NATIONAL BOARD FOR TECHNICAL EDUCATION

BASIC SCIENCE (GENERAL)

CURRICULUM AND COURSE SPECIFICATIONS

FOR

NATIONAL DIPLOMA (ND) AND HIGHER NATIONAL DIPLOMA (HND) PROGRAMMES

MAY, 2025

PLOT B, BIDA ROAD, P.M.B. 2239 KADUNA – NIGERIA

FOREWARD

The reviewed **Basic Science Courses**, encompassing **Physics, Chemistry, and Biology**, designed for the National Diploma (ND) and Higher National Diploma (HND) Programmes represents the Board's recognition of the role of foundational scientific knowledge in nurturing competent and adaptable professionals for Nigeria's industries.

This review, the first since the curriculum's inception in 1999, was necessitated by the dynamic shifts in Technical and Vocational Education (TVE) and the imperative to meet the demands of the 21st century. This aims to ensure that our diplomates are not only equipped with specialized technical skills but also possess a robust scientific understanding that underpins innovation and problem-solving.

These reviewed Basic Science Courses is designed to instill learning, critical thinking and problem-solving abilities firmly grounded in scientific principles and promote an understanding of natural phenomena.

It is our profound hope that the effective implementation of this revised Basic Sciences Courses will empower our diplomates to apply their knowledge with confidence and contribute meaningfully to various sectors of the economy

Prof Idris M. Bugaje
EXECUTIVE SECRETARY NBTE, KADUNA

Introduction

The Basic Sciences Courses (General) are a foundational component of various National Diploma (ND) and Higher National Diploma (HND) Programmes, have remained largely unchanged since their development in 1999. A comprehensive review of these Basic Science courses was carried out to address the evolving needs of Technical and Vocational Education (TVE).

This aims to instill knowledge and skills beyond technical specialization, fostering critical thinking and problem-solving abilities grounded in scientific principles, and promoting a understanding of natural phenomena.

Specifically, the reviewed Basic Sciences Courses (Physics, Chemistry and Biology) are designed to equip students with:

- Improved critical thinking and problem-solving skills, cultivated through scientific methodologies.
- A foundational knowledge of fundamental scientific concepts across Physics, Chemistry, and Biology.
- Essential skills like numeracy and scientific literacy.

These integral elements of the Basic Sciences courses will produce diplomates who are not only technically proficient but also scientifically literate and capable of applying their knowledge to contribute meaningfully to society and various industries.

Lecturer Qualifications

Basic Sciences courses should primarily be taught by qualified lecturers from the Science Laboratory Technology (SLT) Department. In instances where qualified lecturers are unavailable within the SLT Department, the Department may employ the services of a qualified lecturer from another department within the same institution or engage one on a part-time basis.

Teaching Staff Requirements

Lecturers teaching SLT courses should possess relevant qualifications and experience, with a minimum of a Bachelor's degree in a relevant field.

- **ND Courses:** Should be taught by lecturers of Lecturer III rank and above.
- **HND Courses:** Should be taught by lecturers of Lecturer II rank and above.

CURRICULUM TABLE

S/N	COURSE CODE	COURSE TITLE	L	P	CH	CU
ND PHYSICS, CHEMISTRY AND BIOLOGY COURSES						
1	STP 101	GENERAL PHYSICS I	2	1	3	3
2	STC 101	GENERAL CHEMISTRY I	2	1	3	3
3	STB 101	GENERAL BIOLOGY I	2	1	3	3

S/N	COURSE CODE	COURSE TITLE	L	P	CH	CU
HND PHYSICS, CHEMISTRY AND BIOLOGY COURSES						
1	STP 301	GENERAL PHYSICS II	2	1	3	3
2	STC 301	GENERAL CHEMISTRY II	2	1	3	3
3	STB 301	GENERAL BIOLOGY II	2	1	3	4

NATIONAL DIPLOMA

PROGRAMME: NATIONAL DIPLOMA		
COURSE TITLE: General Physics I	**COURSE CODE**: STP 101	**CONTACT HOURS**: 3
	CREDIT UNITS: 3	**THEORETICAL**: 2
YEAR: I **SEMESTER:** 0	**PRE-REQUISITE**:	**PRACTICAL**: 1
GOAL: The course is designed to acquaint students with the knowledge and skills of applications of Physics in everyday life.		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Know the historical development of physics as a science 2.0 Know the concept of motion 3.0 Know the principle of operation of simple machines 4.0 Know the concept of energy 5.0 Know the concept of waves 6.0 Know the concept of electric and magnetic fields. 7.0 Understand the concept of thermodynamics		

PROGRAMME: NATIONAL DIPLOMA		
COURSE TITLE: General Physics I	**COURSE CODE**: STP 101	**CONTACT HOURS**: 3
	CREDIT UNITS: 3	**THEORETICAL**: 2
YEAR: I **SEMESTER**: 0	**PRE-REQUISITE**:	**PRACTICAL**: 1
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL		
GOAL: The course is designed to acquaint students with the knowledge and skills of applications of Physics in everyday life.		
GENERAL OBJECTIVE 1.0: Know the historical developments of Physics as a science		

THEORETICAL CONTENT				**PRACTICAL CONTENT**		
WEEK	**SPECIFIC LEARNING OUTCOME**	**TEACHER'S ACTIVITIES**	**RESOURCES**	**SPECIFIC LEARNING OUTCOME**	**TEACHER'S ACTIVITIES**	**RESOURCES**
1-2	1.1 Outline the development of scientific observations and knowledge as science e.g.: • Making of fire • Free fall • Movement of stars • Law of flotation • Motion of projectile (warfare) • Burning glass 1.2 Outline the growth of Physics into different areas such as:	Explain the development of scientific observations and knowledge as science e.g.: • Making of fire • Free fall • Movement of stars • Law of flotation • Motion of projectile (warfare) • Burning glass Explain the growth of Physics into different areas such as:	Textbooks Journals Whiteboard Marker Computer Internet Projector	Perform simple activities to demonstrate scientific principles: • Falling from a height • Floating of objects in water.	Guide student to: Perform simple activities to demonstrate scientific principles: • Falling from a height • Floating of objects in water.	Floating objects Free-falling objects

	• Optics • Mechanics • Electricity Magnetisms • Heat etc. 1.3 Outline the contributions of named scientists in the development of physics as a science. • Early man • Aristotle • Galileo • Archimedes • Isaac Newton • Einstein etc. 1.4 Explain Physics as a subject 1.5 Distinguish between early observations mentioned in 1.1 above to modern applications of physics 1.6 Enumerate some	• Optics • Mechanics • Electricity Magnetisms • Heat etc. Explain the contributions of named scientists in the development of physics as a science: • Early man • Aristotle • Galileo • Archimedes • Isaac Newton • Einstein etc. Explain Physics as a subject Distinguish between early observations mentioned in 1.1 above to modern applications of physics Explain some modern				

	modern applications of physics in their everyday life 1.7 List the industries and firms that require the services of physicists	applications of physics in their everyday life Explain the industries and firms that require the services of physicists				
GENERAL OBJECTIVE 2.0: Know the concept of motion						
3-4	2.1 Define Motion 2.2 Explain the types of motion e.g. • Translational • Circular • Rational • Oscillatory etc. 2.3 List the application of each type of motion mentioned in 2.2 above 2.4 Explain the cause of motion 2.5 Define the following terms giving practical examples of each one of	Explain motion Explain the types of motion e.g.: • Translational • Circular • Rational • Oscillatory etc. Explain the application of each type of motion mentioned in 2.2 above Explain the cause of motion Explain the following terms giving practical examples of each one of	Textbooks Journals Whiteboard Marker Computer Internet Projector	Carryout experiments to illustrate the following: • Circular motion • Rational motion • S.H.M Demonstrate the methods of measurement of length time-using stop watch as in the application of simple pendulum and mass	Guide student to: Carryout experiments to illustrate the following: • Circular motion • Rational motion • S.H.M Demonstrate the methods of measurement of length time-using stop watch as in the application of simple pendulum and mass	Stop-watch Beam balances Vernier callipers Meter ruler Simple pendulum

	them: • Speed • Acceleration • Velocity • Distance • Displacement 2.6 Use mathematical expressions to solve simple problems	them: • Speed • Acceleration • Velocity • Distance • Displacement Use mathematical expressions to solve simple problems		Perform experiments in the measurement of mass using beam balances, length using vernier callipers and meter-ruler; time, using stop watch, simple pendulum.	Perform experiments in the measurement of mass using beam balances, length using vernier callipers and meter-ruler; time, using stop watch, simple pendulum.	
GENERAL OBJECTIVE 3.0: Know the principle of operation of simple machines						
5-6	3.1 Define a machine as a device which facilitates work 3.2 List simple machines such as: • Levers • Pulleys • Inclined planes • Hydraulic press etc. 3.3 Cite instances of the applications of each type of machine in 3.2 above in their everyday life	Explain machine as a device which facilitates work Explain simple machines such as: • Levers • Pulleys • Inclined planes • Hydraulic press etc. Explain instances of the applications of each type of machine in 3.2 above in their everyday life	Textbooks Journals Whiteboard Marker Computer Internet Projector	Perform simple experiments to illustrate the principles of : • Operation of levers • Inclined planes • Pulleys • Hydraulic press	Guide student to: Perform simple experiments to illustrate the principles of : • Operation of levers • Inclined planes • Pulleys • Hydraulic press	Lever Pulleys Inclined planes Hydraulic press

	3.4 Explain complex machines as a combination of simple machines e.g.: • Bicycles • Sewing machines. etc. 3.5 List factors affecting motion for example air resistance, viscosity, solid friction as it affects machines 3.6 State the advantages and disadvantages of friction	Explain complex machines as a combination of simple machines e.g.: • Bicycles • Sewing machines. etc. Explain factors affecting motion for example air resistance, viscosity, solid friction as it affects machines Explain the advantages and disadvantages of friction				
General Objective 4.0: Know the concept of energy						
7-8	4.1 Define work, energy, power and conversion of energy, stating their units 4.2 State the law of conversion of energy 4.3 List different types of energy: • Mechanical energy	Explain work, energy, power and conversion of energy, stating their units. Explain the law of conversion of energy Explain the different types of energy: • Mechanical energy	Textbooks Journals Whiteboard Marker Computer Internet Projector	Demonstrate experimentally the effects of heat energy e.g.: • Ball and ring experiment • Melting of ice • Boiling of water to form steam.	Guide student to: Demonstrate experimentally the effects of heat energy e.g.: • Ball and ring experiment • Melting of ice • Boiling of water to form steam	Ball Ring Ice Water Car battery Heating coils

	• Chemical energy • Heat energy • Electrical energy • Sound energy • Light energy • Nuclear energy 4.4 Explain simple practical problems involving work and energy 4.5 Define temperature stating the various units of measurement 4.6 Distinguish between heat and temperature 4.7 State the uses of the following types of thermometers: • Mercury in glass • Alcohol in glass • Gas-Volume Thermometer • Clinical	• Chemical energy • Heat energy • Electrical energy • Sound energy • Light energy • Nuclear energy Explain simple practical problems involving work and energy Explain temperature stating the various units of measurement Explain the differences between heat and temperature State the uses of the following types of thermometers: • Mercury in glass • Alcohol in glass • Gas-Volume Thermometer		Perform simple experiments to illustrate. Conversion of energy from one form to another Perform experiments to illustrate conduction, convection and radiation: • Conduction of heat through a metal rod, • Convection in air and radiation through different materials.	Perform simple experiments to illustrate Conversion of energy from one form to another Perform experiments to illustrate conduction, convection and radiation: • Conduction of heat through a metal rod, • Convection in air and radiation through different materials.	Touch Light bulbs Beating drum Metal rod Heating mantel

	Thermometer etc. • Pyrometers etc. 4.8 Describe specific application of the above Thermometers in everyday life	• Clinical Thermometer etc. • Pyrometers etc. Explain the specific application of the different types of thermometers in everyday life				
General Objective 5.0: Know the concept of waves						
9-10	5.1 Define waves 5.2 Explain the differences between mechanical and electro-magnetic waves 5.3 List examples of trans verse and longitudinal waves 5.4 List examples of sound waves 5.5 Explain the differences between music and noise 5.6 Classify musical	Explain waves Explain and state the differences between mechanical and electro-magnetic waves Explain examples of trans verse and longitudinal waves Explain examples of sound waves Explain the differences between music and noise Classify musical	Textbooks Journals Whiteboard Marker Computer Internet Projector	Illustrate experimentally the concept of waves using examples such as: • Ripples on water • Waves on string • Helical string Conduct some simple experiments to demonstrate properties of waves:	Guide student to: Illustrate experimentally the concept of waves using examples such as: • Ripples on water • Waves on string • Helical string Conduct some simple experiment to demonstrate properties of	Water Strings Beating drums Curved mirror Glass block Prism glass

	instruments: • String instrument • Wind • Percussion 5.7 Explain the term Echo and state its application in everyday life, e.g. depth finding, radar, oil prospecting etc. 5.8 List sources of light 5.9 Explain the formation of shadows, eclipse, with diagram 5.10 Explain the phenomenon of reflection and refraction of light 5.11 Analyse descriptively the application of reflection and refraction of light as in: • Shaving mirror	instruments: • String instrument • Wind • Percussion Explain the term Echo and state its application in everyday life, e.g. depth finding, radar, oil prospecting etc. Explain sources of light Explain the formation of shadows, eclipse, with diagram Explain the phenomenon of reflection and refraction of light Analyse descriptively the application of reflection and refraction of light as in: • Shaving mirror • Driving mirror		• Reflection • Refraction. Measure angles of incidence and reflection Conduct simple experiment to demonstrate different sound produced by different instruments. Identify the different sounds produced by string, wind and percussion Perform simple experiments on reflection and refraction:	waves: • Reflection • Refraction. Measure angles of incidence and reflection Conduct simple experiment to demonstrate different sound produced by different instruments. Identify the different sounds produced by string, wind and percussion Perform simple experiments on reflection and refraction:	

	• Driving mirror • Reflectors • Burning glass • Magnifying glass 5.12 Explain the phenomenon of apparent depth and mirage 5.13 List types of lenses – diverging and converging 5.14 Explain the power of a lens 5.15 Describe the working of some optical instruments and briefly describe their uses: • Microscope • Telescope • Camera • Eye • Projector	• Reflectors • Burning glass • Magnifying glass Explain the phenomenon of apparent depth and mirage Explain types of lenses – diverging and converging Explain the power of lens Explain the working of some optical instruments and briefly describe their uses: • Microscope • Telescope • Camera • Eye • Projector		• Plane Mirror • Curved mirror experiment, • Refraction through a glass block, • Refraction through water Perform experiment to illustrate dispersion of white light by prism and relate to its formation of rainbow.	• Plane mirror • Curved mirror experiment • Refraction through a glass block, • Refraction through water Perform experiment to illustrate dispersion of white light by prism and relate to its formation of rainbow.	

	5.16 Compare the eye and the camera 5.17 List the component of white light and rainbow 5.18 Explain mixing of colours as in coloured television	Compare the eye and the camera. Explain the component of white light and rainbow Explain mixing of colours as in coloured television				
GENERAL OBJECTIVE 6.0: Know the concept of electric and magnetic fields						
11-12	6.1 Explain and differentiate using diagrams of the following: • Magnetic field • Electric field • Gravitational field 6.2 Explain the use of a compass 6.3 Illustrate the electrical wiring of a house and equipment using series and parallel connection	Explain experimentally the following: • Magnetic field • Electric field • Gravitational field Explain the use of a compass Explain the electrical wiring of a house and equipment using series and parallel connection	Textbooks Journals Whiteboard Marker Computer Internet Projector	Perform simple experiments to illustrate various effects of: • Electric current, • Heating effects as in heating coil, • Electric bulbs • Sound effects as in bell, loud speaker, microphone Perform simple experiment to show the	Guide students to: Perform simple experiments to illustrate various effects of: • Electric current, • Heating effects as in heating coil • Electric bulbs • Sound effects as in bell, loud speaker, microphone Perform simple experiment to	Heating coil Electric bulbs Bells Loud speaker Microphone Torch bulb Wires Fuse Cable Plug

	6.4 Explain the use of fuses and plugs in an electrical wiring 6.5 Describe precautionary measures involved in electrical wiring and use of electrical appliances in homes, industries and offices 6.6 List common electric instrument and their uses e.g.: • Ammeters • Voltmeters • Watt meters • Ohmmeter • Multimeter 6.7 Explain the uses of electromagnets in dynamos, motors transformers, electric bell, telephone, loudspeakers 6.8 Define Electric power	Explain the use of fuses and plugs in an electrical wiring Explain precautionary measures involved in electrical wiring and use of electrical appliances in homes, industries and offices Explain common electric instrument and their uses e.g.: • Ammeters • Voltmeters • Watt meters • Ohmmeter • Multimeter Explain the uses of electromagnets in dynamos, motors transformers, electric bell, telephone, loudspeakers. Explain Electric power		relationship in above using torch bulb, wires and relevant instruments Insert a fuse in an electric socket Fix a cable into a plug	show the relationship in above using torch bulb and wires and relevant instruments Insert a fuse in an electric socket Fix a cable into a plug	

	6.9 Explain generation and reception of radio and television signals	Explain generation and reception of radio and television signals				
GENERAL OBJECTIVE 7.0: Understand the concept of thermodynamics						
13-15	7.1 Define thermodynamics 7.2 Explain thermodynamic systems 7.3 Explain the laws of thermodynamics 7.4 Explain practical examples of the applications of thermodynamics in daily lives	Explain thermodynamics Explain thermodynamic systems Explain the laws of thermodynamics Explain practical examples of the applications of thermodynamics in daily lives	Textbooks Journals Whiteboard Computer Internet Maker Projector			

EVALUATION
C/A:60%
EXAMS: 40%
TOTAL: 100%

PROGRAMME: NATIONAL DIPLOMA (ND)		
COURSE TITLE: General Chemistry I	**COURSE CODE**: STC 101	**CONTACT HOURS**:3
	CREDIT UNITS: 3	**THEORETICAL**: 2
YEAR: I **SEMESTER**: 0	**PRE-REQUISITE:**	**PRACTICAL:**1
GOAL: This course is designed to acquaint students with the basic principles Chemistry and their applications in everyday life and society		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Understand the scope and concept of science. 2.0 Understand the concept of Chemistry. 3.0 Understand the basic concepts of matter 4.0 Understand the main constituents of air. 5.0 Appreciate the importance of water in our society 6.0 Know the general characteristics and properties of acids, bases and salts. 7.0 Understand the locally available metals, their sources, locations and economic importance. 8.0 Know the nature and importance of organic compounds. 9.0 Understand the concepts of Chemical reactions.		

PROGRAMME: **NATIONAL DIPLOMA CHEMISTRY**						
COURSE TITLE: General Chemistry I		**COURSE CODE**: STC 101		**CONTACT HOURS**: 3		
		CREDIT UNITS: 3		**THEORETICAL**: 2		
YEAR: I **SEMESTER**: 0		**PRE-REQUISITE:**		**PRACTICAL:**1		
COURSE SPECIFIFCATION: THEORETICAL AND PRACTICAL						
GOAL: This course is designed to acquaint students with the basic principles Chemistry and their applications in everyday life and society						
GENERAL OBJECTIVE 1.0: Understand the scope and concept of science.						
	THEORETICAL CONTENT			PRACTICAL CONTENT		
WEEK	**SPECIFIC LEARNING OUTCOME**	**TEACHER'S ACTIVITIES**	**RESOURCES**	**SPECIFIC LEARNING OUTCOME**	**TEACHER'S ACTIVITIES**	**RESOURCES**
1-2	1.1 Define science. 1.2 Explain the history and philosophy of science. 1.3 Explain the relevance of science to man and society. 1.4 Explain the difference between Basic and Applied Sciences 1.5 List different disciplines in Basic and Applied science.	Define science. Explain the history and philosophy of science. Explain the relevance of science to man and society. Explain the difference between Basic and Applied Sciences Explain different disciplines in Basic and Applied science.	Text books Journals Whiteboard Marker Computer Internet Projector			

GENERAL OBJECTIVE 2.0: Understand the concept of Chemistry.						
3-4	2.1 Explain chemistry as a branch of science. 2.2 Give examples of applications of chemistry to man and society e.g.: • Production of salt from hydro-chloric acid and sodium hydroxide. • Processing of crude oil into various products like gasoline, kerosene, gas, etc. • Production of soap (saponification) • Production of cement. • Production of shoe polish from charcoal • Refining of vegetable oil. 2.3 List local chemical industries and their products.	Explain chemistry as a branch of science. Explain examples of applications of chemistry to man and society e.g.: • Production of salt from hydro-chloric acid and sodium hydroxide. • Processing of crude oil into various products like gasoline, kerosene, gas, etc. • Production of soap (saponification) • Production of cement. • Production of shoe polish from charcoal • Refining of vegetable oil. Explain local chemical industries and their products.	Text books Journals Whiteboard Marker Computer Internet Projector			

GENERAL OBJECTIVE 3.0: Understand the basic concepts of matter						
5-6	3.1 Define the three states of matter (solid, liquid and gas). 3.2 Define an atom. 3.3 List the three main constituents of an atom. 3.4 Define an element, a molecule, a mixture and a compound. 3.5 Explain the various physical methods of seperating a mixture 3.6 Explain the relationship between 3.2 and 3.4 above. 3.7 Give the symbols and valences of some common elements e.g. O_2, N_2 H_2 etc.	Explain the three states of matter (solid, liquid and gas). Explain an atom. Explain the three main constituents of an atom Explain an element, a molecule, a mixture and a compound Explain the various physical methods of seperating a mixture Explain the relationship between 3.2 and 3.4 above. Explain the symbols and valences of some common elements e.g. O_2, N_2 H_2 etc.	Text books Journals Whiteboard Marker Computer Internet Projector			

	3.8 Determine the effect of heat and chemicals on different compound e.g.: • Lead nitrate • Sodium sulphate(aq) + Ball(aq) • NQ2, S2, O3(aq) + Ball2(aq)	Explain the effect of heat and chemicals on different compound e.g.: • Lead nitrate • Sodium sulphate(aq) + Ball(aq) • NQ2, S2, O3(aq) + Ball2(aq)				
GENERAL OBJECTIVE 4.0: Understand the main constituents of air.						
7	4.1 Outline the main constituents of air O_2, CO_2, N_2, rare gases and H_2O. 4.2 State the proportion by volume of each constituent in the air. 4.3 Define air pollution 4.4 List the causes of air pollution. 4.5 State the consequences of air pollution.	Explain constituents of air O_2, CO_2, N_2, rare gases and H_2O. Explain the proportion by volume of each constituent in the air. Explain air pollution Explain the causes of air pollution Explain the consequences of air pollution.	Text books Journals Whiteboard Marker Computer Internet Projector Slides			

	4.6 Describe methods of checking air pollution.	Explain methods of checking air pollution.				
GENERAL OBJECTIVE 5.0: Appreciate the importance of water in our society						
8-9	5.1 Define water as a universal solvent 5.2 Explain the constituents of water. 5.3 List the properties of water. 5.4 List the sources of water. 5.5 Differentiate between hard and soft water. 5.6 Describe methods of softening hard water. 5.7 Describe methods of purifying drinking water. 5.8 Describe water cycle 5.9 List the causes of water	Explain water as a universal solvent Explain the constituents of water. Explain the properties of water. Explain the sources of water Explain the difference between hard and soft water. Explain methods of softening hard water Explain methods of purifying drinking water. Explain water cycle Explain the causes of	Textbooks Journals Whiteboard Marker Computer Internet Projector Slides	Carry out the electrolysis of water using Hoffman Voltmeter to identify the constituents of water Carry out distillation of water to produce distilled water which can be used for routine experiments in laboratories and charging of batteries.	Guide student to: Carry out the electrolysis of water using Hoffman Voltmeter to identify the constituents of water Carry out distillation of water to produce distilled water which can be used for routine experiments in laboratories and charging of batteries.	Hoffman Voltmeter Distiller

	pollution. 5.10 List methods of checking water pollution in our society	water pollution. Explain methods of checking water pollution in our society				
GENERAL OBJECTIVE 6.0: Know the general characteristics and properties of acids, bases and salts.						
10-11	6.1 Define acid, base and salts. 6.2 List examples of common acids, bases, and salts. 6.3 List the properties of acids, base and salts 6.4 Differentiate between concentrated and diluted acids. 6.5 Give examples of concentrated and diluted acids. 6.6 List uses of acids, bases, and salts mentioned in 6.2 above.	Explain acid, base and salts. Explain examples of common acids, bases, and salts. Explain the properties of acids, base and salts Explain the differences between concentrated and diluted acids. Explain examples of concentrated and diluted acids. Explain uses of acids, bases, and salts mentioned in 6.2 above.	Textbooks Journals Whiteboard Marker Computer Internet Projector Slides	Carry out simple test for acids, bases and salts. Use indicators to distinguish between acids, bases and salts. Carry out acid base titration. Obtain salt such as sodium chloride from sea water by evaporation process.	Guide students to: Carry out simple test for acids, bases and salts. Use indicators to distinguish between acids, bases and salts. Carry out acid base titration. Obtain salt such as sodium chloride from sea water by evaporation process.	Acid Bases Bunsen Burner Gas Burette Pipette Evaporating dish Volumetric Flask Litmus paper Wire gauze Tripod Stand

						Retord Stand Clamp Sea water
GENERAL OBJECTIVE7.0: Understand the locally available metals, their sources, locations and economic importance.						
12-13	7.1 Define metals 7.2 Describe the properties of metals 7.3 List the locally available metals e.g.: • Iron and Steel • Tin • Aluminium • Uranium etc. 7.3 List the places where the metals mentioned in 7.1 above are located. 7.4 Outline the method of purification of metals listed in 7.1 above. 7.5 Explain the uses some common metals with specific examples.	Explain metals Explain the properties of metals Explain the locally available metals e.g.: • Iron and Steel • Tin • Aluminium • Uranium etc. Explain the places where the metals mentioned in 7.1 above are located. Explain the methods of purification of metals listed in 7.1 above. Explain the uses some common metals with specific examples.	Textbooks Journals Whiteboard Marker Computer Internet Projector Slides			

GENERAL OBJECTIVE 8.0: Know the nature and importance of organic compounds.						
14	8.1 Explain organic compound 8.2 Define hydrocarbons. 8.3 Explain the class of organic compound through the functional groups. 8.4 Outline the production process of petroleum and its products from crude oil e.g.: • Petrol • Kerosene • Plastic. 8.5 Explain the production of soap through saponification process. 8.6 Differentiate between a soap and a detergent. 8.7 Define alcohol	Explain organic compound Explain hydrocarbons. Explain the class of organic compound through the functional groups. Explain the production process of petroleum and its products from crude oil e.g.: • Petrol • Kerosene • Plastic. Explain the production of soap through saponification process. Explain the differences between a soap and a detergent. Explain alcohol	Textbooks Journals Whiteboard Marker Computer Internet Projector Slides.	Carry out an experiment to produce soap from palm oil and potash rich ashes. Carryout an experiment to produce ethanol through the fermentation of locally available cereals.	Guide student to: Carry out an experiment to produce soap from palm oil and potash rich ashes. Carryout an experiment to produce ethanol through the fermentation of locally available cereals.	Millet Distillation Apparatus Soap Bunsen Burner Tripod Stand Wire Gauze Pyrex glass Spatula Stirrer Balance Oil Strong base Water bath

	8.8 Outline sources of alcohol 8.9 List different classes of alcohol 8.10 Outline the methods of production of alcohol from local raw materials e.g.: • Corn • Cocoyam • Banana • Sugar-cane, etc. 8.11 State the various uses of alcohol and ethanol.	Explain sources of alcohol List different classes of alcohol Explain the methods of production of alcohol from local raw materials e.g.: • Corn • Cocoyam • Banana • Sugar-cane, etc. Explain the various uses of alcohol and ethanol				
GENERAL OBJECTIVE 9.0:Understand the concepts of chemical Reactions						
15	9.1 Define chemical reaction 9.2 List different types of chemical reaction 9.3 Explain Catalysts used in chemical reactions	Explain chemical reaction Explain different types of chemical reaction Explain Catalysts used in chemical reactions	Textbooks Journals Whiteboard Marker Computer Internet Projector Slides.			

	9.4 Give examples of different types of reaction mentioned in 9.2 above 9.5 Define rate of chemical reaction 9.6 Explain factors affecting rates of chemical reactions 9.7 Outline some chemical reaction that has beneficial industrial applications	Give examples of different types of reaction mentioned in 9.2 above Explain rate of chemical reaction Explain factors affecting rates of chemical reactions Outline some chemical reaction that has beneficial industrial applications				

EVALUATION
C/A:60%
EXAMS: 40%
TOTAL: 100%

PROGRAMME: NATIONAL DIPLOMA		
COURSE TITLE: General Biology I	**COURSE CODE**: STB 101	**CONTACT HOURS**: 2
	CREDIT UNIT: 3	**THEORETICAL**: 2
YEAR: I **SEMESTER:** 0	**PRE-REQUISITE**:	**PRACTICAL**: 1
GOAL: This module is designed to introduce the students to basic biological sciences and to make them understand the environment in which they live		
GENERAL OBJECTIVES: On completion of this course, the student should be able to: 1.0 Understand the concept of living things 2.0 Know the structure of cells 3.0 Understand the principal features of different groups of living things 4.0 Know the methods by which plants and animals feed themselves 5.0 Understand the methods by which organisms generate energy from their food 6.0 Know the methods by which substances are moved in the bodies of plants and animals 7.0 Understand how plants and animals remove their waste products 8.0 Understand how living things move 9.0 Know how living things increase in size and number 10.0 Understand the interaction between an organism and its environment 11.0 Know man's interference with his environment 12.0 Understand the fundamentals of inheritance		

PROGRAMME: NATIONAL DIPLOMA		
COURSE TITLE: General Biology I	**COURSE CODE**: STB 101	**CONTACT HOURS**: 3
	CREDIT UNIT: 3	**THEORETICAL**: 2
YEAR: I **SEMESTER:** 0	**PRE-REQUISITE**:	**PRACTICAL**: 1
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL		
GOAL: This module is designed to introduce the students to basic biological sciences and to make them understand the environment in which they live		
GENERAL OBJECTIVE: 1.0 Understand the concept of living things		

THEORETICAL CONTENT				PRACTICAL CONTENT		
WEEK	**SPECIFIC LEARNING OUTCOME**	**TEACHER'S ACTIVITIES**	**RESOURCES**	**SPECIFIC LEARNING OUTCOME**	**TEACHER'S ACTIVITIES**	**RESOURCES**
1-2	1.1 Explain Living Things 1.2 Define Biology 1.3 Explain living things and non-living things 1.4 Explain characteristics of living things (e.g., MR NIGER D or MARRIAGE'D) 1.5 Explain the differences between a plant, an animal and a protist e.g.: Mango tree plant,	Explain living things Explain Biology Explain living and non-living things in the immediate environment Explain the characteristics of living organisms Explain the differences between a plant, an animal and a protist e.g.: Mango tree plant,	Textbooks Journals Whiteboard Marker Computer Internet Projector			

	mycobacterium tuberculosis for protist and man for animal)	mycobacterium tuberculosis for protist and man for animal)				
GENERAL OBJECTIVE 2.0: Know the structure of cells						
3-4	2.1 Discuss History and Discovery of Cell 2.2 Explain a Cell theory 2.3 Define Cell 2.4 Different types of Cell (Eukaryotic & Procaryotic) 2.5 Differentiate between an animal cell and a plant cell 2.6 List the components/Cell Organelles (Structure) 2.7 Explain the function of cell organelles (Structure) 2.8 Explain cell Division	Discuss History and Discovery of Cell Explain a cell theory Explain Cell Distinguish between prokaryotic and eukaryotic cells Differentiate between plant and animal cell. Explain the components/ Cell Organelles (Structure) Explain the functions of the different cell organelles Explain cell Division	Text books Journals Whiteboard Marker Computer Internet Projector	Observes some cells under the microscope (e.g. a plant cell, and animal cell) Draw and label the cells observed in above practical	Guide students to: Observes some cells under the microscope (e.g. a plant cell, and animal cell) Draw and label the cells observed in above practical	Microscope Magnifying glass Prepared slide

	2.9 Explain the processes of cell division 2.10 Differentiate between Mitosis and Meiosis cell division 2.11 Explain Mitotic cell division and Meiotic Cell Division Diagrammatically 2.12 Explain the differences between mitosis and meiosis cell division 2.13 List the importance of cell division	Explain the processes of cell division Differentiate between Mitosis and Meiosis cell division Explain Mitotic cell division and Meiotic Cell Division Diagrammatically Explain the differences between mitosis and meiosis cell division Explain the importance of cell division				
GENERAL OBJECTIVE 3.0: Understand the principal features of different groups of living things						

5-6	3.1 Explain Major divisions of the Plant Kingdom: • Thallophyta • Bryophyta • Pteridophyta • Spermatophyta (indicate the features of a subgroup called angiosperm and gymnosperm) 3.2 State the characteristic features of each division in 3.1 above 3.3 List the differences between algae and fungi 3.4 List two examples of each group in 3.3 above 3.5 Explain the features of Flowering Plant	Explain the four major divisions under the plant kingdom: • Thallophyta • Bryophyta • Pteridophyta • Spermatophyta (indicate the features of a subgroup called angiosperm and gymnosperm) Explain the characteristic features of each division in 3.1 above Explain the differences between algae and fungi Explain two examples of each group in 3.3 above Explain the external structures of a flowering plant	Text books Journals Whiteboard Marker Computer Internet Projector			

	3.6 Explain types of flower i.e., insect pollinated flower and wind pollinated flower based on the structural differences	Explain types of flower i.e., insect pollinated flower and wind pollinated flower based on the structural differences				
	3.7 Describe the external structures of a flowering plant	Describe the external structures of a flowering plant				
	3.8 Explain Animal Kingdom	Explain Animal Kingdom				
	3.9 Explain the two (2) group of the animal kingdom i.e., the invertebrate animal and vertebrate animal each with examples and features differentiating them.	Explain the two (2) group of the animal kingdom i.e., the invertebrate animal and vertebrate animal each with examples and features differentiating them.				
	3.10 List the different phyla under animal kingdom	Explain the different phyla under animal kingdom				
	3.11 Explain the distinguishing	Explain the distinguishing				

	characteristics of each phylum mentioned in 3.10 3.12 State two common examples of animals belonging to each group 3.13 Describe the external structure of a mammal	characteristics of each phylum mentioned in 3.6 Explain two common examples of animals belonging to each group Explain the external structure of a mammal				
GENERAL OBJECTIVE 4.0: Know the methods by which plants and animals feed themselves (Nutrition)						
7	4.1 Explain Plant and Animal Nutrition 4.2 Distinguish between the food of plants and that of animals 4.3 Distinguish between autotrophic and heterotrophic modes of feeding 4.4 Explain with examples the different types of heterotrophies e.g. parasitism and saprophytism.	Explain food Plant and Animal Nutrition Distinguish between the food plants and that of animals Distinguish between autotrophic and heterotrophic modes of feeding Explain with examples the different types of heterotrophies e.g. parasitism and saprophytism.	Text books Journals Whiteboard Marker Computer Internet Projector	Draw and label the digestive system in man	Guide students to: Draw and label the digestive system in man	Diagrams

	4.5 Explain the different types of autotrophy e.g. • Photosynthesis, • Chemosynthesis. 4.6 Explain Animal Nutrition 4.7 Explain Balanced diet and its composition 4.8 List the stages involved in feeding animals, e.g.: • Ingestion • Digestion • Assimilation and • Egestion.	Explain the different types of autotrophy e.g. • Photosynthesis, • Chemosynthesis. Explain Animal Nutrition Explain Balanced diet and its composition Explain the stages involved in feeding animals e.g.: • Ingestion • Digestion • Assimilation and • Egestion.				
GENERAL OBJECTIVE 5.0: Understand the methods by which organisms generate energy from their food						
8	5.1 Define respiration 5.2 Distinguish between respiration and breathing 5.3 Differentiate between aerobic and anaerobic respiration.	Explain respiration Explain the differences between respiration and breathing Explain the differences between aerobic and anaerobic respiration	Text books Journals Whiteboard Marker Computer Internet Projector			

	5.4 Explain sites of respiration in cells (e.g. mitochondrion and free cytoplasm) 5.5 State the economic importance of fermentation (Production of alcoholic beverages, lactic acid, vinegar, bread, garri and condiment production.) 5.6 List the respiratory organs in animals (e.g. plasma membrane in protozoa, tracheal system in arthropods, gills in fish and lungs in terrestrial animals)	Explain sites of respiration in cells (e.g. mitochondrion and free cytoplasm) Explain the economic importance of fermentation Production of alcoholic beverages, lactic acid, vinegar, bread, garri and condiment production.) Explain the respiratory organs in animals (e.g. plasma membrane in protozoa, tracheal system in arthropods, gills in fish and lungs in terrestrial animals)				
GENERAL OBJECTIVE 6.0: Know the methods by which substances are moved in the bodies of plants and animals						
9	6.1 Explain the following: • Osmosis • Diffusion • Plasmolysis 6.2 Define transpiration	Explain the following: • Osmosis • Diffusion • Plasmolysis Explain transpiration	Textbooks Journals Whiteboard Marker Computer Internet Projector	Demonstrate osmosis and diffusion by simple experiments.	Guide student to : Demonstrate osmosis and diffusion by simple experiments.	Perfume Potato 1000ml beaker salt

	6.3 Explain the importance of transpiration in living organisms 6.4 Explain the importance of translocation 6.5 Explain Vascular System of Plant 6.6 Differentiate between Vascular system of Dicot and Monocot Plants 6.7 Explain the Structure and Function of blood in higher animals 6.8 Describe clotting of blood	Explain the importance of transpiration in living organisms Explain the importance of translocation Explain the vascular system of the plant Differentiate between Vascular system of Dicot and Monocot Plants Explain the structure and function of blood in higher animals Describe clotting of blood		Draw and label the structure of a mammalian heart.	Draw and label the structure of a mammalian heart.	
GENERAL OBJECTIVE 7.0: Understand how plants and animals remove their waste products						
10	7.1 Define Excretion and give examples 7.2 Outline the excretory organs and excretory products in man	Explain Excretion and give examples Explain excretory organs and excretory products in man	Textbooks Journals Whiteboard Marker Computer Internet Projector			

	7.3 List the structures involved in excretion and the excretory products in plants 7.4 Explain the processes of osmo-regulation in plants and various types of animals	Explain the structures involved in excretion and the excretory products in plants Explain the processes of osmo-regulation in plants and various types of animals				
GENERAL OBJECTIVE 8.0: Understand how living things move						
11	8.1 Explain the organs of locomotion in animals (e.g. pseudopodia: cilia, chaetae, jointed limbs etc.) 8.2 Explain general plan of the Skeletal System in mammals (axial skeleton and appendicular skeleton) 8.3 Explain types of skeleton i.e., chitinous exoskeleton in insects and endoskeleton in mammals.	Explain the organs of locomotion in animals (e.g. pseudopodia: cilia, chaetae, jointed limbs etc.) Explain the general plan of the skeleton in mammals (axial skeleton and appendicular skeleton) Explain types of skeleton i.e., chitinous exoskeleton in insects and endoskeleton in mammals.	Textbooks Journals Whiteboard Marker Computer Internet Projector			

	8.4 State the functions of the skeleton in higher animals 8.5 List the different types of movements in plants (e.g. tropism's taxisms, nastic movements e.t.c)	Explain the functions of the skeleton in higher animals Explain the different types of movements in plants (e.g. tropism's taxisms, nastic movements e.t.c)				
GENERAL OBJECTIVE 9.0: Know how living things increase in size and number						
12	9.1 Explain Reproduction in living things 9.2 Distinguish between sexual, asexual and vegetative propagation 9.3 List some examples of asexual reproduction in plants and animals (e.g. binary fission in bacteria, budding in yeast, fragmentation in spirogyra, grafting etc.) 9.4 List the advantages of asexual and sexual	Explain reproduction in living things Explain the difference between sexual and asexual reproduction Explain some examples of asexual reproduction in plants and animals (e.g. binary fission in bacteria, budding in yeast, fragmentation in spirogyra, grafting etc.) Explain the advantages of asexual and sexual	Textbooks Journals Whiteboard Marker Computer Internet Projector			

	reproduction in plants and animals 9.5 Discuss the modern advances in plants cultures and in invitro and in vivo fertilization (e.g. test tube babies and artificial insemination respectively). 9.6 Describe methods of measuring growth in living things	reproduction in plants and animals Explain the modern advances in plants cultures and in invitro and in vivo fertilization (e.g. test tube babies and artificial insemination respectively). Explain methods of measuring growth in living things				
GENERAL OBJECTIVE 10.0: Understand the interaction between an organism and its environment						
13	10.1 Define the following terms • Ecology (autecology and synecology) • Habitat (terrestrial and aquatic [lotic and lentic]) • Community • Population 10.2 Explain the interaction of living things as	Explain the following terms: • Ecology (autecology and synecology) • Habitat (terrestrial and aquatic [lotic and lentic]) • Community • population Explain the interaction of living things as shown	Textbooks Journals Whiteboard Marker Computer Internet Projector			

	shown by predation, parasitism, saprophytism, commensalism, scavenging	by predation, parasitism, saprophytism, commensalism				
	10.3 List examples of interactions in 10.2 above	Explain examples of interactions in 10.2 above				
	10.4 Explain the food relationship in the community (e.g. food chain, food web, pyramid of numbers, pyramid of energy etc.)	Explain the food relationship in the community (e.g. food chain, food web, pyramid of numbers etc.)				
	10.5 List useful and harmful microbes giving	Explain useful and harmful microbes giving				
	10.6 State the causes and control of the following diseases • Malaria • Guinea worm • Bilharzia • River blindness • Cholera • Meningitis	Explain the causes and control of the following diseases • Malaria • Guinea worm • Bilharzia • River blindness • Cholera • Meningitis				

	• Typhoid fever 10.7 State the common sources and types of environmental pollution. 10.8 Explain the types of environmental pollutants (biodegradable and non-biodegradable pollutants) 10.9 Describe the effects of environmental pollution on living organisms 10.10 List the control measures of environmental pollution described in 10.9 above	• Typhoid fever Explain the common sources of environmental pollution. Explain the types of environmental pollutants (biodegradable and non-biodegradable pollutants) Explain the effects of environmental pollution on living organisms Explain the control measures of environmental pollution described in 10.9 above				
GENERAL OBJECTIVE 11.0: Understand man's interference with his environment						
14	11.1 Explain Types of soil 11.2 Explain the composition and characteristics of a fertile soil	Explain Types of soil Explain the composition and characteristics of a fertile soil	Textbooks Journals Whiteboard Marker Computer Internet Projector			

	11.3 List the causes of soil erosion	Explain the causes of soil erosion				
	11.4 Give three methods of prevention of soil erosion	Explain three methods of prevention of soil erosion				
	11.5 Describe man's activities (Farming, Mining, Deforestation, overgrazing that accentuate disasters e.g. desert encroachment, flooding etc.	Explain man's activities (Farming, Mining, Deforestation, overgrazing that accentuate disasters e.g. desert encroachment, flooding etc.				
	11.6 Enumerate different methods by which the deleterious effects can be minimized	Explain different methods by which the deleterious effects can be minimized				
	11.7 Explain the need for the creation of dams and lakes	Explain the need for the creation of dams and lakes				
	11.8 List the disadvantages of man-made lakes	Explain the disadvantages of man-made lakes				

GENERAL OBJECTIVE 12.0: Understand the fundamentals of inheritance						
15	12.1 Explain the role of chromosomes and genes found in the nucleus of the cell 12.2 Explain the role of gametes in cross fertilization 12.3 Define hybridization, phenotypes and genotypes 12.4 Explain the ABO blood groupings 12.5 Describe how sex is determined in man 12.6 Explain sex-linked characters (e.g. haemophilia)	Explain the role of chromosomes and genes found in the nucleus of the cell Explain the role of gametes in cross fertilization Explain hybridization, phenotypes and genotypes Explain the ABO blood groupings Explain how sex is determined in man Explain sex-linked characters (e.g. haemophilia)	Textbooks Journals Whiteboard Marker Computer Internet Projector			

EVALUATION:
C.A: 60%
EXAMINATION: 40%
TOTAL: 100%

HIGHER NATIONAL DIPLOMA

PROGRAMME: HIGHER NATIONAL DIPLOMA		
COURSE TITLE: General Physics II	**COURSE CODE**: STP 301	**CONTACT HOURS**: 3
	CREDIT UNIT: 3	**THEORETICAL**: 2
YEAR: I **SEMESTER:** 0	**PRE-REQUISITE**:	**PRACTICAL**: 1
GOAL: This course is designed to acquaint students with the knowledge and skills of core concepts in classical physics.		

GENERAL OBJECTIVES: On completion of this course, the student should be able to:

1.0 Understand units and dimensions
2.0 Understand the difference between vectors and scalars.
3.0 Know what is meant by rectilinear motion.
4.0 Understand the meaning of work, energy and power.
5.0 Understand friction as it occurs both in liquids and solids
6.0 Know the concept of elasticity
7.0 Know the general concept of static electricity
8.0 Know the nature of current electricity
9.0 Know the concept of heat and temperature
10.0 Understand reflection and refraction
11.0 Understand wave propagation

PROGRAMME: HIGHER NATIONAL DIPLOMA		
COURSE TITLE: General Physics II	**COURSE CODE**: STP 301	**CONTACT HOURS**: 3
	CREDIT UNIT: 3	**THEORETICAL**: 2
YEAR: I **SEMESTER:** 0	**PRE-REQUISITE**:	**PRACTICAL**: 1
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL		
GOAL: This course is designed to acquaint students with the knowledge of core concepts in classical physics.		
GENERAL OBJECTIVE 1.0: Understand units and dimensions		

THEORETICAL CONTENT				**PRACTICAL CONTENT**		
WEEK	**SPECIFIC LEARNING OUTCOME**	**TEACHER'S ACTIVITIES**	**RESOURCES**	**SPECIFIC LEARNING OUTCOME**	**TEACHER'S ACTIVITIES**	**RESOURCES**
1-2	1.1 Define units and dimensions 1.2 Differentiate between fundamental and derived units 1.3 Give examples of both derived and fundamental units 1.4 Explain how to check the correctness of equations like: $V2 = u2 + 2as$; $V = U + at$; $T = 2\pi\sqrt{L/G}$ etc. usingdimensions	Explain units and dimensions Differentiate between fundamental and derived units Explain examples of both derived and fundamental units Explain how to check the correctness of equations like $v2 = u2 + 2as$; $V = U + at$; $T = 2\pi\sqrt{L/G}$ etc. using dimensions	Textbooks Journals Whiteboard Marker Computer Internet Projector			

GENERAL OBJECTIVE 2.0: Understand the difference between vectors and scalars.						
3	2.1 Define vectors and scalars 2.2 Explain examples of both scalars and vectors quantities 2.3 Explain how to solve simple problems involving scalars and vectors	Explain vectors and scalars Explain examples of both scalars and vectors quantities Explain how to solve simple problems involving scalars and vectors	Textbooks Journals Whiteboard Marker Computer Internet Projector			
General Objective 3.0: Know what is meant by rectilinear motion.						
4-5	3.1 Explain velocity and speed 3.2 Differentiate between velocity and speed 3.3 Explain the equations of uniform motion in a straight line by graphical method 3.4 Explain how to solve problems using equations derived in 3.3 above	Explain velocity and speed Explain between velocity and speed Explain the equations of uniform motion in a straight line by graphical method Explain how to solve problems using equations derived in 3.3 above	Textbooks Journals Whiteboard Marker Computer Internet Projector	Perform simple experiments to measure velocity and speed Solve problems using equations derived in 3.2 above Solve simple problems on motions	Guide student to: Perform simple experiments to measure velocity and speed Solve problems using equations derived in 3.2 above Solve simple problems on motions	Speedometer

	3.5 State Newton's law of motion 3.6 Derive the relation between forces, mass and acceleration. i.e. F=ma where F=force a= acceleration=mass 3.7 Define force, mass and weight 3.8 Explain how to solve simple problems using equation derived in 3.6 above.	Explain Newton's law of motion Derive the relation between forces, mass and acceleration. i.e. F=ma where F=force a= acceleration=mass Explain force, mass and weight Explain how to solve simple problems using equation derived in 3.6 above.				
GENERAL OBJECTIVE 4.0: Understand the meaning of work, energy and power						
6	4.1 Define work, energy and power 4.2 List types of energy 4.3 Explain the law of conservation of energy and give examples	Explain work, energy and power Explain types of energy Explain the law of conservation of energy and give examples	Textbooks Journals Whiteboard Marker Computer Internet Projector			

	4.4 Explain the conservation of kinetic energy and potential energy 4.5 Explain how to solve simple problems on work, energy and power	Explain the conservation of kinetic energy and potential energy Explain how to solve simple problems on work, energy and power				
GENERAL OBJECTIVE 5.0: Understand friction as it occurs both in liquids and solids						
7	5.1 Define friction 5.2 Explain types of friction 5.3 Differentiate between static and dynamic friction 5.4 Explain the applications of friction to human existence 5.5 Explain the effects of friction to human existence	Explain friction Explain types of friction Explain the difference between static and dynamic friction Explain the applications of friction to human existence Explain the effects of friction to human existence	Textbooks Journals Whiteboard Marker Computer Internet Projector			

	5.6 Describe methods of reducing friction	Explain simple methods of reducing friction				
GENERAL OBJECTIVE 6.0: Know the concept of elasticity						
8-9	6.1 Define the following: • Elasticity, • Stress, • Strain • Elastic limit 6.2 State the relationship between load and extension 6.3 Estimate elastic energy from work done on elasticity body 6.4 Give practical examples of application of elasticity in day-to-day life.	Explain the following: • Elasticity, • Stress, • Strain • Elastic limit Explain the relationship between load and extension Estimate elastic energy from work done on elasticity body Explain the practical application of elasticity in day-to-day life.	Textbooks Journals Whiteboard Marker Computer Internet Projector	Conduct simple experiments on the following: • Elasticity, • Stress • Strain • Elastic limit Demonstrate the application of elasticity in day-to-day life.	Guide students to: Conduct simple experiments on the following: • Elasticity, • Stress • Strain • Elastic limit Demonstrate the application of elasticity in day-to-day life.	Elastic band
GENERAL OBJECTIVE 7.0: Know the general concept of static electricity and magnetisms						
10-11	7.1 Define static electricity 7.2 Explain the processes of charging by friction, and conduction	Explain static electricity Explain the processes of charging by friction, and conduction	Text books Journals Whiteboard Marker Computer Internet	Use the goldleaf electroscope to determine the nature of charges on different bodies.	Guide student to : Use the goldleaf electroscope to determine the nature of charges on different bodies	Goldleaf electroscope Rubber balloon Glass rod

	7.3 Explain the working principles of van de Greaf generator 7.4 Define Magnets 7.5 Explain the classifications of magnets 7.6 Describe how magnets are made 7.7 Explain the application of magnets in daily life	Explain the working principles of van de Greaf generator Explain Magnets Explain the classifications of magnets Explain how magnets are made Explain the application of magnets in daily life	Projector	Perform some laboratory activities to generate some static electricity such as: • Rubber balloon and glass rod experiments • Metal sphere experiment etc.	Perform some laboratory activities to generate some static electricity such as: • Rubber balloon and glass rod experiments • Metal sphere experiment etc.	Metal sphere
GENERAL OBJECTIVE 8.0: Know the nature of current electricity						
12	8.1 Define electric current 8.2 Explain the units of electric current 8.3 State and express Ohm's Law mathematically. 8.4 Explain the relationship between voltage (V),	Explain electric current Explain the units of electric current State and express Ohm's Law mathematically. Explain the relationship between voltage (V), current (I)	Text books Journals Whiteboard Marker Computer Internet Projector	Conduct simple experiments in electricity such as: • Light bulb experiment • Resistor experiment etc.	Guide student to: Conduct simple experiments in electricity such as: • Light bulb experiment • Resistor experiment etc.	Light bulb Resistor Circuit Power Source

	current (I) and resistance (R). • V=IR where • V=Voltage • I=Current • R=Resistance	and resistance (R). • V=IR where • V=Voltage • I=Current • R=Resistance				
	8.5 Illustrate diagrammatically electrical circuit symbols.	Illustrate the circuit symbols with their names in circuit arrangement				
	8.6 Explain operation of simple electrical measuring instruments e.g. Voltmeter, Ammeter etc.	Explain operation of simple electrical measuring instruments e.g. Voltmeter, Ammeter etc.				
	8.7 Explain how to solve simple problems involving resistors in series and parallel	Explain how to solve simple problems involving resistors in series and parallel				
	8.8 Define electrical energy and power	Explain electrical energy and power				

	8.9 Explain how to solve problems involving electrical energy 8.10 Differentiate between primary and secondary cells 8.11 List example of both primary and secondary cells 8.12 Solve simple problem involving primary cells in series and parallel circuits	Explain how to solve problems involving electrical energy Differentiate between primary and secondary cells List example of both primary and secondary cells Solve simple problem involving primary cells in series and parallel circuits				
GENERAL OBJECTIVE 9.0: Know the concept of heat and temperature						
13	9.1 Define temperature in relation to heat and energy 9.2 Explain the properties of thermometric liquids.	Explain temperature in relation to heat and energy. Explain the properties of thermometric liquids.	Text books Journals Whiteboard Marker Computer Internet Projector	Conduct experiments in thermometric liquids and thermometers such as: • Thermal expansion experiment • Calibration of thermometers • Thermometer comparison experiment	Guide student to: Conduct experiments in thermometric liquids and thermometers such as: • Thermal expansion experiment	Thermometer Thermometric liquids Water bath Bunsen Burner Gas

	9.3 Explain temperature scales i.e. Kelvin and Celsius. 9.4 List the various types of thermometers. 9.5 Explain the working principles of the thermometers listed in 9.4 above. 9.6 Give various examples of the applications of the thermometers listed in 9.4 above. 9.7 Explain the modes of heat transfer • Conduction • Convection • Radiation 9.8 State the effect of heat on liquids and solids	Explain temperature scales i.e. Kelvin and Celsius. Explain the various types of thermometers. Explain the working principles of the thermometers listed in 9.4 above. Explain various examples of the applications of thermometers listed in 9.4 above. Explain the modes of heat transfer • Conduction • Convection • Radiation Explain the effect of heat on liquids and solids			• Calibration of thermometers • Thermometer comparison experiment	

	9.9 Explain some applications of expansion in real life situations. 9.10 Define expansivity and solve simple problems using the related equation 9.11 Define heat capacity, specific heat capacity and specific latent heats. 9.12 Explain how to solve problems involving heat capacity, specific heat capacity, latent heat of vaporisation	Explain some applications of expansion in real life situations. Explain expansivity and solve simple problems using the related equation Explain heat capacity, specific heat capacity and specific latent heats. Explain how to solve problems involving heat capacity, specific heat capacity, latent heat of vaporisation				
GENERAL OBJECTIVE 10.0: Understand reflection and refraction						
14	10.1 Define reflection and refraction 10.2 Explain how reflection and refraction take place on plane and curved surfaces.	Explain reflection and refraction Explain how reflection and refraction take place on plane and curved surfaces.	Text books Journals Whiteboard Marker Computer Internet Projector			

	10.3 State the laws of refraction and reflection. 10.4 Explain apparent depth and total internal reflection 10.5 Explain the formation of images by plane mirror, spherical mirrors and lenses	Explain the laws of refraction and reflection. Explain apparent depth and total internal reflection Explain the formation of images by plane mirror, spherical mirrors and lenses				
GENERAL OBJECTIVE11.0: Understand wave propagation						
15	11.1 Define wave propagation 11.2 Explain types of waves 11.3 Define the following: • Displacement, • Amplitude frequency, • Period, • Wavelength, • Velocity • Phase of a wave	Explain wave propagation. Explain types of waves Explain the following: • Displacement, • Amplitude frequency, • Period, • Wavelength, • Velocity • Phase of a wave	Text books Journals Whiteboard Marker Computer Internet Projector	Conduct simple experiments on water wave such as: • Wave generation, • Reflection and Refraction of waves.	Guide student to: Conduct simple experiments on waves such as: • Wave generation, • Reflection and Refraction of waves	Ruler Water Shallow Basin Dropper Colours Measuring Tape

	11.4 Explain how to solve simple problems involving $v = f\lambda$ Where v= velocity f= frequency λ= wavelength 11.5 Give practical applications of waves in daily life.	Explain how to solve simple problems involving $v = f\lambda$ Where v= velocity f= frequency λ= wavelength Explain practical applications of waves in daily life				

EVALUATION
C/A:60%
EXAMS: 40%
TOTAL: 100%

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND)		
COURSE TITLE: General Chemistry II	**COURSE CODE**: STC 301	**CONTACT HOURS**: 3
	CREDIT UNITS: 3	**THEORETICAL**: 2
YEAR: I **SEMESTER:** 0	**PRE-REQUISITE:**	**PRACTICAL:**1
GOAL: This course is designed to equip student with knowledge of fundamental chemical phenomena and their relevance to everyday life and industry.		
GENERAL OBJECTIVES: On completion of this course, the students should be able to: 1.0 Understand the basic structure of the atom. 2.0 Understand the different types of chemicals bonds (their formation and properties). 3.0 Understand the periodic table. 4.0 Understand the concepts of solutions and solubility. 5.0 Understand the concepts of electrolysis 6.0 Understand the laws governing chemical combination. 7.0 Understand the change of matter and behaviour of gas under certain conditions. 8.0 Understand the rate of chemical reaction and factors affecting rate of reaction. 9.0 Appreciate the usefulness of some non-metals like H_2,Cl_2 and their compounds. 10.0 Appreciate the importance of some metals like Cu,AI,Na etc. in our society. 11.0 Appreciate the importance of carbon compound 12.0 Conduct laboratory work based on the above topics.		

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND)						
COURSE TITLE: General Chemistry II			**COURSE CODE**: STC 301		**CONTACT HOURS**: 3	
			CREDIT UNITS: 3		**THEORETICAL**: 2	
YEAR: I **SEMESTER:** 0			**PRE-REQUISITE:**		**PRACTICAL:**1	
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL						
GOAL: This course is designed to equip student with knowledge of fundamental chemical phenomena and their relevance to everyday life and industry.						
GENERAL OBJECTIVE 1.0: Understand the basic structure of the atom.						
	THEORETICAL CONTENT			**PRACTICAL CONTENT**		
WEEK	**SPECIFIC LEARNING OUTCOME**	**TEACHER'S ACTIVITIES**	**RESOURCES**	**SPECIFIC LEARNING OUTCOME**	**TEACHER'S ACTIVITIES**	**RESOURCES**
1	1.1 Define atom. 1.2 Explain the 3 basic constituents of the atom: • Electrons, • Protons • Neutrons. 1.3 Explain the arrangement of electrons in the atoms	Explain an atom Explain the 3 basic constituents of the atom: • Electrons, • Protons • Neutrons Explain the arrangement of electrons in the atoms	Text books Journals Whiteboard Marker Charts Computer Internet Projector			

	1.4 State the properties of the electrons, protons and neutrons. 1.5 Define the relative atomic mass and relative molecular mass 1.6 Define isotopes and give examples of some elements that exhibit isotopy e.g. chlorine. 1.7 Describe how to calculate the relative atomic mass of some isotopic elements. 1.8 Explain the arrangement of electrons in the atoms.	Explain the properties of the electrons, protons and neutrons. Explain the relative atomic mas and relative molecular mass. Explain isotopes and give examples of some elements that exhibit isotopy e.g. chlorine. Explain how to calculate the relative atomic mass of some isotopic elements. Explain the arrangement of electrons in the atoms.				
GENERAL OBJECTIVE 2.0: Understand the different types of chemicals bonds (their formation and properties).						
2	2.1 Define chemical bond	Explain chemical bond	Text books Journals Whiteboard			

	2.2 Outline the 3 types of chemical bonds, viz: • Covalent bond • Dativebond • Electrovalent bond.	Explain the 3 types of chemical bonds, viz: • Covalent bond • Dative bond • Electrovalent bond	Marker Charts Computer Internet Projector			
	2.3 Define valency.	Explain valency.				
	2.4 List the valences of some common elements like H_2, O_2, Na and K	Explain the valences of some common elements like H_2, O_2, Na and K .				
	2.5 Outline the formation of each bond type.	Outline the formation of each bond type.				
	2.6 Outline the properties of each bond type.	Outline the properties of each bond type.				
GENERAL OBJECTIVE 3.0: Understand the periodic table.						
3	3.1 Define periodic table	Define periodic table	Text books Journals Whiteboard			
	3.2 State the importance of periodic table	State the importance of periodic table	Marker Charts Computer			

	3.3 Describe the periodic table. 3.4 Explain the relative positions of elements on the table. 3.5 Discuss the two main division of the periodic table. 3.6 State the general properties of each group of elements.	Explain periodic table. Explain relative positions of elements on the table. Explain the two main division of the periodic table. Explain the general properties of each group of elements	Internet Projector Periodic table			
GENERAL OBJECTIVE 4.0: Understand the concepts of solutions and solubility						
4	4.1Define a solution. 4.2 Differentiate between types of solutions: • Saturated • Unsaturated • Super –saturated 4.3 Define the term solubility.	Explain a solution. Explain the difference types of solutions: • Saturated, • Unsaturated • Super – saturated Explain the term solubility	Text books Journals Whiteboard Marker Charts Computer Internet Projector	Conduct some simple experiments of water quality (physical and chemical).	Guide student to Conduct some simple experiments of water quality (physical and chemical).	Water pH meter

	4.4 Explain the solubility of some compounds like KNO_3,$CUSO_4$, etc. in water. 4.5 Explain the significance of the use of solubility curves. 4.6 Describe how to solve simple problems based on 4.4 and 4.5 above.	Explain the solubility of some compounds like KNO_3,$CUSO_4$, etc in water. Explain the significance of the use of solubility curves. Explain how to solve simple problems based on 4.4 and 4.5 above.				
GENERAL OBJECTIVE 5.0: Understand the concepts of electrolysis						
6	5.1 Define electrolysis. 5.2 Define electrolytes and non-electrolytes. 5.3 List examples of electrolyte and non-electrolyte 5.4 Explain Faraday's law of electrolysis. 5.5 Explain the uses of	Explain electrolysis. Explain electrolytes and non-electrolytes. Explain examples of electrolyte and non-electrolyte Explain Faraday's law of electrolysis. Explain the uses of	Text books Journals Whiteboard Marker Charts Computer Internet Projector			

	electrolysis in some electrolytes 5.6 Explain the uses of electrolytes. 5.7 Derive mathematically the relation between current ionic charge and mass of substances liberated electrodes. 5.8 Describe how to solve some problems based on 5.7 above. 5.9 List some applications of electrolysis in industry.	electrolysis in some electrolytes Explain the uses of electrolytes. Explain mathematically the relation between current ionic charge and mass of substances liberated electrodes. Explain how to solve some problems based on 5.7 above. Explain some applications of electrolysis in industry				
GENERAL OBJECTIVE 6.0: Understand the laws governing chemical combination.						
7	6.1 State the laws of: • Conservation of matter • Gay lussac's • Avogadros	Explain the laws of: • Conservation of matter • Gay lussac's • Avogadros	Text books Journals Whiteboard Marker Charts Computer			

	6.2 Describe how to solve simple problems involving formulae, chemical composition and mole concept.	Explain how to solve simple problems involving formulae, chemical composition and mole concept.	Internet Projector			
GENERAL OBJECTIVE 7.0: Understand the change of matter and behaviour of gas under certain conditions.						
8	7.1 Explain the kinetic theory of matter in relation to: • The nature of solids, liquids and gases. • Diffusion of gasses • Melting and boiling points. 7.2 State the following gas laws qualitatively and mathematically – Boyles, Charle's, Graham's and Dalton's. 7.3 Derive the relationship between the vapour	Explain the kinetic theory of matter in relation to: • The nature of solids, liquids and gases. • Diffusion of gasses • Melting and boiling points. Explain the following gas laws qualitatively and mathematically – Boyles, Charle's, Graham's and Dalton's. Explain the relationship between	Text books Journals Whiteboard Marker Charts Computer Internet Projector			

	density of a gas and its relative molar mass. 7.4 Describe how to solve simple problems based on 7.2 above.	the vapour density of a gas and its relative molar mass. Explain how to solve simple problems based on 7.2 above.				
13.0 GENERAL OBJECTIVE 8.0: Understand the rate of chemical reaction and factors affecting rate of reaction.						
9	8.1 Differentiate between reversible and irreversible reactions. 8.2 List examples of reversible and irreversible reactions e.g. N_2,O_4, $2NO_2$. 8.3 Explain the term equilibrium. 8.4 State Le-chatelier's principle. 8.5 Outline the factors which can change the rate of a reaction viz:	Explain the difference between reversible and irreversible reactions Explain examples of reversible and irreversible reactions e.g. N_2,O_4, $2NO_2$. Explain the term equilibrium. Explain Le-chatelier's principle. Explain the factors which can change the rate of a reaction	Text books Journals Whiteboard Marker Charts Computer Internet Projector			

	temperature, concentration, surface area, catalyst and pressure. 8.6 Explain the manufacture of ammonia from N_2 and H_2 (Habers process) to illustrate the effects of changes in the factors mentioned in 8.5 above	viz: temperature, concentration, surface area, catalyst and pressure. Explain the manufacture of ammonia from N_2 and H_2(Habers process) to illustrate the effects of changes in the factors mentioned in 8.5 above				
GENERAL OBJECTIVE 9.0: Appreciate the usefulness of some non-metals like H_2, CI_2 and their compounds.						
10	9.1 Describe the laboratory preparation of the following non-metals: • CI_2 H_2, • O_2. 9.2 Describe the industrial preparation of non-metals mentioned in 10.1 above.	Explain the laboratory preparation of the following non-metals: • CI_2 H_2, • O_2. Explain the industrial preparation of non-metals mentioned in 10.1 above.	Text books Journals Whiteboard Marker Charts Computer Internet Projector			

	9.3 List the physical and chemical. Properties of the following non-metals: CI_2 ,O_2, C, S, N_2.	Explain the physical and chemical. Properties of the following non-metals: CI_2, O_2, C, S, N_2.				
	9.4 List the uses of the non-metals and their compounds.	Explain the uses of the non-metals and their compounds.				
GENERAL OBJECTIVE10.0: Appreciate the importance of some metals like Cu, Al, Na etc. in our society.						
11	10.1 Describe the methods of extracting metals from their ores. 10.2 List the properties of metals in 11.1 above. 10.3 List the uses of the metals and their compounds.	Explain the methods of extracting metals from their ores. Explain the properties of metals in 11.1 above Explain the uses of the metals and their compounds.	Text books Journals Whiteboard Marker Charts Computer Internet Projector			
General Objective 11.0: Appreciate the importance of carbon compounds in our society.						
12-13	11.1 Explain the tetrahedral arrangement of carbon bonds.	Explain the tetrahedral arrangement of carbon bonds	Text books Journals Whiteboard Marker Charts	Illustrate the tetrahedral arrangement of carbon bonds.	Guide students to: Illustrate the tetrahedral arrangement of carbon bonds.	Building sticks

	11.2 Explain the characteristics functional group of each class of organic compound. 11.3 State the general formula of each class of compounds. 11.4 Explain the naming of members of each series. 11.5 Describe the general method for preparing carbon compound 11.6 State the physical properties of the compounds. 11.7 Describe the reaction of each class of compound.	Explain the characteristics functional group of each class of organic compound. Explain the general formula of each class of compounds Explain the naming of members of each series. Explain the general method for preparing each of the compound. Explain the physical properties of the compounds. Explain the reaction of each class of compound.	Computer Internet Projector			

	11.8 Outline the usefulness of the compounds.	Explain the usefulness of the compounds.				
GENERAL OBJECTIVE12.0: Conduct laboratory work based on the above topics.						
14-15	12.1 Explain how to clean laboratory apparatus and glass wares 12.2 Explain the effect of heat and reagent on substances. 12.3. Explain how to prepare simple laboratory solutions	Explain how to clean laboratory apparatus and glass wares Explain the effect of heat and reagent on substances. Explain how to prepare simple laboratory solutions	Text books Journals Whiteboard Marker Charts Computer Internet Projector	Clean laboratory equipment's and apparatus. Dry the apparatus either in hot oven or in air. Observe the effects of heat and reagents on substances.	Guide student to: Clean laboratory equipment's and apparatus. Dry the apparatus either in hot oven or in air. Observe the effects of heat and reagents on substances.	PPE Laboratory equipment Oven Sample reagents

EVALUATION
C/A:60%
EXAMS: 40%
TOTAL: 100%

PROGRAMME: HIGHER NATIONAL DIPLOMA (HND)		
COURSE TITLE: General Biology II	**COURSE CODE**: STB 301	**CONTACT HOURS: 4**
	CREDIT UNITS: 3	**THEORETICAL**: 2
YEAR: I **SEMESTER:** 0	**PRE-REQUISITE:**	**PRACTICAL:** 1
GOAL: This course is designed to equip the students in (non-science programmes) with the knowledge of the fundamental aspects of biological science.		

GENERAL OBJECTIVES: On completion of this course, the students should be able to:

1.0 Understand cell structure
2.0 Understand the types of plant and animal tissues
3.0 Appreciate the classification of living organisms.
4.0 Know the principal features of different groups in the plant kingdom
5.0 Understand the distinguishing characteristics of the different groups of animal kingdom
6.0 Understand the structure and life history of the following plants and animals:-
- i) An Alga
- ii) An angiosperm
- iii) A protozoon
- iv) A vertebrate

7.0 Understand the internal structure of a flowering plant
8.0 Understand the general arrangement of the internal organs in a mammal.
9.0 Understand methods of nutrition.
10.0 Understand the transport of substances in plants and animals.
11.0 Know the process and significance of respiration.
12.0 Know the excretory organs and products.
13.0 Understand the general plan of the skeleton in a mammal.
14.0 Know the reproductive structures in plants and animals.
15.0 Understand the principal sense organs and their functions.
16.0 Understand the relationship of organisms to their environment.
17.0 Understand the constituents and characteristics of soil.
18.0 Know the methods of conserving soil fertility.

19.0	Know the development and method of cultivation of maize.
20.0	Understand how character is inherited.

PROGRAMME: **HIGHER NATIONAL DIPLOMA**		
COURSE TITLE: General Biology II	**COURSE CODE**: STB 301	**CONTACT HOURS: 4**
	CREDIT UNITS: 3	**THEORETICAL**: 2
YEAR: I **SEMESTER:** 0	**PRE-REQUISITE:**	**PRACTICAL: 1**
COURSE SPECIFICATION: THEORETICAL AND PRACTICAL		
GOAL: This course is designed to equip the students in (non-science programmes) with the knowledge of the fundamental aspects of biological science.		
GENERAL OBJECTIVE 1.0: Understand cell structure		

	THEORETICAL CONTENT			**PRACTICAL CONTENT**		
Week	**Specific Learning Outcome**	**Teacher's Activities**	**Resources**	**Specific Learning Outcome**	**Teacher's Activities**	**Resources**
	1.1Explain Cell theory and its discovery 1.2 Mention some scientist associated with cell discovery 1.3 Describe the structure of a plant cell as seen under a light microscope 1.4 Explain the structure of an animal cell. 1.5 State the differences between a plant cell and animal cell	Explain cell theory and its discovery Explain some scientist associated with cell discovery Explain the structure of a plant cell as seen under a light microscope Explain the structure of an animal cell. Explain the differences between a plant cell and animal cell	Textbooks Journals Whiteboard Marker Computer Internet Projector	Prepare cell slides using onion Identify an animal cell using a microscope Draw and label a plant cell and an animal cell	Guide student to: Prepare cell slides using onion Identify an animal cell using a microscope Draw and label a plant cell and an animal cell	Microscope Onion Knife Slides Cover slip Epithelium cell from the cheek

GENERAL OBJECTIVE 2.0: Understand the different types of plant and animal tissues						
	2.1 Defines a tissue. 2.2 Name 4 different types of plant tissues. 2.3 State the functions of each of the tissue. 2.4 Distinguish between the different animal tissues. 2.5 Give the names of the different animal tissues 2.6 List the functions of 2.5 above.	Explain a tissue Explain 4 different types of plant tissues Explain the functions of each of the tissue Distinguish between the different animal tissues. Explain the names of the different animal tissues Explain the functions of 2.5 above.	Textbooks Journals Whiteboard Marker Computer Internet Projector	Draw and label the tissues given permanent slide	Guide students to Draw and label the tissues given permanent slide	Permanent slides Microscope Magnifying lens
GENERAL OBJECTIVE 3.0: Appreciate the necessity for classification of living organisms.						
	3.1 Explain Taxonomy 3.2 Explain the rules of nomenclature 3.3 Explain the necessity for classification of living organisms. 3.4 Explain binomial	Explain taxonomy Explain the rules of nomenclature Explain the necessity for classification of living organisms. Explain binomial	Textbooks Journals Whiteboard Marker Computer Internet Projector			

	nomenclature: Features of kingdom, phylum/division, subphylum/subdivision, class, sub class, superclass, order, sub order, genus and species	nomenclature: Features of kingdom, phylum/division, subphylum/subdivision, class, sub class, superclass, order, sub order, genus and species				
GENERAL OBJECTIVE 4.0: Know the classification and principal features of different groups in the plant kingdom						
	4.1 List the major groups in the plant kingdom. 4.2 Describe the general characteristic of the major groups of plants. 4.3 Classify some common examples of plants 4.4 State three reasons for the classifications of plants.	Explain the major groups in the plant kingdom. Explain the general characteristic of the major groups of plants. Explain some common examples of plants Explain three reasons for the classifications of plants.	Textbooks Journals Whiteboard Marker Computer Internet Projector	Observe, draw and label plant specimens.	Guide student to: Observe, draw and label plant specimens.	Plant Specimen Writing materials
GENERAL OBJECTIVE 5.0: Understand the classification and distinguishing characteristics of the different groups in the animal kingdom						
	5.1 Discuss the different phyla in the animal kingdom 5.2 Explain the distinguishing characteristics of major	Explain the different phyla in the animal kingdom Explain the distinguishing characteristics of major groups of animals.	Textbooks Journals Whiteboard Marker Computer Internet Projector			

	groups of animals. 5.3 Classify some examples of animals	 Explain some examples of animals				
GENERAL OBJECTIVE 6.0: Understand the structure and life history of the following plants and animals:-i) An Alga, ii) An angiosperm, iii) A protozoon, iv) A vertebrate						
	6.1 Explain the structures of spirogyra 6.2 Describe the methods of reproduction in spirogyra 6.3 Outline the differences between a dicot and a monocot plant in external features 6.4 Explain the methods of reproduction in amoeba.	Explain the structures of spirogyra Explain the methods of reproduction in spirogyra Explain the differences between a dicot and a monocot plant in external features Explain the methods of reproduction in amoeba.	Textbooks Journals Whiteboard Marker Computer Internet Projector			
GENERAL OBJECTIVE 7.0: Understand the internal structure of a flowering plant						
	7.1 Explain the internal structure of: • Root (Dicot and Monocot) • Stem (Dicot and Monocot) 7.2 List types of tissues in the	Explain the internal structure of : • Root • Stem in a flowering plant Explain types of tissues in	Textbooks Journals Whiteboard Marker Computer Internet Projector			

	cross section of a stem	the cross section of a stem				
GENERAL OBJECTIVE 8.0: Understand the general arrangement of the internal organs in a mammal.						
	8.1 List Internal organs of a Mammal 8.2 State the functions of the different organs in 8.1 above	Explain the internal organs Explain the functions of the different organs in 8.1 above	Textbooks Journals Whiteboard Marker Computer Internet Projector			
GENERAL OBJECTIVE 9.0: Understand the different methods of nutrition.						
	9.1 Explain Nutrition in plant and Animal 9.2 Explain the different methods of nutrition 9.3 List the macro and micro elements necessary in plants 9.4 Define photosynthesis 9.5 Explain the conditions necessary for photosynthesis 9.6 Describe the process of photosynthesis	Explain Nutrition in plant and Animal Explain the different methods of nutrition Explain the macro and micro elements necessary in plants Explain photosynthesis Explain the conditions necessary for photosynthesis Explain the process of photosynthesis	Textbooks Journals Whiteboard Marker Computer Internet Projector			

	9.7 Define digestion 9.8 Explain types of Foods: • Energy giving food • Body building food • Health preserving food • Balanced diet 9.9 State the functions of the liver in body metabolism	Explain digestion Explain the food substances • Energy giving food • Body building food • Health preserving food • Balanced diet Explain the functions of the liver in body metabolism				
GENERAL OBJECTIVE 10.0: Understand the transport of substances in plants and animals.						
	10.1 Define the following: • Osmosis • Diffusion 10.2 Outline the significance of these processes in plants 10.3 Explain transpiration 10.4 Explain the structure of blood 10.5 List the functions of blood	Explain, the following: • Osmosis • Diffusion Explain the significance of these processes in plants Explain transpiration Explain the structure of blood Explain the structure of blood	Textbooks Journals Whiteboard Marker Computer Internet Projector	Conduct an experiment to demonstrate osmosis in potato cells Conduct an experiment to demonstrate diffusion Compare osmosis and diffusion	Guide student to: Conduct an experiment to demonstrate osmosis in potato cells Conduct an experiment to demonstrate Compare osmosis and diffusion	Potato Salt 1000ml beakers

GENERAL OBJECTIVE 11.0: Understand the process and significance of respiration.						
	11.1 List the respiratory organs 11.2 Outline the process of respiration and its significance 11.3 Explain the significance of 11.2 above 11.4 Differentiate between aerobic and anaerobic respiration 11.5 Explain the economic importance of fermentation	Explain the respiratory organs Explain the process of respiration and its significance Explain the significance of 11.2 above Differentiate between aerobic and anaerobic respiration Explain the economic importance of fermentation	Textbooks Journals Whiteboard Marker Computer Internet Projector			
GENERAL OBJECTIVE 12.0: Understand the excretory organs and products						
	12.1 Define Excretion 12.2 Describe the excretory organs in a mammal 12.3 List the excretory organs and excretory products in man 12.4 State the excretory products in a plant	Explain excretion Explain the excretory organs in a mammal Explain the excretory organs and excretory products in man Explain the excretory products in a plant	Textbooks Journals Whiteboard Marker Computer Internet Projector			

GENERAL OBJECTIVE 13.0: Understand the general plan of the skeleton in a mammal						
	13.1.Explain the general Plan of Skeleton 13.2 Explain types of skeleton in animals (exoskeleton and endoskeleton) 13.3 State the functions of the skeleton 13.4 Describe the general plan of the skeleton in a mammal 13.5 Describe the skeleton of the fore and hind limbs of a mammal	Explain the general plan of the skeleton in a mammal Explain types of skeleton in animals (exoskeleton and endoskeleton Explain the functions of the skeleton Explain the general plan of the skeleton in a mammal Explain the skeleton of the fore and hind limbs of a mammal	Textbooks Journals Whiteboard Marker Computer Internet Projector	Draw and label the structure of a vertebra e.g. a. Atlas b. Axis	Guide students to: Draw and label the structure of a vertebra e.g. a. Atlas b. Axis	
GENERAL OBJECTIVE 14.0: Know the reproductive structures in plants and animals.						
	14.1 Explain Structure of a flower 14.2 Differentiate insect and wind pollinated flower 14.3 Differentiate between a staminate and pistilate	Explain the structure of a flower Differentiate insect and wind pollinated flower Differentiate between a staminate and pistilate	Textbooks Journals Whiteboard Marker Computer Internet Projector	Draw and Label the structure of a flower	Guide students to: Draw and Label the structure of a flower	Drawing materials

	flower	flower				
	14.4 List the parts of a flower and their functions	Explain the parts of a flower and their functions				
	14.5 Distinguish between pollination (self-pollinated flower and cross pollinated flower) and fertilization.	Explain between pollination and fertilization.				
	14.6 Distinguish the process of fertilization in a flowering plant	Explain the process of fertilization in a flowering plant				
	14.7 Distinguish between a grain, drupe and berry	Explain differences between grain, drupe and berry				
	14.8 List the different methods of dispersal of fruits and seeds	Explain the different methods of dispersal of fruits and seeds				
	14.9 Explain the structure of a seed and its germination of seed	Explain the structure of a seed and its germination of seed				
	14.10 Explain dicotyledonous seed and	Explain dicotyledonous seed and				

	monocotyledonous seeds	monocotyledonous seeds				
	14.11 Explain germination of seeds (epigeal germination and hypogeal germination)	Explain germination of seeds (epigeal germination and hypogeal germination)				
	14.12 Explain factors affecting germination	Explain factors affecting germination				
GENERAL OBJECTIVE 15.0: Understand the principal sense organs and their functions.						
	15.1 Explain coordination	Explain coordination	Textbooks Journals			
	15.2 Name the principal sense organs	Explain the principal sense organs	Whiteboard Marker Computer			
	15.3 State the functions of 15.2 above	Explain the functions of 15.2 above	Internet Projector			
	15.4 Define hormones	Explain hormones				
	15.5 List types of Hormones	Explain types of Hormones				
	15.6 Enumerate the functions of hormones	Explain the functions of hormones				
	15.7 Explain the role of auxins in tropisms	Explain the role of auxins in tropisms				

General Objective 16.0: Understand the relationship of organisms to their environment.						
	16.1 Define the following ecological terms; • Ecosystem • Community • Population • Habitat 16.2 List the biotic and abiotic in a habitat 16.3 Explain the following associates: • Symbiosis • Parasitism • Commensalism • Saprophytism 16.4 Describe the methods of studying an ecological habitat (e.g., quadrat) 16.5 Explain the causes and control of diseases such as malaria, bilharzia cholera, river blindness and polio	Explain the following ecological terms; • Ecosystem • Community • Population • Habitat Explain the biotic and abiotic in a habitat Explain the following associates: • Symbiosis • Parasitism • Commensalism • Saprophytism Explain the methods of studying an ecological habitat Explain the causes and control of diseases such as malaria, bilharzia cholera, river blindness and polio	Textbooks Journals Whiteboard Marker Computer Internet Projector			

	16.6 Explain five pollutants of air and water 16.7 Describe the methods of controlling pollution	Explain five pollutants of air and water Explain the methods of controlling pollution				
GENERAL OBJECTIVE 17.0: Know the constituents and characteristics of soil.						
	17.1 Explain soil Study 17.2 List the constituents of soil 17.3 Differentiate between different types of soil, e.g. sandy, clay, loamy. 17.4 Explain the characteristics of a good soil most favourable for crop cultivation 17.5 Explain how soil organisms increase soil fertility	Explain soil Study Explain the constituents of soil Explain the differences between types of soil, e.g. sandy, clay, loamy. Explain the characteristics of a good soil most favourable for crop cultivation Explain how soil organisms increase soil fertility	Textbooks Journals Whiteboard Marker Computer Internet Projector	Examine the texture of soil sample in the laboratory. Determine the pH of the soil sample	Guide student to: Examine the texture of soil sample in the laboratory. Determine the pH of the soil sample	Soil Sample pH meter Beaker
GENERAL OBJECTIVE 18.0: Understand the methods of conserving soil fertility.						
	18.1 Explain Soil conservation 18.2 List the ways in which soils lose fertility	Explain Soil conservation Explain the ways in which soils lose fertility	Textbooks Journals Whiteboard Marker			

	18.3 Define Soil Erosion 8.4 List types of soil erosion. 18.5 State the measures to check soil erosion 18.6 Outline the various ways to conserve soil fertility	Explain Soil Erosion Explain types of soil erosion. Explain the measures to check soil erosion Explain the various ways to conserve soil fertility	Computer Internet Projector			
GENERAL OBJECTIVE 19.0: Understand the development and method of cultivation of maize.						
	19.1 Discuss the type of soil preferred by maize 19.2 Explain the method of cultivation 19.3 Discuss major diseases which can affect maize 19.4 List how the diseases can be checked	Explain the type of soil preferred by maize Explain the method of cultivation Explain major diseases which can affect maize Explain how the diseases can be checked	Textbooks Journals Whiteboard Marker Computer Internet Projector			
GENERAL OBJECTIVE 20.0: Understand how character is inherited						
	20.1 Explain the following terms: • Genetics, • Heredity and	Explain the following terms: • Genetics, • Heredity and	Textbooks Journals Whiteboard Marker			

	• Inheritance 20.2 Differentiate between Hereditary and Genetics 20.3 State Mendel's law 20.4 Explain mono-hybrid and dehybrid inheritance. 20.5 Define linkage and sex-linked characters 20.6 Explain how sex-linked characters are inherited. 20.7 Explain how to solve problems with 20.1	• Inheritance Explain the differences between Hereditary and Genetics Explain Mendel's law Explain mono-hybrid and dehybrid inheritance. Explain linkage and sex-linked characters Explain how sex-linked characters are inherited. Explain how to solve problems with 20.1	Computer Internet Projector			

EVALUATION
C/A:60%
EXAMS: 40%
TOTAL: 100%

PRACTICAL MANUAL BASIC SCIENCE

GENERAL PHYSICS I STP 101	1. Perform simple activities to demonstrate scientific principles: • Falling from a height • Floating of objects in water. 2. Carryout experiments to illustrate the following: • Circular motion • Rational motion • S.H.M 3. Demonstrate the methods of measurement of length time-using stop watch as in the application of simple pendulum and mass 4. Perform experiments in the measurement of mass using beam balances, replace length using vernier callipers and meter-ruler; time, using stop watch, simple pendulum. 5. Perform simple experiments to illustrate the principles of : • Operation of levers • Inclined planes • Pulleys • Hydraulic press 6. Demonstrate experimentally the effects of heat energy e.g.: • Ball and ring experiment • Melting of ice • Boiling of water to form steam. 7. Perform simple experiments to illustrate.Conversion of energy from one form to another

	8. Perform experiments to illustrate conduction, convection and radiation: • Conduction of heat through a metal rod, • Convection in air and radiation through different materials. 9. Illustrate experimentally the concept of waves using examples such as: • Ripples on water • Waves on string • Helical string 10. Conduct some simple experiments to demonstrate properties of waves: • Reflection • Refraction. 11. Measure angles of incidence and reflection 12. Conduct simple experiment to demonstrate different sound produced by different instruments. 13. Identify the different sounds produced by string, wind and percussion 14. Perform simple experiments on reflection and refraction: • Curved mirror experiment, • Refraction through a glass block, • Refraction through water 15. Perform experiment to illustrate dispersion of white light by prism and relate to its formation of rainbow.

	16. Perform simple experiments to illustrate various effects of: • Electric current, • Heating effects as in heating coil, • Electric bulbs • Sound effects as in bell, loud speaker, microphone 17. Perform simple experiment to show the relationship in above using torch bulb, wires and relevant instruments 18. Insert a fuse in an electric current 19. Fit a cable into a plug
GENERAL PHYSICS II STP 301	1. Perform simple experiments to measure velocity and speed 2. Solve problems using equations derived in 3.2 above 3. Solve simple problems on motions 4. Conduct simple experiments on the following : • Elasticity, • Stress • Strain • Elastic limit 5. Demonstrate the application of elasticity in day-to-day life. 6. Use the goldleaf electroscope to determine the nature of charges on different bodies.

	7. Perform some laboratory activities to generate some static electricity such as: • Rubber balloon and glass rod experiments • Metal sphere experiment etc. 8. Conduct simple experiments in electricity such as: • Light bulb experiment • Resistor experiment etc. 9. Conduct experiments in thermometric liquids and thermometers such as: • Thermal expansion experiment • Calibration of thermometers • Thermometer comparison experiment 10. Conduct simple experiments on water wave such as: • Wave generation, • Reflection and Refraction of waves.
GENERAL CHEMISTRY I STC 101	1. Carry out the electrolysis of water using Hoffman Voltmeter to identify the constituents of water 2. Carry out distillation of water to produce distilled water which can be used for routine experiments in laboratories and charging of batteries. 3. Carry out simple test for acids, bases and salts. 4. Use indicators to distinguish between acids, bases and salts. 5. Carry out acid base titration.

	6. Obtain salt such as sodium chloride from sea water by evaporation process. 7. Carry out an experiment to produce soap from palm oil and potash rich ashes. 8. Carryout an experiment to produce ethanol through the fermentation of locally available cereals.
GENERAL CHEMISTRY II STC 301	1. Conduct some simple experiments of water quality (physical and chemical). 2. Conduct some experiments on acids, bases and salts (for example acid-base neutralisation, preparation of salts e.g. sodium chloride and copper sulphate) 3. Illustrate the tetrahedral arrangement of carbon bonds. 4. Clean laboratory equipment's and apparatus. 5. Dry the apparatus either in hot oven or in air. 6. Observe the effects of heat and reagents on substances.
GENERAL BIOLOGY I STB 101	1. Observes some cells under the microscope (e.g. a plant cell, and animal cell) 2. Draw and label the cells observed in above practical 3. Draw and label the digestive system in man 4. Demonstrate osmosis and diffusion by simple experiments. 5. Draw and label the structure of a mammalian heart.
GENERAL BIOLOGY II STB 301	1. Prepare cell slides using onion

	2. Identify an animal cell using a microscope 3. Draw and label a plant cell and an animal cell 4. Draw and label the tissues given permanent slide 5. Observe, draw and label plant specimens. 6. Conduct an experiment to demonstrate osmosis in potato cells 7. Conduct an experiment to demonstrate diffusion 8. Compare osmosis and diffusion 9. Draw and label the structure of a vertebra e.g. a. Atlas b. Axis 10. Draw and Label the structure of a flower 11. Examine the texture of soil sample in the laboratory. 12. Determine the pH of the soil sample

LIST OF EQUIPMENT FOR BASIC SCIENCE

S/N	EQUIPMENT	QUANTITY
1	1000ml beakers	
2	Acid	Assorted
3	Balance	2
4	Ball	Assorted
5	Bases	
6	Beaker	
7	Beam balances	
8	Beating drum	
9	Bells	
10	Building sticks	
11	Bunsen Burner	
12	Burette	
13	Cable	Assorted
14	Car battery	Assorted
15	Circuit	
16	Clamp	
17	Colours	Assorted
18	Copper sulphate	
19	Cover slip	
20	Curved mirror	
21	Distillation Apparatus	
22	Distiller	
23	Drawing materials	Assorted
24	Dropper	

25	Elastic band	
26	Electric bulbs	Assorted
27	Epithelium cell from the cheek	
28	Evaporating dish	
29	Floating objects	Assorted
30	Free-falling objects	Assorted
31	Fuse	Assorted
32	Gas	
33	Glass block	
34	Glass rod	
35	Goldleaf electroscope	
36	Heating coils	
37	Heating mantel	
38	Hoffman Voltmeter	
39	Hydraulic press	
40	Inclined planes	
41	Indicator	
42	Knife	Assorted
44	Lever	
45	Light bulb	Assorted
46	Litmus paper	
47	Loud speaker	1
48	Magnifying glass	
49	Magnifying lens	
50	Measuring Tape	Assorted
51	Metal rod	
52	Metal sphere	
53	Meter ruler	

54	Microphone	1
55	Microscope	
56	Millet	Assorted
57	Oil	Assorted
58	Onion	Assorted
59	Oven	2
60	Perfume	Assorted
61	Permanent slides	
62	pH meter	
63	Pipette	
64	Plant Specimen	Assorted
65	Plug	
66	Potato	Assorted
67	PPE	Assorted
68	Prepared slide	
69	Prism glass	
70	Pulleys	
71	Pyrex glass	
72	Resistor	
73	Retort Stand	
74	Ring	
75	Rubber balloon	Assorted
76	Ruler	Assorted
77	Salt	Assorted
78	Sample reagents	Assorted
79	Sea water	Assorted
80	Shallow Basin	1
81	Simple pendulum	Assorted

82	Slides	Assorted
83	Soap	Assorted
84	Sodium chloride	
85	Soil Sample	Assorted
86	Spatula	
87	Speedometer	
88	Stirrer	
89	Stop-watch	2
90	Strings	
91	Thermometer	
92	Thermometric liquids	
93	Touch Light bulbs	
94	Tripod Stand	
95	Tripod Stand Wire Gauze	
96	Vernier callipers	
97	Volumetric Flask	
98	Water bath	
99	Wire gauze	
100	Wires	Assorted
101	Writing materials	Assorted