

Science Laboratory Technology - National Diploma (ND)

NDII 2ND Semester

Course: Genetics	2
Course: Ecology	6
Course: Organic Chemistry II	14
Course: Biochemistry	19
Course: Maintenance and Repair of Science and Electronic Equipment	32
Course: GLT, Module (vii) Vacuum Techniques, and Module (viii) Glassblowing	36
Course: Practical Project and Seminar	40
Course: Small Business Management I	44

Course: Genetics

Department/ Programme: National Diploma			
Course: Genetics	Course Code: STB 221	Credit Hours:	3
Year: Semester:	Pre-requisite:	Theoretical:	1 hours/week
		Practical:	2 hours /week
General Objectives			
<ol style="list-style-type: none">1. Understand basic concepts in Genetics2. Understand rudiments of Mendelian Genetics3. Understand the concept of dominance and deviations from Mendelian Genetics4. Understand sex determination and sex linkage5. Understand the mechanism of variation and mutation6. Understand the basic concept in genetic engineering			

Theoretical Content			Practical Content			
Week/s	Specific Learning Outcomes	Teacher's activities	Resources	Specific Learning Outcomes	Teacher's activities	Resources
General Objective 1.0: Understand Basic Concepts in Genetics						
1-2	Basic Concepts In Genetics 1.1 Define genetics. 1.2 Define genes 1.3 Explain the importance of chromosomes and genes in heredity.	lecture and discussion	Blackboard Chalk Overhead projectors			
General Objective 2.0: Understand Rudiments of Mendelian Genetics						
3-4	Mendelian Laws 2.1 Explain Mendel's experiments and points out the conclusions from the experiments 2.2 Explain the following terms, monohybrid, dihybrid, alleles, linkage, recessive gene, dominant gene, phenotype, genotype 2.3 State the two Mendelian laws of inheritance. 2.4 Explain, the first and the second laws of Mendel, in relation to meiosis.	Lecture	Classroom	Identifying chromosomes in prepare slide of mitosis.	Assist students to Use the laboratory materials	Prepared slides Microscopes Slides & cover slips
5-6	2.5 List examples of monohybrid inheritance in fruit fly (Drosophila melanogaster) albinism cystic fibrosis, and chondrodystrophic dwarfism in men. 2.6 Describe dihybrid inheritance by means of plant height/flower colour; seed coat/position of flower, or any other combination of character of pea plant (<i>Pisum Sativum</i>). 2.7 Explain the deviations from Mendelian ratio			Identifying chromosomes.		

Theoretical Content			Practical Content			
Week/s	Specific Learning Outcomes	Teacher's activities	Resources	Specific Learning Outcomes	Teacher's activities	Resources
General Objective 3.0: Understand the concept of dominance and deviations from Mendelian Genetics						
7-8	Dominance 3.1 Describe complete dominance as in Mendel's experiments where in heterozygous one allele is expressed in the phenotype. 3.2 Explain deviations by linkage; multiple alleles(codominance); lethal genes in mice, dominance 3.3 Explain the genetic basis of ABO blood group.	Lecture	Classroom	Identify the various degrees of dominance:- complete no dominance and partial dominance.	.Identify examples in the field. Classroom lectures and discussions.	Genetic Corn.
General Objective 4.0: Understand Sex determination and Sex linkage						
9-10	Sex Determination and Linkage 4.1 Explain the mechanism of sex determination 4.2 Describe sex linked inheritance as in eye colour in Drosophila; colour blindness and haemophilia in man. 4.3 Explain the relevance of genetics in disputed paternity.	Field observations and classroom lectures and discussion	Organisms, fly, rats.	Identify the characteristics that qualify an organism for use in genetic experiments with references to Drosophila and Neurospora.		
General Objective 5.0: Understand the mechanism of variation and Mutation						
11	Variation and Mutation 5.1 Define variation 5.2 Differentiate between continuous and discontinuous variations. 5.3 Explain the role of meiosis in causing variation	Observation and classroom lectures and discussions Lecture	Classroom	Separating individual characteristics.	Assist students to examine the individual characteristics.	Drosophila culture.
12-13	5.4 Define mutation 5.5 State the causes of mutation 5.6 List and describe the kinds of mutation 5.7 Explain the role of mutation in variation 5.8 Explain the following:- Mongolism/Down's syndrome; Klinefelter's syndrome; Turner's syndrome and XYZ combinations.					

Theoretical Content			Practical Content			
Week/s	Specific Learning Outcomes	Teacher's activities	Resources	Specific Learning Outcomes	Teacher's activities	Resources
General Objective 6.0: Understand the basic concept in genetics Engineering						
14	Genetics Engineering 6.1 Define Biotechnology 6.2 Explain Nucleic acid and non-nucleic acid biotechnology.	. Lecture . Assignment	Classroom	Insert plasmid pAMP into e.coli	Guide and supervise students	Internet. http://academy.d20.co.edu/kadets/lundberg/student.html
15	6.3 Explain Genetic manipulation techniques 6.4 State the importance of biotechnology in development.					e.coli and pAMP, sterile pipettes, petri dishes agar, ampicillin, test tubes etc

Assessment:

Coursework/Assignments 10 %; Practical 40 %; Examination 50 %

Recommended Textbooks & References:

Biology: A Functional Approach, by Michael Roberts, Nelson Thornes (Publishers) Ltd

Introduction to Biology (2nd West African Edition) by D.G. MaCkean

A. Modern Course in Biology by M. Deardem.

Course: Ecology

Department/ Programme: National Diploma			
Course: Ecology	Course Code: STB 222	Credit Hours:	5
Year: Semester:	Pre-requisite:	Theoretical:	2 hours/week
		Practical:	3 hours /week
General Objectives			
<ol style="list-style-type: none">1. Know the various ecological terminologies and types of habitats2. Understand the concept of succession3. Understand the problems confronting organism in their habitat4. Know the concept of population ecology5. Understand the soil as an ecosystem6. Know the pollutants and effect of pollution on the environment, vegetation and animal life			

Theoretical Content				Practical Content		
Week/s	Specific Learning Outcomes	Teacher's activities	Resources	Specific Learning Outcomes	Teacher's activities	Resources
General Objective 1: Know the various ecological terminologies and types of habitats						
1	Types of Habitat 1.1 Define ecology 1.2 Define habitat 1.3 Identify different kinds of habitats i.e. aquatic, terrestrial and arboreal habitats. 1.4 Differentiate between fresh water habitat, marine habitat and brackish water habitat. 1.5 Differentiate between forest, savannah and desert. 1.6 Identify various vegetational zones of Nigeria and Africa.	Audio visual film of various vegetation zones	Overhead projector, films	Measure temperature, light intensity, wind evaporation rate, relative humidity and saturation deficit in terrestrial habitats.	Conduct practical Conduct practical on weather measurements.	Soil thermometer Psychomotor dry and wet bulb thermometer Rain gauge Sunshine recorder light meter Meteorological station Anemometer wind vane.
2	1.7 Identify the diagnostic features of mangrove forest, tropical rainforest, deciduous forest. 1.8 Identify the diagnostic features of guinea savannah, Sudan Savannah and Sahel Savannah 1.9 Define ecological niche. 1.10 Describe the status of a terrestrial arthropod e.g. wood louse by observing its response to light, temperature, humidity and gravity. 1.11 Define environment. 1.12 List environmental factors and their effect on various beings. 1.13 Identify the instruments used in measuring the various environmental factors.			Measure temperature, turbidity (light penetration depth), pH, salinity in aquatic habitats.	Conduct field trips	secchi disc pH meters

Theoretical Content				Practical Content		
Week/s	Specific Learning Outcomes	Teacher's activities	Resources	Specific Learning Outcomes	Teacher's activities	Resources
General Objective 2: Understand the Concept of Succession						
3	Concept of Succession 2.1 Define Succession. 2.2 Define and explain primary succession. 2.3 List and describe factors such as erosion, strong winds, hurricanes, volcanic actions etc. as being responsible for primary bare surfaces such as bare land, depositing dunes, volcanic ash etc.	Audio-visual exposures Field trips	Cleared are Audio visuals	Examine and describe an arboreal habitat, for example the trunk of a palm tree which usually carries specialised fauna and flora like ferns, mosses and orchids and insects with their larvae.		
4	2.4 Define secondary succession 2.5 List and describe the factors that give rise to secondary succession. 2.6 Describe the series of communities in a succession - pioneers, the intermediate or transitory communities and the climax community. 2.7 Describe the processes involved in ecological successions, nudation, immigration, acesis, reaction and stabilisation.			Examine and describe stratification in a forest, a savannah and aquatic communities		
General Objective 3: Understand the problems confronting organism in their habitat						
5	Problems of organisms in their habitat 3.1 List and explain the problems of plants living in fresh water habitats such as the problems of buoyancy inadequate sunlight, low oxygen tension, reproduction etc. 3.2 List and explain the problems			Examine and describe an epiphyte and its responses to light, temperature, humidity and gravity.	Preserved specimen.	

Theoretical Content				Practical Content		
Week/s	Specific Learning Outcomes	Teacher's activities	Resources	Specific Learning Outcomes	Teacher's activities	Resources
	<p>of animals living in fresh water habitats - the problems of buoyancy, breathing, feeding, reproduction and enemies.</p> <p>3.3 Identify the various adaptive features employed by plants and animals in overcoming their problems in fresh water habitats.</p> <p>3.4 List and explain the problems of plants living in brackish water habitat - problems of buoyancy. Flooding, respiration, osmotic balance.</p> <p>3.5 Identify the adaptations of mangrove plants to life in their habitat - red mangrove (Rhizophara) and white mangrove (Avicenia)</p> <p>3.6 List and explain the problems of animals living in brackish water - problems of wave action, salinity,. Water current.</p>					
6	<p>3.7 Describe the adaptations of animal communities to life in brackish water habitat</p> <p>3.8 Explain poor light condition as a major problem of organisms living in tropical rainforest.</p> <p>3.9 Describe the adaptation of plants as a means of solving the problem of poor light in rainforest - long petioles of plants, climbing habit, mosaic arrangement of leaves etc.</p> <p>3.10 List and describe the problems of organisms in the savannah - drought, poor soils,</p>			<p>Measure environmental factors applying the instruments identified above e.g. psychometric for measuring humidity, rain gauge for measuring rain fall, light meter for determining light intensity, Secchi disk for determining depth of light penetration into a pond: anemometer for estimating wind speed; thermometer for measuring temperature; pH meter of pH paper for determining acidity or alkalinity of pond water or soil.</p>		

Theoretical Content				Practical Content		
Week/s	Specific Learning Outcomes	Teacher's activities	Resources	Specific Learning Outcomes	Teacher's activities	Resources
	<p>fires, seasonal food scarcity and shelter.</p> <p>3.11 Explain the xeromorphic features of savannah plants.</p> <p>3.12 Describe the adaptations of plant communities for surviving annual grass fires - tick bark, vigorous regeneration, fire resistant seeds, underground perenating organs (e.g. tuber, bulbs, rhizomes).</p> <p>3.13 Explain the physiological adaptations of savannah species - deciduous habit, pre-rain flusing and flowering for life in their habitat</p>					
General Objective 4: Know the concept of population ecology						
7	<p>4.1 Describe the transect sampling technique.</p> <p>4.2 Find population size applying the formula.</p> $N = \frac{n}{a} \times A$ <p>When N = population size, A = area covered by the population: a = average of the number of sample plots; n = average of the number of individuals in the sample</p> <p>4.3 Explain the use of lincohl Index in estimating population size - say in a restricted volume of Water like fish pond.</p> <p>4.4 Describe the capture-release- recapture method of population size estimation.</p> <p>4.5 Explain the various</p>	Lecture with worked examples.		Exemplify the study of succession by regular observation of a cleared area		

Theoretical Content				Practical Content		
Week/s	Specific Learning Outcomes	Teacher's activities	Resources	Specific Learning Outcomes	Teacher's activities	Resources
	precautions and assumptions in the use of capture - release - recapture method.					
8	<p>4.6 Describe the regression method of estimating population size.</p> <p>4.7 Explain the assumptions underlying the regression method of estimating population size.</p> <p>4.8 Explain population growth and rate of growth.</p> <p>4.9 Draw and describe the growth curves - J - shaped and S- shaped growth curves.</p> <p>4.10 Explain the various factors influencing sizes of populations - natality, mortality, fecundity, immigration emigration etc</p>			Provide relevant preserved specimens for proper explanation		
9	<p>4.11 Describe the regression method of estimating population size.</p> <p>4.12 Explain the assumptions underlying the regression method of estimating population size.</p> <p>4.13 Explain population growth and rate of growth.</p> <p>4.14 Draw and describe the growth curves - J - shaped and S- shaped growth curves.</p> <p>4.15 Explain the various factors influencing sizes of populations - natality, mortality, fecundity, immigration emigration etc</p> <p>4.16 Identify the density - dependent and density - independent factors of populations.</p>			Observe closely laboratory culture of lemna fruit fly (<i>Drosophila</i>) or stored product insect such as <i>Sitophilus</i> over a period of time and describe their population growth	Practical observation over a period	Insect cage Fly cage

Theoretical Content				Practical Content		
Week/s	Specific Learning Outcomes	Teacher's activities	Resources	Specific Learning Outcomes	Teacher's activities	Resources
	4.17 Identify the biotic and abiotic factors and explain their effect on population sizes.					
General Objective 5: Understand the soil as an ecosystem						
10	Soil as an Ecosystem 5.1 Explain soil 5.2 List and describe the methods of soil formation 5.3 List and describe the components of soil 5.4 Explain the properties of soil - soil texture, soil structure, soil profile. 5.5 Explain the influence of temperature, air, moisture, pH flora and fauna of the soil. 5.6 Describe the role of micro-organisms in soil 5.7 List soil macroflora and macrofauna and describe their influence on soil			Isolate fungi and bacteria from soil sample.		
11-12	5.8 Describe the measurement of soil physical and chemical factors such as porosity (i.e. water retention capacity): particle size, pH, water content, organic matter content etc. 5.9 Describe ways by which soil fertility is lost - e.g. erosion, leaching, burning, over cultivation etc. 5.10 Identify and describe types of erosion, water (Gully, Sheet) erosion, wind erosion. 5.11 Describe methods of controlling water erosion 5.12 Describe methods of controlling wind erosion	Conduct practicals on fungi and bacteria isolation Conduct field trips	Culture media Autoclave Incubator Wire loop. Soil samples	Identify the different kinds of soil and state their properties. Determine the fertility or otherwise of the soil types above.		

Theoretical Content				Practical Content		
Week/s	Specific Learning Outcomes	Teacher's activities	Resources	Specific Learning Outcomes	Teacher's activities	Resources
General Objective 6 Know the pollutants and effect of pollution on the environment, vegetation and animal life						
13	Pollutants and Pollution 6.1 Define Pollution and Pollutants 6.2 List examples of pollutants - like carbon monoxide sulphur dioxide, oils, scraps, sewage etc. 6.3 Explain the effects of the pollutants on plants and animal life including man. 6.4 Identify different types of pollution: water pollution, air pollution: soil pollution: industrial pollution: oil pollution etc.			Visit industrial estates to assess the effect of effluents on their immediate environment.		
14	6.5 Explain the need for frequent medical check ups for industrial employees.. 6.6 Describe different ways of sewage treatment: sewage farming: stabilisation ponds; filter beds; cesspits and septic tanks; activated sludge. 6.7 Identify each of the sewage treatment plants described in 6.9 above.	Field trips to industries to asses effluents; sewage treatment plants, refuse dumps	Lecture note	Visit drilling locations and assess and describe the damage done by oil spillage to the lives and economy of the inhabitants.		
15				Visit a few filthy places in a nearby city or town to assess and describe the health condition of the local inhabitants		

Assessment:

Coursework/Assignments 10 %; Practical 40 %; Examination 50 %

Recommended Textbooks & References:

Ecology: Individuals, Populations and Communities by M.Begon, J.Harper and C.Townsend, publishers Blackwell, UK

Course: Organic Chemistry II

Department/ Programme: National Diploma			
Course: Organic Chemistry II	Course Code: STC 221	Credit Hours:	5
Year: Semester:	Pre-requisite:	Theoretical:	2 hours/week
		Practical:	3 hours /week

General Objectives

1. Understand the chemistry of ethers
2. Know the chemistry of amines
3. Understand the chemistry of aromatic compounds
4. Understand some chemical reactions of benzene
5. Understand the mechanism of electrophilic and nucleophilic substitution in aromatic compounds
6. Understand the chemistry of phenol
7. Understand the chemistry of carbonyl substituted benzene
8. Understand the chemistry of benzoic acid
9. Understand the chemistry of benzoic acid derivatives
10. Understand the chemistry of benzamides and phthalic anhydride
11. Understand the chemistry of aniline
12. Understand the chemistry of diazonium compounds and azo-dyes

Theoretical Content				Practical Content		
Week/s	Specific Learning Outcomes	Teacher's activities	Resources	Specific Learning Outcomes	Teacher's activities	Resources
General Objective 1.0 Understand Chemistry of Ethers						
1-2	Ethers 1.1 Write the functional group of ethers 1.2 Write general formula of ethers as R-O-R with examples. 1.3 Name simple ethers using IUPAC 1.4 Describe methods of preparation of ethers. 1.5 Use curly arrows to show the mechanism of the formation of an ether by the Williamson reaction 1.6 Describe the physical properties of diethyl ether. 1.7 Write equations for the cleavage of ether by acids. 1.8 Describe uses of diethyl ether.	Lectures with charts	Teaching Board	Prepare a simple ether in the laboratory e.g. Neonerolin	Guide and supervise students	Benzyl alcohol ethyl iodide sodium hydride solvents glassware
General Objective : 2.0 Know the chemistry of amines						
3-4	Amine 2.1 Relate amines to ammonia structurally. 2.2 Describe the methods of preparation of 1° amides. 2.3 Classify amines as 1°, 2°, 3°, and 4° 2.4 State the general formula for the classes under 3.66 above and give examples. 2.5 Discuss the basicity of amines 2.6 Use curly arrows to show the reaction of an amine with a hydrogen ion 2.7 Describe the following reactions of 1° amides - Hofmann's reaction, nitrosation, and acylation. 2.8 Use curly arrows to show the mechanism of acylation of an amine with an acyl chloride 2.9 Describe the uses of amines.	Lectures with charts Practical identification	Glassware	Distinguish among 1°, 2°, 3°, amine by chemical tests.	Guide and supervise students	aminophenol acetic anhydride chemicals glassware

Theoretical Content				Practical Content		
Week/s	Specific Learning Outcomes	Teacher's activities	Resources	Specific Learning Outcomes	Teacher's activities	Resources
General Objective 3.0 Understand Chemistry of Aromatic Compounds						
5	Chemistry of Aromatic Compounds 3.1 Write the structures of benzene and its homologues. 3.2 Explain aromaticity: resonance, resonance theory $4D + 2$ rule. 3.3 Explain the fulfilment of the rule in Benzene and its homologues. 3.4 Explain the physical properties of benzene and alkyl benzene, e.g. M.P. and b.p.	Lectures with charts		Prepare paracetamol in the lab by acylation of aminophenol		
General Objective 4: Understand some chemical reactions of Benzene						
6	4.1 Describe the physical and chemical properties of benzene 4.2 Describe the following reactions of benzene: Friedel-Crafts (Alkylation and Acylation) Nitration, Sulphonation and halogenation. 4.3 Describe some examples of nucleophilic substitution of derivatives of benzenes such as fluorobenzene	Lectures	Teaching board	Nitration of bromobenzene	Guide and supervise students	Bromobenzene Con nitric conc. sulphuric acids etc
General Objective 5: Understand the mechanism of electrophilic and nucleophilic substitution in aromatic compounds						
7	1.1 Describe the mechanism of nucleophilic and electrophilic aromatic substitution reactions of mono substituted benzene 1.2 Describe the following i) effect of substituents ii) effects of solvents orientation of incoming group.			React dinitro fluoro benzene with either an amine or an amino acid	Guide and supervise students	Chemicals glassware tlc equipment
General Objective 6: Understand the Chemistry of Phenol						
8	6.1 Describe the preparation of Phenol. 6.2 Explain physical properties and chemical reactions of phenol. 6.3 List uses of phenol.			Investigate the solubility of alcohols, phenols and carboxylic acids in water, bicarbonate and hydroxide solutions. and/or React phenol with bromine water		

Theoretical Content				Practical Content		
Week/s	Specific Learning Outcomes	Teacher's activities	Resources	Specific Learning Outcomes	Teacher's activities	Resources
General Objectives: 7.0 Understand the chemistry of carbonyl substituted benzene						
9	7.1 Describe the preparation of benzaldehyde and benzophenone. 7.2 Explain properties and chemical reactions of the above 7.3 List uses of benzaldehyde and benzophenone			Prepare demethyl benzophenone or similar in the lab	Guide and supervise students	Toluene and toluoyl chloride and aluminium trichloride Or toluene toluic acid and phosphoric acid
General Objectives: 8.0 Understand the Chemistry of Benzoic acid						
10	8.1 Describe the preparation of benzoic acid. 8.2 Explain the physical properties and chemical reactions of benzoic acids and list uses of benzoic acids.			prepare benzoic acid from toluene and/or benzyl alcohol by oxidation with permanganate isolate and purify by recrystallisation and identify the product by its mp		
General Objectives: 9.0 Understand the chemistry of benzoic acid derivatives						
11	9.1 Describe the preparation of benzoyl chloride and esters. 9.2 Use curly arrows to show the mechanism of the reaction between benzoyl chloride and methanol 9.3 List uses of benzoyl chloride and benzoyl esters.			Either: React benzoic acid with thionyl chloride and then methanol to give the methyl ester Or: saponify methyl benzoate	Guide and supervise students	Chemicals source of heat (not a Bunsen)
General Objectives: 10 Understand the chemistry of benzamides and phthalic anhydride						
12-13	10.1 Describe the preparation of benzamide and phthalic anhydride 10.2 Use curly arrows to show the mechanism of the reaction between benzoyl chloride and ammonia 10.3 Explain physical properties and chemical reactions of benzamide and phthalic anhydride. 10.4 List uses of benzamide and phthalic anhydride.			Prepare benzamide from benzoyl chloride and aqueous ammonia		

Theoretical Content				Practical Content		
Week/s	Specific Learning Outcomes	Teacher's activities	Resources	Specific Learning Outcomes	Teacher's activities	Resources
General Objectives: 11 Understand the chemistry of Aniline						
14	11.1 Describe the laboratory and industrial preparation of Aniline 11.2 Describe the physical properties and chemical reactions of aniline with emphasis on the basic nature of aniline 11.3 List uses of aniline			prepare aniline by reduction of nitrobenzene with Sn or Fe and acid		
General Objectives 12: Understand the chemistry of diazonium Compounds and Azo-dyes						
15	12.1 Describe the preparation of diazonium salts. 12.2 Describe the conversion of diazonium salts to chloride bromide, and cyano compounds. 12.3 Explain the formation of sample azo dyes.	Demonstrate preparation		Prepare an azo dye such as orange II in the lab	Guide and supervise students	

Assessment:

Coursework/Assignments 10%; Practical 40%; Examination 50 %

Recommended Textbooks & References:

Chemistry by M.J. Sienko and R.A. Plane (Mc Graw Hill)

Organic Chemistry by McMurray. 6th edition. Thompson/Brooks-Cole.

Classic Chemistry Experiments published by The Royal Society of Chemistry (UK) and free on the internet at http://www.chemsoc.org/networks/learnnet/classic_exp.htm

Salters Advanced Chemistry Activities and Assessment Pack published by Heinemann

Small scale synthesis by M.Zanger and J.R.McKee published by Wm.C.Brown

Course: Biochemistry

Department/ Programme: National Diploma			
Subject/Course: BIOCHEMISTRY	Course Code: STC 222	Credit Hours:	5
Year: 2 Semester: 2	Pre-requisite:	Theoretical:	2 hour/week
		Practical:	3 hours /week
General Objectives			
<ol style="list-style-type: none">1. Understand the molecular organization of the living cell and its topochemistry2. Understand the importance of water and the concepts of pH and buffers3. Understand the properties, sources, uses and structure of carbohydrates4. Understand the properties, structures and reactions of monosaccharides5. Understand the structures and uses of disaccharides and polysaccharides6. Understand nature, biological and industrial importance of lipids7. Understand the structure, properties and functions of proteins8. Understand the classification of amino acids9. Understand the structure and behaviour of Proteins10. Understand the nature of enzymes11. Understand vitamins and minerals found in the Living cell			

Theoretical Content				Practical Content		
Week/s	Specific Learning Outcomes	Teacher's activities	Resources	Specific Learning Outcomes	Teacher's activities	Resources
General Objective 1.0: Understand the molecular organization of the living cell and its topochemistry						
1	<p>1.1 On completion of this course, the student should be able to:</p> <p>Molecular Organisation of the living cells</p> <p>1.1 List cell organelles</p> <p>1.2 Explain centrifugation</p> <p>1.3 Explain the structure, functions and fractions of intracellular organelles.</p> <p>1.4 Describe chemical composition of the (i.e. carbohydrate, protein, lipids, DNA, RNA nucleoproteins etc.)</p>	Lectures	Classroom	Centrifugation of fractions.	Demonstrate practical on cell fractionation	Black Board Centrifuge a. experimental animal b. .Dissecting set c. .Homogeniser d...Glassewares.
General Objective 2.0: Understand the importance of water and the concepts of pH and buffers						
2	<p>2.1 Explain the importance of water as a major cellular component.</p> <p>2.2 List the properties of water which makes it suitable as the liquid of living systems.</p> <p>2.3 List the common laboratory and physiological buffer systems with their components.</p> <p>2.4 Explain how the buffers above function to resist pH changes particularly in physiological systems.</p>	Lecture	Blackboard	<p>Choose the appropriate acid and its salts (base and its salt) for a buffer system at a given pH from a list of weak acids/bases.</p> <p>Measure the pH of systems using lovibond comparator or pH meter.</p>	<p>Demonstrate the use of the pH metre.</p> <p>Conduct practicals on the measurement of pH of solutions</p>	Lovibond comparator Indicator papers pH metre Indicator solutions. Glassware's/Tiles

Theoretical Content				Practical Content		
Week/s	Specific Learning Outcomes	Teacher's activities	Resources	Specific Learning Outcomes	Teacher's activities	Resources
General Objective 3.0: Understand the properties, sources, uses and structure of carbohydrates						
3	<p>Carbohydrates</p> <p>3.1 Explain carbohydrates as polyhydroxyketones of polyhydroxyaldehydes and their derivatives.</p> <p>3.2 List the general properties of carbohydrates.</p> <p>3.3 Explain the general properties of carbohydrates.</p> <p>3.4 List common sources of carbohydrates.</p> <p>3.5 List domestic and industrial uses of carbohydrates</p> <p>3.6 Classify carbohydrates as mono-di-oligo and polysaccharides.</p> <p>3.7 Draw structural formula of named examples of the families in 3.5 above.</p>	Lecture	Blackboard	Test for carbohydrates in the laboratory by e.g. methyl test, Fehling's etc.	Conduct practical test for carbohydrates	Glasswares Reagents such as molisch, Fehling's etc.
General Objective 4.0: Understand the properties, structures and reactions of monosaccharides						
4	<p>4.1 Name monosaccharides systematically according to the number of carbon atoms in the molecule.</p> <p>4.2 Explain the concepts of stereoisomerism, optical isomerism and the property of optical activity.</p> <p>4.3 Distinguish between epimers, stereoisomers and optical isomers</p>	Lectures	Blackboard	Measure experimentally optical activity in sugars using polarimeter.	Conduct practical measurement	Glasswares Polarimeter Reagent such as Bial's, Benedict's etc

Theoretical Content				Practical Content		
Week/s	Specific Learning Outcomes	Teacher's activities	Resources	Specific Learning Outcomes	Teacher's activities	Resources
	<p>4.4 List examples of other biochemical substances that relate the plane of polarized light.</p> <p>4.5 Distinguish between Dextrorotary (+) and laevorotatory() compounds on one hand and D and L structure on the other hand.</p>					
	<p>4.6 Explain the formation of pyranoses and furanoses by monosaccharides.</p> <p>4.7 Draw ring formula to represent glucose, fructose, ribose and ribulose.</p> <p>4.8 Define mutarotation</p> <p>4.9 Draw structures to differentiate between anomers of named aldoses and ketoses.</p> <p>4.10 Outline the general reactions of monosaccharides due to OH and C=O functional groups.</p> <p>4.11 Outline methods for estimating reducing sugars</p>	Lectures	Blackboard	Carry out chemical tests to identify reducing sugars		
General Objective 5.0: Understand the structures and uses of disaccharides and Polysacchs						
5	<p>5.1 Define glycosidic linkage.</p> <p>5.2 Write equation for the formation of glycosidic linkage.</p> <p>5.3 List the different types of glycosidic linkages.</p> <p>5.4 State the sources of some common</p>	<p>Lecture</p> <p>Conduct practical grade reports on reducing and non-reducing starch and glycogen</p>	<p>Blackboard</p> <p>Glassware burners</p> <p>Water bath</p>	hydrolyse a non-reducing disaccharide to give reducing monosaccharide and test for their presence		

Theoretical Content				Practical Content		
Week/s	Specific Learning Outcomes	Teacher's activities	Resources	Specific Learning Outcomes	Teacher's activities	Resources
	<p>disaccharides.</p> <p>5.5 Draw the structures of disaccharides in 3.26 above.</p> <p>5.6 Distinguish between reducing and non reducing disaccharides.</p> <p>5.7 State the biological and industrial importance of disaccharides.</p> <p>5.8 List the common polysaccharides and their sources.</p> <p>5.9 List the monomers of polysaccharides.</p> <p>5.10 State the types of glycosidic linkages in Polysaccharides.</p> <p>5.11 Draw in the outline, the pattern and arrangement of the sub-units in the following:</p>					
	<p>i) amylose ii) amylopectin iii) glycogen iv) cellulose</p> <p>5.12 State the biological and industrial importance of polysaccharides.</p>	Lectures with charts.		Distinguish between starch and glycogen.	Practical identification	Glasswares
General Objective 6.0: Understand nature, biological and industrial importance of lipids						
6	<p>Lipids</p> <p>6.1 Define lipids as fats and fat like substance.</p>	Lecture	Classroom	Test for fats in the laboratory e.g. by solubility test.	Assist students to carry out laboratory assignment.	<p>Glasswares</p> <p>Bunsin burner</p>

Theoretical Content				Practical Content		
Week/s	Specific Learning Outcomes	Teacher's activities	Resources	Specific Learning Outcomes	Teacher's activities	Resources
	<p>6.2 Define fat as mono-di- and tri - carboxylic esters of glycerides e.g. monoglycerides, diglycerides and triglycerides.</p> <p>6.3 List natural sources of fats.</p> <p>6.4 Classify lipids into simple and complex lipids.</p> <p>6.5 List members of classes in 6.5 above.</p> <p>6.6 Draw structures of named saturated and unsaturated fatty acids most abundant in acylglycerols.</p> <p>6.7 Explain why fatty acids obtained from lipids are almost always even numbered carbon atoms.</p> <p>6.8 Distinguish between essential and non-essential fatty acids.</p> <p>6.9 Write the general chemical structure of mono-di- and triacylglycerols.</p> <p>6.10 Write the general chemical structure of a named triacylglycerols.</p> <p>6.11 Write the structure of mono-di-and triacylglycerols.</p> <p>6.12 State physical properties and uses of triglycerides</p>			<p>Practical test for fats</p> <p>Carry out simple chemical tests for triacylglycerides</p>		<p>Water bath</p> <p>Saturated and unsaturated fat</p> <p>Liquid and solid fats.</p>

Theoretical Content				Practical Content		
Week/s	Specific Learning Outcomes	Teacher's activities	Resources	Specific Learning Outcomes	Teacher's activities	Resources
7	<p>6.13 Describe with equation the hydrolysis of triglycerides.</p> <p>6.14 Describe the hydrolysis of triacylglycerols with alkali to yield a mixture of soap and glycerol - (saponification)</p> <p>6.15 Define saponification number, iodine number and free fatty acids (FFA) value of fats and oils (acylglycerols)</p> <p>6.16 Explain the significance of the value of listed in 4.16 above.</p> <p>6.17 Explain the hardening of oils.</p> <p>6.18 Relate 18 to commercial production of fats as margarine.</p> <p>6.19 Draw the structural formula of phosphatidic acid.</p> <p>6.20 Explain that phosphatidic acid is the parent compound to phosphoglycerides</p> <p>6.21 Draw structural formula of the following glycerophosphatides:</p> <p>(a) Phosphatidylethanolamine (b) Phosphatidylcholine (c) Phosphatidylserine (d) Phosphatidylglycerol</p>	Lecture	Blackboard			

Theoretical Content				Practical Content		
Week/s	Specific Learning Outcomes	Teacher's activities	Resources	Specific Learning Outcomes	Teacher's activities	Resources
	<p>6.22 List other important glycerophosphatides.</p> <p>6.23 State the cellular location or sources of glycerophosphatides.</p> <p>6.24 Explain the significance of the variations in the size, shape, polarity and electric charge of the polar heads of glycerophosphatides.</p> <p>6.25 Enumerate the functions of glycerophosphatides in the living systems and their roles in food and chemical industries.</p>					
	<p>6.27. List the products of hydrolysis of glycerophosphatides by:</p> <p>a) alkaline b) acid and c) Enzymes</p>					
General Objective 7.0: Understand the structure, properties and functions of proteins						
8	<p>Proteins</p> <p>7.1 Classify proteins as globular or fibrous.</p> <p>7.2 List natural courses of proteins</p> <p>7.3 State the characteristics properties of the classes in 5.1 above.</p> <p>7.4 Explain with examples the role of different proteins in the functioning of living matter e.g. transport, structural catalytic, regulatory defence etc.</p> <p>7.5 Define prosthetic group as a non-protein</p>	Lecture	Blackboard	<p>Identify proteins in the laboratory</p> <p>Isolate albumin from egg white by size exclusion chromatography</p> <p>Denature the albumin purified above and conserve its precipitation from solution</p>	Practical identification of protein	<p>Protein sample,:</p> <p>Millon's reagent</p> <p>Biuret reagent tiles. dropers.</p> <p>Glassware</p> <p>Colorimeter or</p> <p>Spectrophotometer</p> <p>Water bath</p>

Theoretical Content				Practical Content		
Week/s	Specific Learning Outcomes	Teacher's activities	Resources	Specific Learning Outcomes	Teacher's activities	Resources
	<p>moiety of a complex protein.</p> <p>7.6 Describe proteins in terms of their prosthetic groups e.g. hemoproteins, glycoproteins, lipoproteins etc.</p> <p>7.7 Describe the structure of a protein as a chain of amino acids which are chemically linked together by chemical bonds between carboxyl alpha amino groups on amino acids (Co-NH)</p> <p>7.8 Draw the general structural formular for alpha amino</p>					
General Objective 8.0: Understand the Classification of Amino Acids and their structures						
	<p>8.1 Classify amino acids on the basis of the chemical nature of the side groups.</p> <p>8.2 Describe the hydrolysis of protein to give amino acids as their final product.</p> <p>8.3 Place given structural formula of any amino acid in the correct class as in 5.11 above.</p> <p>8.4 Explain D and L isomers within the amino acids.</p> <p>8.5 Explain the amphoterism of amino acids.</p> <p>8.6 Write equations to show the ionization of a named amino acid in solutions.</p> <p>8.7 Interpret a given titration curve for a given</p>			<p>Identify amino acid generally and specifically.</p> <p>Amino acid standards and test samples, Ninhydrin.</p>		<p>Amino acid analyzer chromatographic tanks</p> <p>Glass plate and chromatographic clumns</p>

Theoretical Content				Practical Content		
Week/s	Specific Learning Outcomes	Teacher's activities	Resources	Specific Learning Outcomes	Teacher's activities	Resources
	<p>amino acid</p> <p>8.8 Define the term isoelectric point.</p> <p>8.9 Determine the isoelectric point from a given titration curve.</p> <p>8.10 State the solubility of an amino acid on either side of the isoelectric point.</p> <p>8.11 Explain why proteins are precipitated at their isoelectric points.</p> <p>8.12 Explain the application of 5.18 above in the separation of amino acids.</p> <p>8.13 Explain the general reactions of amino acids due to (a) NH₂ group and (b) -COOH group.</p> <p>8.14 Describe the specific reactions of amino acids due to the side groups.</p> <p>8.15 Explain that peptides are formed by condensation of amino acids and hydrolysis of proteins.</p> <p>8.16 Write an equation to show the formation of dipeptide.</p>					
General Objective 9.0: Understand the structure and behaviour of Proteins						
10	<p>9.1 Explain the primary, secondary, tertiary and quaternary structure of proteins.</p> <p>9.2 List the types of interactions involved in:-</p>	Lecture	Blackboard	precipitate a protein from solution at its IEP and show that at other pH values it remains in solution		

Theoretical Content				Practical Content		
Week/s	Specific Learning Outcomes	Teacher's activities	Resources	Specific Learning Outcomes	Teacher's activities	Resources
	<p>a) Secondary b) Tertiary and c) Quaternary structures of proteins.</p> <p>9.3 List examples to illustrate the structural organization in 5.27 above.</p> <p>9.4 Describe denaturation of proteins with examples.</p> <p>9.5 Explain that the denaturation is the result of an unfolding of the natural structure of the protein molecule and may or may not be reversible.</p> <p>9.6 Explain why proteins are precipitated at their isoelectric point.</p>					
General Objective 10.0: Understand the nature of enzymes						
11-13	<p>Enzymes</p> <p>10.1 Define enzymes as proteins specialized to catalyse biological reactions at a rapid rate within a narrow range of temperature and pH.</p> <p>10.2 Define substrate as the substance on which the enzyme acts.</p> <p>10.3 Define active site as that region of the enzyme molecule where substrate transformation occurs.</p> <p>10.4 Explain the distinctive features of enzymes i.e. specificity, high catalytic rate and</p>	Lecture	Blackboard	Investigate the rate of a catalysed reaction (catalase and H ₂ O ₂) at different concentrations of substrate and at different pH and temperatures		yeast as source of catalase, hydrogen peroxide burette for measuring gas production stop clock glassware etc

Theoretical Content				Practical Content		
Week/s	Specific Learning Outcomes	Teacher's activities	Resources	Specific Learning Outcomes	Teacher's activities	Resources
	<p>directive effect.</p> <p>10.5 Illustrate with examples the distinctive features in 6.4 above.</p> <p>10.6 Classify enzymes as oxido-reductases, Transfeases, Hydrolases, Lyases, isomerases and ligases.</p> <p>10.7 List examples of enzymes belonging to each the classes in 6.6 above</p>					
14	<p>10.8 Explain that many enzymes require metal ions and/or organic molecules which act as cofactors.</p> <p>10.9 Explain that the efficiency of enzyme action is dependent on such factors as pH, temperature, substrate concentration, ionic environment activators and inhibitors.</p> <p>10.10 Draw profiles to show the effect of pH, temperature and substrate concentration on the rate of enzyme activity</p> <p>10.11 Define the terms optimums pH and optimum temperature.</p>	Lecture	Classroom	<p>Determine the effect of pH of the velocity of enzyme catalyses reaction.</p> <p>Determine the effect of temperature on the velocity of enzyme catalysed reaction.</p>	Explain each of the experimental steps	
General Objective 11.0: Understand vitamins and minerals found in the Living cell						
15	<p>Vitamins</p> <p>11.1 Explain the importance of vitamin supplements</p> <p>11.2 Define the water soluble vitamins</p> <p>11.3 Explain the general functions of water</p>	Lecture with charts and drawing	Overhead projector	Determination of Ascorbic acid using titration\colorimetric method.	Assist students to carry out the experiment.	Ascorbic acid standard, Burette, Colorimeter and accessories.

Theoretical Content				Practical Content		
Week/s	Specific Learning Outcomes	Teacher's activities	Resources	Specific Learning Outcomes	Teacher's activities	Resources
	soluble vitamins. 11.4 List the deficiency diseases. 11.5 Define fat soluble vitamins 11.6 Explain the general functions and the deficiency diseases of fat soluble vitamins.					

Assessment:

Coursework/ Assignments 10%; Practical 40%; Examination 50%

Recommended Textbooks & References:

Biochemistry by Stryer, published by Freeman

Salters Advanced Chemistry Activities and Assessment Pack published by Heinemann

Course: Maintenance and Repair of Science and Electronic Equipment

Department/ Programme: SLT (National Diploma)			
Course: Maintenance and Repair of Science and Electronic Equipment	Course Code: STP 221	Credit Hours: 4	
Year: 2 Semester: 2	Pre-requisite: Electronics	Theoretical:	hours/week 1 hours
		Practical:	hours /week 3 hours
General Objectives			
On completion of this module, students should be able to			
1. Understand the concept of maintenance			
2. Identify the basic tools and instruments used in maintenance and repairs of science and electronic equipment.			
3. Identify some electronic components and know their specifications			
4. Understand soldering techniques			
5. Understand circuit layout on chassis			
6. Understand troubleshooting and fault isolation in science and electronic equipment			

Theoretical Content				Practical Content		
Week/s	Specific Learning Outcomes	Teacher's activities	Resources	Specific Learning Outcomes	Teacher's activities	Resources
General Objective 1: Understand the concept maintenance						
1-2	1.1 Define maintenance 1.2 State the different types of maintenance 1.3 List procedures involved in carrying out maintenance 1.4 State when to carryout each of the types of maintenance.	Lecture .Mention the two types of maintenance i Correctives and ii Preventive maintenance	Classroom Resources	Carryout preventive maintenance on some selected science and electronic equipment	Demonstrate how to carry out preventive maintenance on some selected equipment in the laboratory	Selected equipment, maintenance tools.
	1.5 Distinguish between equipment and operator failure 1.6 Explain "down time" and the causes of down time 1.7 Explain over head, check an malfunction	Lecture with examples				
General Objective 2: identify the basic serving tools and instrument used in maintenance and repairs of science and electronic equipment						
3	Know some basic servicing tools an instruments and explain the use of each of them	List the basic servicing tools and instrument as multimeter, oscilloscope, soldering iron and soldering lead, screw driver and spanner, allen keys, methylated spirit etc and explain the use of them.	Lecture	Demonstrate the correct ways of using given tools and equipment as in column two.	Demonstrate the use tools and listed instrument in column two.	Maintenance tools
Objective 3: Identify components and know their specifications						
4	Identify components and know their specifications	Show the students some electronic components and identify them. Draw the symbols for each and direct them on how to obtain information on the components from databook	Classroom resources and databook	Allow the students to obtain information on some electronic components using data book	Allow students to obtain information on some electronic components using data book	Electronic components

Theoretical Content				Practical Content		
Week/s	Specific Learning Outcomes	Teacher's activities	Resources	Specific Learning Outcomes	Teacher's activities	Resources
6	Use colour codes to obtain the resistance values of resistors	Explain to the students how to use colour codes to obtain resistance values of different resistors	Resistors of different values	Identify resistors using their colour codes	Make available resistors of different values and allow students to obtain their values using the colour codes	Resistors of different values
7	Understand the use of instruments e.g. multimeter to know the conditions of components			Use of instruments e.g. multimeter to know the conditions of components	Make available some electronic components and allow students to use appropriate instruments to know the condition of the components	Measuring Instruments e.g. multimeter, oscilloscope
General Objective 4: understand soldering techniques						
8	4.1 Describe soldering and de-soldering techniques 4.2 List all the precautions to be taken before and when i. Soldering ii. De soldering	Lecture	Classroom resources	Carry out basic soldering practice	Demonstrate some basic soldering and de-soldering technique	Copper wire, soldering iron, soldering lead, connecting wires
9	4.2 Select appropriate soldering lead and soldering iron 4.3 Distinguish between good and dry joint.	Lecture		Carry out basic soldering practice	Group the students and allow each group to carry out some basic soldering and de-soldering techniques. Supervise and grade	Copper wires soldering iron and soldering lead.
General Objectives: 5 Understand the layout of components on chassis						
10	5.1 List the different types of boards 5.2 Interpret and explain circuit diagrams			Identify different types of boards	Show the students different types of board e.g. Veroboard bread board etc	Veroboard bread board etc
				Layout components on a veroboard from a given circuit	Let the students use the circuit diagrams for Single stage	Circuit diagrams of single stage amplifier regulated power supply unit etc

Theoretical Content				Practical Content		
Week/s	Specific Learning Outcomes	Teacher's activities	Resources	Specific Learning Outcomes	Teacher's activities	Resources
				diagram.	amplifier, power supply unit etc to layout components on veroboard.	
General Objective 6: Understand troubleshooting and fault isolation in science and electronic equipment						
11	6.1 Explain the two general methods of fault-finding	State and explain the two general methods of fault-finding: i. Static testing [point to point testing] ii. Dynamic testing [signal testing]	Classroom resources	Carryout point to point testing on some equipment	Group the students and let them carry out point to point testing on some equipment. Supervise the students closely	Testing instrument/ equipment e.g. power supply unit, signal generator etc.
12				Carryout out dynamic testing using injectors on equipments.	Group the student and let them carry out dynamic testing .Supervise the students closely.	Testing instrument/ equipment e.g. power supply units, signal generator etc.
13				Trace and rectify faults in equipment	Introduce faults into some equipment and allow students to trace the fault and rectify it.	Various testing equipment, soldering iron ,soldering lead, components for the regulated power supply and single stage amplifier and their respective circuit diagrams
14-15				construct a regulated power supply unit, single stage amplifier etc.	Student should be made to construct a regulated power supply unit, single stage amplifier etc. The above should be graded	

Assessment: Give details of assignment to be used:

Course Work/Assignment 15 %, Course Test 15 %, Practical 40 %, Examination 30 %

Recommended Textbooks and References:

Course Journal on Maintenance Workshop, No. 1984, NBTE

Simple equipment maintenance by Brown and Lewis Harcourt

Course: GLT, Module (vii) Vacuum Techniques, and Module (viii) Glassblowing

Department/ Programme:			
Course: GLT, Module (vii) Vacuum Techniques, and Module (viii) Glassblowing		Course Code: GLT 222	Credit Hours: 2
Year: Semester:		Pre-requisite:	Theoretical: 1 hours/week Practical: 1 hours /week
General Objectives <ol style="list-style-type: none">1. Know the principle of vacuum production.2. Know common types of vacuum pumps3. Know the use of vacuum gauges4. Know the different types of glasses used as laboratory ware5. Know glass hazards and precautions6. Know the construction of simple glass ware			

Theoretical Content				Practical Content		
Week/s	Specific Learning Outcomes	Teacher's activities	Resources	Specific Learning Outcomes	Teacher's activities	Resources
General Objective 1: Know the principle of Vacuum Production.						
1-3	1.1 Classify vacuum pressure gauges e.g. low, medium high and ultra high. 1.2 Explain the classification of 1.1 above. 1.3 List and explain the units in vacuum technology e.g. the torr; the mmHg; the micron, the Newton; the pascal; etc. 1.4 Explain the effects of temperature on the relationship between pressure (P) and the number of molecules (M) within a giving vacuum system. 1.5 List the various component of a simple vacuum set-up. 1.6 Explain the sequence of operation of a simple vacuum system.	Lecture Show gauges to students Lecture Lecture	Vacuum pressure gauge	Operate a simple vacuum system.	Lecture and demonstration Get students involved in the operation of vacuum systems.	Vacuum pump
General Objective 2: Know common types of vacuum pumps						
4	2.1 List common types of vacuum pumps: rotary and diffusion pumps. 2.2 Describe the application of each of the pumps in 2.1 above.	Lecture Emphasize areas of application of pumps.	Rotary pump Diffusion pump	Operate the pumps in 2.2	Lecture and practical. Ensure that each student has access to and operate a pump	Rotary pump
General Objective 3: Know the use of vacuum gauges						
5	3.1 List and describe common gauges e.g. McLeod gauge; the vacustat; the pirani gauge; cold and hot ionization gauges and U-tube mano meters. 3.2 Explain the principle of operation of the gauges in 3.1 above.	Lecture . Show students some of the gauges listed.	McLeod gauge Vacustat Pirani gauge U-tube manometer	Demonstrate the use of the gauges in 3.1 above.	Demonstration Ensure that each student has access to the gauges.	McLeod gauge Vacustat Pirani gauge U-tube manometer

Theoretical Content				Practical Content		
Week/s	Specific Learning Outcomes	Teacher's activities	Resources	Specific Learning Outcomes	Teacher's activities	Resources
6 - 7	3.3 Explain the care and handling of the gauges in 3.1 3.4 Explain leak detection e.g. by the use of High Frequency tester (Test coil).	Lecture Get students involved in the care and handling of gauges. Use leak detectors for the explanation. Lecture	- do - Test-coil	Detect vacuum leaks using leak detectors.	Demonstrate the use of vacuum leak detectors	Test-coil
General Objective 4: Know the different types of glasses used as laboratory wares						
8	4.1 List types of glasses suitable for laboratory glass wares e.g. borosilicate, soda lime (soda glass), silica glass 4.2 State properties of glasses in 4.1 above e.g. transparency and durability etc.	Lecture and demonstration Teacher brings samples to class to show students. Teacher uses the samples brought to class to explain. Passes samples round the class.	Soda glass, Borosilicate and silica glass.	Identify types of glass by chemical and physical methods.	Lecture and practical demonstration with soda and borosilicate with rods.	Hot plate phenolphthalein Trichloroethylene Beaker soda/pyrex.
General Objective 5: Know glass hazards and precautions						
9	5.1 List hazards associated with gas e.g. explosion, toxicity, fire etc. 5.2 Enumerate safety measures adopted in glass blowing e.g. use of didymium goggles and handling gloves etc.	Lecture Teacher tabulates hazards and corresponding solutions. Taken students round standard glass workshop installation. Lecture Teacher shows students samples of didymium goggles and demonstration how to wear. Encourages students to view glasswork with the goggles and compare with bare eyes.	Didymium goggles Handling gloves Goggles safety spectacles			

Theoretical Content				Practical Content		
Week/s	Specific Learning Outcomes	Teacher's activities	Resources	Specific Learning Outcomes	Teacher's activities	Resources
General Objective 6: Know the construction of simple glass wares						
10 - 15	<p>6.1 Identify various tools and equipment used in glass blowing workshops.</p> <p>6.2 Describe and apply glass cutting techniques.</p> <p>6.3 Describe and apply various methods of glass manipulation e.g. simple point pulling.</p>	<p>Lecture and practical demonstration.</p> <p>Teacher parades a number of these tools. Teacher asks students to tabulate tools draw and label, and indicate uses.</p>	<p>Glass cutting knife Calliper gauges Three way fuel gas filling top Glass inspection polarizer Cork borer set. Cork borer set. Rotary air blower e.g. compressors types EB 3B Tweezers Glass blowing hanging tools (cones) Glass blowing tapers 13x13mm. Diamond glass cutter Bunsen burner for annealing Oxygen/air/gas burners Wooden corks (Assorted)</p>	<p>Join two glass tubes.</p> <p>Blow bulbs at the end and in the middle of tubes.</p> <p>Construct T.Y joints</p> <p>Construct U bends</p> <p>Construct simple glass wares e.g. pipettes, burettes, and test tube.</p> <p>Calibrate the glass ware.</p> <p>Anneal glass apparatus after construction.</p>	<p>Lecture and practical demonstration.</p> <p>Teacher demonstration and construction of bulbs bands and joints T, Yate. Lecture practicals demonstration as above. Teacher asks students to do the constructions in turns. Teacher goes round encouraging.</p>	See column 3.

Assessment:
Practical 100%

Recommended Textbooks & References:

Course: Practical Project and Seminar

Department/ Programme: National Diploma			
Course: Practical Project and Seminar	Course Code: STS 221	Credit Hours:	8
Year: Semester:	Pre-requisite:	Theoretical:	1 hours/week
		Practical:	7 hours /week

General Objectives

Students should be able to:

1. Select, with the help of lecturers, a laboratory based topic for investigation.
2. Decide, with the help of a lecturer, on an experimental investigation in that area.
3. Carry out a literature review of the topic, paying particular attention to the area selected for investigation.
4. Prepare a seminar on the proposed investigation
5. Give the seminar and defend the proposed investigation when questioned by the participants in the Seminar
6. Perform, under the supervision of lecturing staff, the experimental investigation over the course of the academic year.
7. Write a full project report in scientific format consisting of: (i) A free standing Abstract, (ii) Introduction, (iii) Methods (or Experimental), (iv) Results, (iii) Discussion, (iv) References.
8. Prepare a seminar on the investigation, the results found and the conclusions drawn.
9. Give the seminar and defend the investigation when questioned by the participants in the Seminar

Theoretical Content				Practical Content		
Week/s	Specific Learning Outcomes	Teacher's activities	Resources	Specific Learning Outcomes	Teacher's activities	Resources
General Objective 1 Select, with the help of lecturers, a laboratory based topic for investigation						
1	Students are able to 1. Understand the process of carrying out a research project and seminar. 2. Explain the characteristics of a good project/research investigation 3. List the different components of a research/project work 4. List the factors considered in selecting a project/research problems 5. Select a topic for investigation	Explain the process by using the general objectives 1-9 above. Provide a list of proposed investigations and help students choose one.	Cooperation of all lecturers, list of topics, classroom resources			
General Objective 2: Decide, with the help of a lecturer, on an experimental investigation in that area						
2	With help from the lecturer students: 1. Understand the topic and areas suitable for experimental investigation. 2. Select the area of the topic and design experiments for the investigation	Discuss the topic and areas for investigation design experiments for the student	Expertise of the Lecturer Desk chairs paper and pen or pencil			
General Objective 3: Carry out a literature review of the topic, paying particular attention to the area selected for investigation						
3	1. Read relevant books and papers Make relevant notes Understand how the proposed investigation complements the existing literature	Check that students understand relationship between existing knowledge and the proposed investigation	Quiet areas for talking			

Theoretical Content				Practical Content		
Week/s	Specific Learning Outcomes	Teacher's activities	Resources	Specific Learning Outcomes	Teacher's activities	Resources
General Objective 4: Prepare a Seminar on the proposed investigation						
4	1. Students understand how to prepare for presenting a seminar. 2. Students prepare for the seminar	Revise how to prepare a seminar (refer to the Technical English course) and Guide students through their preparation	Classroom and Library	Students begin relevant experiments e.g. analysis, synthesis, measurement, observations, data collection etc		Laboratory resources, glassware, chemicals, meters, instruments spectrometers etc
General Objective 5: Give the seminar and defend the proposed investigation when questioned by the participants in the Seminar						
5	Student gives a seminar on the proposed topic Student answers questions from the audience Student adjusts proposed project in light of comments made during the seminar	Attend seminar, ask questions designed to challenge and improve project, note helpful comments from the audience	Seminar room Overhead projector and acetates	Students continue relevant experiments e.g. analysis, synthesis, measurement, observations, data collection etc		Laboratory resources, glassware, chemicals, meters, instruments spectrometers etc
General Objective 6: Perform, under the supervision of lecturing staff, the experimental investigation over the course of the Semester						
6 - 12	1. Students can work under GLP conditions, keeping notebook and writing up experiments in a second lab notebook (both notebooks hard bound) 2. Students begin to draft their report beginning with the Introduction then methods then results and, at a late stage their conclusions	Advise and Guide students Make sure students are writing up as they go along and begin to write the final report at about week 7.		Students continue experiments and data collection	Guide and supervise students. Review results regularly making sure that students understand them and draw appropriate conclusions.	Laboratory resources, glassware, chemicals, meters, instruments spectrometers etc
General Objective 7: Write a full project report in scientific format consisting of: (i) A <u>free standing</u> Abstract, (ii) Introduction, (iii) Methods (or Experimental), (iv) Results, (iii) Discussion, (iv) References						
13	1. Students complete and submit a full project report in the layout of a Scientific report. 2. Students Write an Abstract that stands alone and does not refer to	Revise how to prepare a seminar (refer to the Technical English course) and Guide students through their preparation				

Theoretical Content				Practical Content		
Week/s	Specific Learning Outcomes	Teacher's activities	Resources	Specific Learning Outcomes	Teacher's activities	Resources
	the body of the report 3. Students the report consists of an Introduction, Methods (or Experimental), Results, Discussion and References. (The Results and Discussion may be combined as Results and Discussion).					
General Objective 8. Prepare a seminar on the investigation, the results found and the conclusions drawn.						
14	1. Students understand how to prepare for presenting a seminar. 2. Students prepare for the seminar	Revise how to prepare a seminar (refer to the Technical English course) and Guide students through their preparation				
General Objective 9 Give the seminar and defend the investigation when questioned by the participants in the Seminar						
15	1. Student gives a seminar on the proposed topic 2. Student answers questions from the audience	Attend seminar, ask questions	Seminar Room, overhead projector and acetates			

Assessment: Give details of assignments to be used:
Seminars 20%; Practical 40 %; Final Report 40%;

Recommended Textbooks & References: Scientific Journals (particularly reviews)

Course: Small Business Management I

Programme: Statistics (National Diploma)			
Course: Small Business Management I	Course Code: STA 225	Total Hours:	2
Year: 2 Semester: 4	Pre-requisite:	Theoretical:	1 hour /week
		Practical:	1 hour /week
Goal: This course is designed to provide the student with the basic knowledge on the various tools used in the management of small-scale businesses.			
General Objectives: On completion of this course, the diplomate will be able to:			
<ol style="list-style-type: none">1. Understand the nature of small-scale enterprises.2. Understand the legal framework for small-scale enterprises.3. Understand the role of governments in small-scale enterprises in Nigeria4. Understand a business plan for a small-scale business enterprise.5. Understand marketing management in a small business enterprise6. Understand the general concept of production management7. Know human capital needs for an enterprise			

Theoretical Content				Practical Content		
Week	Specific Learning Outcomes	Teacher's activities	Resources	Specific Learning Outcomes	Teacher's activities	Resources
General Objective 1 (STA 225): Understand the nature of small-scale enterprises.						
1	1.1 Define the range and scope of a small business. 1.2 Explain the importance of a small business. 1.3 Describe the problems associated with small business operations.	Explain range, scope and importance of a small scale business. Explain problems associated with small business operations.	Text Books Journals Publications	Select a small business enterprise and indicate its signs of success and failures. Use case studies based on a local organisation.	Guide students in identifying range, scope and importance of a small scale business.	Internet and relevant websites Guest speaker on small businesses
2	1.4 Describe types of businesses that could be run on a small scale. 1.5 Describe the merits and demerits of being self-employed 1.6 Identify the starting problems and signs of failure of a small business	Explain types of businesses that could be run on small scale, their associated problems and signs of failure during operations. Explain wage employment and self employment. Explain the merits and demerits of self employment.	Text Books Journals Publications	Select a small business enterprise and indicate its signs of success and failures. Use case studies based on a local organisation.	Guide students in identifying types of businesses that could be run on small scale, their associated problems and signs of failure during operations.	Internet and relevant websites Guest speaker on small businesses
General Objective 2 (STA 226): Understand the legal framework for small-scale enterprises.						
3	2.1 Explain the types of business organization. 2.2 Identify the legal form of business.	Explain the types of business organization Explain legal formation and regulatory status of small business. Explain environmental factors of business.	Text Books Journals Publications	Use CAMB to explain the regulatory frame work of small business. Group work to set up a small business - realistic scenarios Use of relevant documentation taken from the internet.	Guide students to identify the legal formation and regulatory status of small business.	Internet and relevant websites

Theoretical Content				Practical Content		
Week	Specific Learning Outcomes	Teacher's activities	Resources	Specific Learning Outcomes	Teacher's activities	Resources
4	<p>2.3 Describe the environmental factors of business - law of sales, licenses, failure signs, etc.</p> <p>2.4 Explain regulatory status and formation of small business.</p>	<p>Explain legal formation and regulatory status of small business.</p> <p>Explain environmental factors of business.</p>	<p>Text Books</p> <p>Journals</p> <p>Publications</p>	<p>Use CAMB to explain the regulatory frame work of small business.</p> <p>Group work to set up a small business - realistic scenarios</p> <p>Use of relevant documentation taken from the internet.</p>	<p>Guide students to identify the environmental factors of business.</p>	<p>Internet and relevant websites</p>
General Objective 3 (STA 226): Understand the role of governments in small-scale enterprises in Nigeria						
5	<p>3.1 Explain government policies for small enterprises development.</p> <p>3.2 Explain the effects of government policies on direct and indirect assistance to small businesses</p>	<p>Explain government policies for small enterprises development and effects of the policies on direct and indirect assistance to these enterprises.</p>	<p>Text Books</p> <p>Journals</p> <p>Publications</p>	<p>Identify government policies and their effects on small scale business.</p>	<p>Guide students to evaluate the contributions of the promoting bodies (IDC, NASA, NERFUND, NDE, NAPEP etc to growth of small business in Nigeria.</p>	<p>Internet and relevant websites</p>
6	<p>3.3 State the role of the following institutions in promoting small enterprises</p> <p>(a) Industrial Development Centre (IDC)</p> <p>(b) State Ministries of Commerce and Industries.</p> <p>(c) State Export Promotion Committees.</p> <p>(d) Centre for Management Development (CMD)</p> <p>(e) National Directorate of Employment (NDE)</p> <p>(f) NAPPEP</p> <p>(g) CIRD</p> <p>(h) NERFUND</p> <p>(i) NACRDB, NEPC</p> <p>(j) NASSI, NASME, etc</p>	<p>Explain the following institutions and their roles in promoting small scale enterprises.</p> <p>- IDC, State Ministries of Commerce, State Export Promotion Committees, CMD, NDE, NAPPEP, CIRD NERFUND NACRDB, NEPC NASSI, NASME, etc</p>	<p>Text Books</p> <p>Journals</p> <p>Publications</p>	<p>Identify and explain beneficiaries of the bodies. Promotion SME in Nigeria.</p>	<p>Guide students to evaluate the contributions of the promoting bodies (IDC, NASA, NERFUND, NDE, NAPEP etc to growth of small business in Nigeria.</p>	<p>Internet and relevant websites</p>

Theoretical Content				Practical Content		
Week	Specific Learning Outcomes	Teacher's activities	Resources	Specific Learning Outcomes	Teacher's activities	Resources
General Objective 4 (STA 226): Understand a business plan for a small-scale business enterprise.						
7	4.1 Explain business plan. 4.2 Explain the purpose of business plan 4.3 Identify the components of a business plan from project development up to project cost.	Explain business Plan, its purpose and components from project development to project cost.	Text Books Journals Publications	Identify business plan. Identify how to plan in small business. Formulate a business plan for a particular project.	Guide students to:- Work in pairs to develop a relevant business plan. Refer to business planning information on the internet Present the plans and justify the goals	Internet and relevant websites
8	4.4 State the necessary steps in carrying out financial analysis and planning for a small business 4.5 Compare personal goal and business goals. 4.6 Identify influences of family goals in business goals	Explain steps in carrying out financial analysis and planning for a small business. Explain personal goals and business goals. Explain influences of family goals an business goals. Invite a successful entrepreneur to give a talk.	Text Books Journals Publications	Identify business plan. Identify how to plan in small business. Formulate a business plan for a particular project.	Guide students to:- Work in pairs to develop a relevant business plan. Refer to business planning information on the internet Present the plans and justify the goals	Internet and relevant websites
General Objective 5 (STA 226): Understand marketing management in a small business enterprise						
9	5.1 Understand the basic concept of marketing. 5.2 Identify the steps in conducting market surveys to determine demand and supply for particular products. 5.3 Identify markets for specific products.	Explain basic concepts of marketing. Explain steps in conducting marketing survey to determine demand and supply for particular products. Explain how to identify markets for specific products.	Text Books Journals Publications	Identify the process of conducting a marketing survey. Identify appropriate training strategies for products produced on a small scale.	Guide students to use the internet to identify the marketing needs of small business enterprises.	Internet and relevant websites

Theoretical Content				Practical Content		
Week	Specific Learning Outcomes	Teacher's activities	Resources	Specific Learning Outcomes	Teacher's activities	Resources
10	5.4 Identify channels of distribution for a selected product or service.	Explain channels of distribution for a selected product or service.	Text Books	Identify the process of conducting a marketing survey.	Guide students to use the internet to identify the marketing needs of small business enterprises.	Internet and relevant websites
	5.5 Explain the promotional and sales activities for a selected product or service	Explain promotional and sales activities for a selected product or service	Journals Publications	Identify appropriate training strategies for products produced on a small scale.		
	5.6 Explain appropriate pricing strategies	Explain appropriate pricing strategies				
General Objective 6 (STA 226): Understand the general concept of production management						
11	6.1 Explain the basic concepts of production	Explain the basic concepts of production	Text Books	Identify appropriate technology for different types of SME.	Guide students to prepare a case study on the location of an industry and factory layout Oversee group work and guide reference to relevant web sites	Internet and relevant websites
	6.2 Explain choice of appropriate technology	Explain choice of appropriate technology	Journals Publications	Identify sources of machinery and material from the internet.		
	6.3 Identify types and sources of machinery and equipment.	Explain types and sources of machinery and equipment, their installed and utilized capacity.	Sample business	Identify appropriate locations and their problems for SMES		
	6.4 Explain the installed capacity.					
	6.5 Explain the utilized capacity.					
12	6.6 Identify sources of raw materials.	Explain sources of raw materials.	Text Books	Identify appropriate technology for different types of SME.	Guide students to prepare a case study on the location of an industry and factory layout Oversee group work and guide reference to relevant web sites	Internet and relevant websites
	6.7 Describe factory location and factors in the selection of site.	Explain factory location, its layout and safety measures.	Journals Publications	Identify sources of machinery and material from the internet.		
	6.8 Describe factory layout.		Sample business	Identify appropriate locations and their problems for SMES		
	6.9 Explain plant and machinery maintenance.	Explain Plant and machinery maintenance.				
	6.10 Explain Plan and scheduling.	Explain plan and scheduling.				

Theoretical Content				Practical Content		
Week	Specific Learning Outcomes	Teacher's activities	Resources	Specific Learning Outcomes	Teacher's activities	Resources
13	<p>6.11 Explain quality control issues.</p> <p>6.12 Explain factory safety measures.</p> <p>6.13 Identify problems of production in the Nigerian situation.</p> <p>6.14 Explain how to cope with production problems in Nigeria.</p>	<p>Explain quality control.</p> <p>Explain problems of production in the Nigerian situation and how to cope with them.</p> <p>Organise a field trip to a successful small business establishment.</p>	<p>Text Books</p> <p>Journals Publications</p> <p>Sample business</p>	<p>Identify appropriate technology for different types of SME.</p> <p>Identify sources of machinery and material from the internet.</p> <p>Identify appropriate locations and their problems for SMES</p>	<p>Guide students to prepare a case study on the location of an industry and factory layout</p> <p>Oversee group work and guide reference to relevant web sites</p>	<p>Internet and relevant websites</p>
General Objective 7 (STA 226): Know human capital needs for an enterprise						
14	<p>7.1 Identify human capital needs for an enterprise.</p> <p>7.2 Explain recruitment procedures.</p> <p>7.3 Explain need for training of workers.</p> <p>7.4 Explain how to motivate workers.</p>	<p>Explain human capital management and its needs for small business enterprises.</p> <p>Explain recruitment procedures</p>	<p>Text Books</p> <p>Journals Publications</p> <p>Cardboard</p>	<p>Identify the recruitment compensation and training procedures of workers in SMES.</p> <p>Identify problems of human capital management and how to solve them in SMEs</p>	<p>Guide students to prepare organizational charts for SME and how to forecast their employment needs.</p>	<p>Internet and relevant websites</p>
15	<p>7.5 Explain how to compensate workers.</p> <p>7.6 Explain organization of work force, organizational chart.</p> <p>7.7 Explain problems of human capital management in</p>	<p>Explain need for training of workers.</p> <p>Explain how to motivate. and compensate workers</p> <p>Explain organization of work force.</p> <p>Guide students to prepare</p>	<p>Text Books</p> <p>Journals Publications</p> <p>Cardboard</p>	<p>Identify the recruitment compensation and training procedures of workers in SMES.</p> <p>Identify problems of human capital management and how to solve them in SMEs</p>	<p>Guide students to prepare organizational charts for SME and how to forecast their employment needs.</p>	<p>Internet and relevant websites</p>

Theoretical Content				Practical Content		
Week	Specific Learning Outcomes	Teacher's activities	Resources	Specific Learning Outcomes	Teacher's activities	Resources
	small business enterprises. 7.8 Explain how to cope with the problems of human capital management.	organizational, chart for a small business enterprise. Explain problems of human capital management in small business enterprises and how to cope with them.				

Assessment: Give details of assignments to be used:

Coursework/Assignments %; Course test %; Practical %; Project %; Examination %

Type of Assessment	Purpose and Nature of Assessment (STA 226)	Weighting (%)
Examination	Final Examination (written) to assess knowledge and understanding	0
Test	At least 1 progress test for feed back.	25
Practical / Project	Project with group (25%) and individual (50%) components to be assessed by the teacher	75
Total		100

Recommended Textbooks & References: