The New Senior Secondary Curriculum for Sierra Leone

Subject syllabus for Integrated Science
Subject stream: Science & Technologies

This subject syllabus is based on the National Curriculum Framework for Senior Secondary Education. It was prepared by national curriculum specialists and subject experts.

SSSC
Senior Secondary School Curriculum

Curriculum elements for Integrated Science – a core subject

Subject description

Integrated Science 1 is a science course designed for high school students needing an entry-level science course covering basic concepts found in Earth Science, Biology, Astronomy, Physics and General Inquiry. Topics included in this study are:

- Inquiry
- Astronomy
- Oceanography
- Energy and matter
- Waves
- Cells
- Earth science

Broad goals/objectives

Throughout the course, students will have opportunities to observe simulations, investigate ideas, and solve problems–both on screen and away from the computer. The course seeks to help students expand their knowledge and skills so that they may achieve the following goals:

- Gain an understanding of foundational concepts in Earth Science, Astronomy, Biology and Chemistry.
- Make careful observations of the surrounding environment.
- Analyze problems and solutions scientifically.
- Integrate science knowledge with real world situations at local, regional, national, and international levels.
- Appreciate the impact of science discovery on everyday life.
- Use their senses for observation of the world around them.
- Define science and describe its history.
- Demonstrate knowledge of the various changes in matter.
- Describe elements and compounds in terms of atoms and molecules.
- Classify different animals using taxonomy.
- Demonstrate a knowledge of molecular structure as it relates to organic compounds.
- Use a microscope to study microscopic organisms.
- Describe cells, their different parts, and the function of a cell.

Structure of the Syllabus Over the 3-Year Senior Secondary Cycle

	SSS 1	SSS 2	SSS 3
Term 1	**Definition of cell and cell functions and processes** • Cells and cellular processes • Cell and its function? • The 4 cell processes? **Definition of tissues, organ, and systems of selected** • The living processes associated with the selected organ system	**Definition of mutation and evolution** • Role of mutation in evolution • Mutation and evolution relationship • Mutation evolution examples **Definition of basic atomic structure Periodic table** • Atomic model • Atomic numbers • Atomic mass and isotopes	**Definition of amino acids and proteins** • Building blocks of proteins • Acid-base properties • Standard amino acids • Amino acid reactions • Other functions • Nonstandard amino acids • Analysis of amino acid Mixtures • Some common uses energy.
Term 2	**Definition of ecology** • What Is Ecology • Biotic and Abiotic Factors • Types of Ecology • Importance of Ecology • Examples of Ecology	**Definition of acid bases and salts** • Their preparation and qualitative • Hydrogen and hydroxide ions • The Brønsted–Lowry definition • Alternative definitions • Acid–base reactions • Proton-transfers • Reactions of Lewis acids • Acid–base catalysis • Acid–base equilibrium • Aqueous solutions • Nonaqueous solvents • Lewis acids • The effect of molecular structure • Dissociation constants in aqueous solution	**Definition of forces and motion** • Balanced and Unbalanced Forces • Contact Forces • Fluid Mechanics • Reference Frames and Relative Position • Projectile Motion and Freefall • Speed, Velocity, Acceleration • Describing Motion, Momentum and Collisions • Circular Motion • Newton's Laws of Motion • Periodic Motion • Electric Force • Relationship between Magnetic and Electric Fields • Magnetic Force • Gravitational Force • Nuclear Forces

			• Comparing the Fundamental Forces of Nature

Term 3	**Definition of genetics**
	• What are examples of genetics?
	• What exactly are genetics?
	• What are genetics and its importance?
	• What are the 4 types of genes?
		Definition of Gravimetric techniques
		• Types of gravimetric methods?
		• The gravimetric method used for.
		• How do you perform a gravimetric analysis?
		• What is a gravimetric precipitation method?
		
		Definition of Crude oil and its Separation
		• Chemical and physical properties
		• Extraction and processing
		• How is crude oil separated?
		• Fractional distillation of crude oil
		• What are the fractions of crude oil?
			Definition of heat as a form of energy
			• Thermal expansion
			• Heat transfer Mixing temperature
			• Heat capacities
			• Converting mechanical energy into heat
			• Converting electrical energy into heat
			
			The Material Cycle-Eater, Carbon, and Nitrogen
			• Intro to biogeochemical cycles (This is the currently selected item)
			• Biogeochemical cycles overview
			  ○ The water cycle
			  ○ The carbon cycle
			  ○ The nitrogen cycle
			
			Working Scientifically
			• What is working scientifically in senior secondary school?
			• How do students work scientifically?
			• What are the scientific Enquiry skills?

Teaching syllabus

Topic/Theme/Unit	Expected learning outcomes	Recommended teaching methods	Suggested resources	Assessment of learning outcomes
Topic 1: The Cell and Cell functions and processes	By the end of this topic pupils will be able to: 1. Know what a cell and the function of cell is 2. know the various processes in cell and how the work	Brainstorming, question and answers, videos, films and slides, group work, fieldtrips, application of knowledge and understanding / problem solving, research	Internet, local available resources, textbooks, revision questions, laboratory work, specific models, specific charts.	Questions and answers, oral, multiple choice questions, self assessment, practical work, formative assessment, summative assessment
Topic 2: The structure of selected Tissues, Organs and Organ systems and the living processes associated with the selected Organ system	By the end of this topic pupils will be able to: 1. Know detailed about those selected tissues, organ, and systems Know about the various living processes	Brainstorming, questions and answers, research, videos, films &slides, application of knowledge and understanding, fieldtrips, group work	Textbooks, internet, local available resources, specific models, specific charts, research, video clips and slides, specific charts, specific models	Questions and answers, oral, practical work, multiple choice questions, Formative assessment, summative assessment.
Topic 3: Ecology	By the end of this topic pupils will be able to: 1. The relationship between living organisms 2. Understand the vital connections between plants and animals and the world around them.	Brainstorming, research, project, questions and answers, fieldtrips, group work, videos, films and slides, application of knowledge and understanding about ecology.	Textbooks, Websites / internet, video clips and slides, specific models, specific charts	Questions and answers, oral, multiple choice questions, research, formative assessment and summative assessment

Topic 4: Genetics	By the end of this topic pupils will be able to: 1. Know the differences between genes, heredity, trait, and variation 2. Know what DNA is	Brainstorming, questions and answers, research, videos, films and slides, application, and knowledge on the understanding about genetics, projects.	Textbooks, websites/internet, video clips and slides, specific models, specific charts	Questions and answers, oral, multiple choice questions, formative assessment, summative assessment, research.
Topic 5: Mutation and Evolution	By the end of this topic pupils will be able to: 1. Know that mutation is a change in DNA 2. Know that DNA is the hereditary material of life.	Brainstorming, research, hands on activities, fieldtrips, videos, films and slides, group work, direct instruction, application of knowledge and understanding	Internet, textbooks, local available resources, power point presentation, video clips, films and slides, subject specific charts, subject specific models	Questions and answers, quiz, self-assessment, group task, practical work, formative assessment, summative assessment.
Topic 6: Basic Atomic Structure and Periodic Table	By the end of this topic pupils will be able to: 1. Know that atoms are Made up of three particles 2. Know how the periodic table is related to atomic structure 3. Know what the basic atomic structures are 4. What is the structure of the periodic table. 5. What are atoms and periodic table.	Brainstorming, research, questions and answers, videos, films and slides, application of knowledge and understanding on basic atomic structure, project, group work.	Textbooks, internet, video clips, films and slides, subject specific models, subject specific charts, library, laboratory work.	Practical work, research, questions and answers, oral, quiz, formative assessment, summative assessment.

Topic 7: Acid Bases and Salts, and their preparation and qualitative analysis	By the end of this topic pupils will be able to: 1. Know what acid are, base and Salts. 2. Know various concepts that is Bronsted-Lowery, Lewis. 3. Know basic concepts on qualitative analysis.	Brainstorming, questions and answers, videos, films, and slides, application of knowledge and understanding, group work project.	Internet, textbooks, video clips and slides, laboratory work, subject specific models, subject specific charts	Questions and answers, oral, research, practical work, self-assessment, formative assessment, summative assessment.
Topic 8: Gravimetric	By the end of this topic pupils will be able to: 1. Know how to analyse quantity based on the mass of solid example: measure the solids; examples of bases.	Questions and answers, brainstorming, research, videos, films and slides, application of knowledge and understanding, projects, group work, laboratory work	Textbooks, internet, laboratory work, video clips, films and slides, subjects specific model, subject specific charts, library	Questions and answers, oral, quiz, self assessment, formative assessment, summative assessment, practical work
Topic 9: Crude Oil and its separation	By the end of this topic pupils will be able to: 1. Know what crude oil is made up of. 2. The main process for separating the Hydrocarbon components of crude oil is	Brainstorming, questions and answers, laboratory work, group work, direct instructions, videos, films and slides, application of knowledge and understanding on crude oil, projects research.	Textbooks, internet, laboratory work, video clips slides, subject specific models, subject charts, library.	Questions and answers, oral, quiz, self-assessment, formative assessment, summative assessment, practical work.

Topic 10: Amino Acids and Proteins	By the end of this topic pupils will be able to: 1. Know that amino acids are monomer that make up Proteins. 2. Know that specifically, a protein is made up of one or more linear chains of amino acids. 3. How amino acid related to a protein? 4. Why are amino acids importance to protein	Brainstorming, research, laboratory work, videos, films and slides, application on the knowledge and understanding, using experts, groupwork, hands on activities, direct instruction	Internet, textbooks, power point presentation, video clips, films, and slides, local available resources, subject specific models, subject specific charts	Questions and answers, oral, multiple choice questions, self-assessment, formative assessment, summative assessment
Topic 11: Forces and Motion	By the end of this topic pupils will be able to: 1. Know what is forces and motion 2. Examples of forces and motions 3. Know the types of forces	Questions and answers, brainstorming, research, group work, videos, films, and slides, application on the knowledge and understanding about forces and motions, laboratory work, hands on activities.	Textbooks, websites / internet, power point presentation, local available resources, video clips and slides, subject specific models, subject specific charts.	Questions and answers, oral, self-assessment, formative assessment, summative assessment, practical.
Topic 12: Electricity and its generation	By the end of this topic pupils will be able to: 1. Know that the process of generating electric power from sources of primary energy. 2. Know what electricity is and how is it generated 3. Know The process of electricity generation	Brainstorming, questions and answers, research, group work, laboratory work, direct instructions, application, and knowledge on the understanding / project using experts, videos, films, and slides, hands on activities	Websites / internet, textbooks, power point presentation, local available resources, subject specific models, subject specific charts	Questions and answers, oral, multiple choice questions, self-assessment, formative assessment, summative assessment

	4. Know the types of electricity. 5. The methods of producing electricity.			
Topic 13: Heat as a form of energy	By the end of this topic, pupils will be able to: 1. Know the motion of particles that create a form of energy is called heat 2. Know that heat is a form of energy 3. Know what the energy of heat is?	Brainstorming, questions and answers, research, group work, videos, films and slides, application of the knowledge and understanding project, laboratory work.	Textbooks, Websites / internet, video clips and slides, subject specific models, subject specific charts.	Questions and answers, oral, multiple choice questions, self-assessment, formative assessment, summative assessment
Topic 14: The Material Cycle-Water, Carbon and Nitrogen	By the end of this topic pupils will be able to: 1. Know that biochemical cycles important to living organisms. 2. Know what the water are, carbon and nitrogen cycles. 3. Know how the water is cycle different from carbon and nitrogen cycle.	Brainstorming, questions and answers, research, group work, videos, films and slides, application of the knowledge and understanding project.	Textbooks, websites, video clips, films and slides, subject specific models, subject specific charts.	Questions and answers, oral, multiple choice questions, self-assessment practical work, formative assessment, summative assessment
Topic 15: Working scientifically	By the end of this topic pupils will be able to: 1. Know the processes of science, including understanding the sorts	Brainstorming, questions and answers, research, group work, laboratory work, direct instructions,	Websites / internet textbooks, video clips, films, and slides power points presentation, subject specific models, subject	Questions and answers, oral, self-assessments, multiple choice questions, formative assessment, summative assessment

	of questions that are the province of science 2. Know the design of experiments;	using experts, application of knowledge of the understanding / projects	specific charts	