>Using Radio reporter Spidergram and Tree diagram Think-pair-share, Running dictation and discussion. Animation, simulations, YouTube and other online resources. concept mapping Presentations (individual & group) Field trips Practical work</p>

3	<p>Chemistry of industry and environment</p> <p>Occurrence, extraction/refining and uses of: Aluminium, iron, gold and crude Oil / Petroleum</p> <p>a). Aluminium</p>	<ul style="list-style-type: none"> • Occurrence, extraction/refining (electrolytic refining) and uses. • Effects of aluminum mining on the environment (land/soil, water bodies and air) • Occurrence, extraction/refining (use of the blast furnace) and uses <ul style="list-style-type: none"> - Rusting of iron – investigating factors needed for rusting, relevant chemical reactions involved in rusting. - Effects of rusting - Prevention of rusting. • Effects of iron mining on the environment (land/soil, water bodies and air) 	<p>Using Radio reporter Spidergram and Tree diagram Think-pair-share and running dictation and discussion. Animation, simulations, YouTube and other online resources. Concept mapping Presentations (individual & group) Field trips Practical work</p> <p>Using Radio reporter Spidergram and Tree diagram Think-pair-share and running dictation and discussion.</p>
---	---	--	---

		<p>b) Iron</p> <ul style="list-style-type: none"> • Occurrence, extraction/refining (electrolytic refining) and uses. • Effects of gold mining on the environment (land/soil, water bodies and air). <p>c) Gold</p> <ul style="list-style-type: none"> • Occurrence and composition, • Extraction/refining of crude oil/petroleum: - physical method i.e. fractional distillation. -chemical methods i.e. cracking and reforming. • Explanations of 'octane number' and 'knocking'. • Uses of major components of crude oil. • Effects of oil extraction, refining, spillage and petrochemicals on the environmental (land/soil, water bodies and air) <p>d)Crude oil and petroleum</p> <ul style="list-style-type: none"> • Composition of glass. • Reasons why glass is not a true solid. • Types/varieties of glass and their uses. <p>e) Glass and uses</p> <ul style="list-style-type: none"> • Environmental effects of open disposal of glass materials. • Meaning of Cement • Raw materials for cement production <p>f) Cement and its uses</p> <ul style="list-style-type: none"> • Chemical composition of cement – major and minor constituents. • Description of processes involved in cement manufacturing. • Hydration of cement including 'setting' and factors affecting setting. • Environmental effects of cement production <p>E.g.</p> <ul style="list-style-type: none"> - Emissions into air, water bodies 	<p>Animation, simulations, YouTube and other online resources</p> <p>Presentations (individual & group)</p> <p>Field trips</p> <p>Practical work</p> <p>Questions and answers technique can also be employed where appropriate (being mindful of equity and inclusivity).</p>
--	--	--	---

			<ul style="list-style-type: none">- Noise• Disposal of waste cement products.	
--	--	--	--	--

	4	Biotechnology	<ul style="list-style-type: none"> • Explanation of biotechnology • Chemical and technological situations concerning biotechnology • Branches and Application of Biotechnology • General Classes of Biotechnology: <ul style="list-style-type: none"> - Red biotech, - White/grey biotech, - Green biotech, - Blue biotech, • Effects of biotechnology on humans and the environment 	<p>Using concept mapping to present the concepts (being mindful of equity and inclusivity)</p> <p>Using individual and group presentations (being mindful of gender roles).</p> <p>Videos and animations from known science education sites online.</p> <p>Questions and answers technique can also be employed where appropriate.</p>
--	---	---------------	--	--

5	<p>Introduction to Polymers:</p> <p>Polymers</p> <p>Carbohydrates</p>	<p>Definitions of: monomers, polymers, Examples and comparison of natural and artificial polymers</p> <ul style="list-style-type: none"> • General sources of carbohydrates • Classes of carbohydrates i.e. Monosaccharide, disaccharides and polysaccharides. • Structure of glucose, fructose (as monosaccharide) and sucrose as a disaccharide. • Sugars –reducing and non- reducing • Starch and cellulose as a carbohydrate polymer • Hydrolytic/enzymatic fermentation of starch to produce glucose. • Iodine Test for carbohydrates • Structure of fats and oils • Uses of fats and oils • Chemical test for fats and oils • Production of margarine from unsaturated hydrocarbons (hardening of oil) 	<p>Using concept mapping and cartooning for illustrating and discussing the concepts. Using individual and group presentations Whole class discussion Using Radio reporter Spidergram and Tree diagram Think-pair-share Running dictation Animation, simulations, YouTube and other online resources. Field trips Practical work</p>
---	---	---	---

		Fats and oils as esters	<ul style="list-style-type: none"> • Production of soap –from traditional materials. • Structure and cleansing action of soap • Detergents • Differences between soap and detergents. • Actions of soap and detergents on hard water • Environmental and health hazards of detergents 	
		Proteins	<ul style="list-style-type: none"> • Proteins as polymers of amino acids • Structure and properties of proteins. • Hydrolysis of proteins. • Make specific reference to the structure and IUPAC names of lysine, leucine, alanine, glycine, and aspartic acid. • Properties and importance of protein to living organisms. • Chemical test for proteins • Polymerisation • Plastics as examples of polymers - Explanations of thermosetting and thermoset 	
		Synthetic Polymers	<ul style="list-style-type: none"> (thermosetting plastics) • Polymerisation reactions • Addition reactions involved the formation of e.g. 	
		Rubber		

			<ul style="list-style-type: none">- Polythene, polyvinyl chloride, polyphenylethene (polystyrene), polytetrafluoride, polypropene etc.• Condensation polymers: condensation reactions involved in the formation of e.g.• Polyamide (nylon), Polyester and Bakelite.• Importance/uses of artificial polymers.• Environmental problems posed by polymers and management.	
--	--	--	--	--

			<ul style="list-style-type: none"> • Rubber as a natural product. • Vulcanisation of rubber – process, reasons and examples of product and uses. 	
Course Assessment (Educative assessment: of, for and as learning)	<p>Component 1: Formative assessment (individual and group presentation) Summary of Assessment Method: Individual and group presentations on unit 1-3 (core skills to be developed: , digital literacy, respect for diversity, critical thinking, collaboration and communicative skills,) Weighting: 20% Assesses Learning Outcomes: CLO 1 & 2 (units 1 & 2)</p>			
<p>Component 2: Formative assessment (Quizzes and Exercises) Summary of Assessment Method: Quiz and exercises on unit 3-4 (core skills to be developed: critical thinking and personal development) Weighting: 20% Assesses Learning Outcomes: CLO 3 and 4 (unit 3 and 4)</p>				
<p>Component 3: Summative assessment Summary of Assessment Method: End of semester examination on units 1 to 5 (core skills to be developed: critical thinking, personal development) Weighting: 60% Assesses Learning Outcomes: CLO 1-5</p>				
<ol style="list-style-type: none"> 1. Projectors and computers 2. Audio-visuals and animations from YouTube 3. Flip charts 				
Required references	Abbey, T.K., Ameyibor, K., Essiah, J.W., Nyavor, C.B., Seddoh, S. & Wiredu M.B. (1995). <i>GAST Science for senior secondary school</i> . London: Unimax Publishers Limited Ameyibor, K., & Wiredu M. B. (1991). <i>GAST chemistry for senior secondary school</i> . London: Macmillan Education Limited. Chang, R. (2003). <i>General chemistry: The essential concepts</i> . (3 rd ed.). Boston: McGraw Hill.			

Additional Reading List	<p>Gallagher, R. & Ingram, P. (1987). <i>Chemistry made clear</i>. Oxford: Oxford University Press.</p> <p>Ohia, G.N.C., Amasiatu, G.I., & Ajagbe, J.O. (2005). <i>Comprehensive certificate chemistry</i>. Ibadan: University Press PLC.</p> <p>Whitten, K.W., Davis, R.E., & Peack M.L. (2000) <i>General Chemistry</i>. (6thed.). Fort Worth: Saunders College Publishing.</p>
-------------------------	--