

NATIONAL BOARD FOR TECHNICAL EDUCATION KADUNA

NATIONAL DIPLOMA/HIGHER NATIONAL DIPLOMA

IN

GENERAL LABORATORY TECHNIQUES

CURRICULUM AND COURSE SPECIFICATIONS

2002

PLOT 'B' BIDA ROAD, P.M.B. KADUNA - NIGERIA

GENERAL LABORATORY TECHNIQUES IN NATIONAL DIPLOMA
CURRICULUM TABLE

FIRST YEAR
FIRST SEMESTER

CODE	COURSE	DURATION (HRS)	UNITS
GLT 111	General Laboratory Techniques I		
	MODULE 1: Care and Maintenance of laboratory wares and simple equipments	15	1.0
	MODULE 2: Safely in the laboratory	15	1.0
	TOTAL	30	2.0

FIRST YEAR
SECOND SEMESTER

CODE	COURSE	DURATION (HRS)	UNITS
GLT 121	MODULE 3: General Laboratory Techniques II. Preparation of laboratory and side shelf reagents.	15	1.0
	MODULE 4: Separation techniques and samples managements	15	1.0
		30	2.0

SECOND YEAR
FIRST SEMESTER

CODE	COURSE	DURATION (HRS)	UNITS
GLT 211	General Laboratory Techniques III MODULE 5: Photography and audio-visual aids. MODULE 6: woodwork and metal work	15	1.0
		15	1.0
		30	2.0

SECOND YEAR
SECOND SEMESTER

CODE	COURSE	DURATION (HRS)	UNITS
GLT 221	General Laboratory Techniques IV MODULE 7: Vacuum Techniques MODULE 8: Glass Blowing	15	1.0
		15	1.0
		30	2.0

HIGHER NATIONAL DIPLOMA
FIRST YEAR
FIRST SEMESTER

CODE	COURSE	DURATION (HRS)	UNITS
GLT 311	Laboratory Management	30	2.0
GLT 312	Instrumentation General	45	2.0
GLT 321	Biological and Chemical Instrumentation	75	2.0
GLT 322	Glass Blowing	45	2.0
	TOTAL	195	8.0

REPORT OF THE PANEL ON THE REVIEW OF CURRICULUM AND GUIDED SYLLABUSES FOR NATIONAL DIPLOMA (ND) AND HIGHER NATIONAL DIPLOMA (HND) IN GENERAL LABORATORY TECHNIQUES (GLT)

INTRODUCTION

The focus of the panel was the goal of the GLT courses which is “To equip the diplomats of the ND/HND Science Laboratory and Technology Programmes who will be involved in Laboratory analysis understand the management of Laboratories and make maximum and safe use of the equipment and other facilities available in these laboratories.

Chief Ogugua E. Okafo, Deputy Director, programmes, National Board for Technical Education, visited the panel during one of its meetings and emphasized the importance of GLT, being fundamental to all the science and technology based programmes. He urged the panel to treat GLT with the thoroughness, which it deserves. The panel promised to do a good job.

Highlight of the Deliberations of the Panel

The panel discussed the “guidelines for panelists evolving the curricular and Guide syllabuses for National Diploma (ND) and Higher National Diploma (HND) Programmes” and made observations. There were also, two papers from the biological sciences group. The papers contained suggested items for inclusion in the Laboratory Management and Laboratory Animals Sections of the GLT syllabuses. Both the observations and the papers were taken into account in the work of the panel. Some items were added to the syllabuses, while some were deleted, bearing in mind the implications of such medications.

Specific Recommendation and Actions

1. The panel recommends that:
 - (a) The minimum entry requirement for the ND Programmes shall be English Language, Mathematics and any two Science Subjects passed at Credit Level.

(b) NBTE should ensure that relevant documents, e.g. “Schedule of practical work activities to be covered by the student while he is on supervised industrial attachment” get to the location of industrial attachment early enough (ahead of the students) to enable the industry make adequate provisions for training.

© The word “Technologist” replaces “Higher Technician”

2. (a) Two minor additions were made to the items on “Care and maintenance of laboratory wares” in line with trend in technology.

(b) Some of the suggestions from the biological sciences were included in 3.19 under Laboratory Animals.

© Metal Work, Vacuum Techniques, Glass blowing, photography and instrumentation posed challenges in terms of the level of skills and expectations of diplomats. It was relatively easy to accommodate additions or rearrangement in metal work, photography, vacuum techniques and instrumentation without overloading the syllabuses. But, it was a different matter in glass blowing.

The panel observed, from various reports, that many institutions offering science courses are not able to construct glass wares and fittings varying from simple types to relatively complicated ones. Apart from institutions of learning, industries also need these glass wares and fittings.

One reason for the predicament is that glass blowers are in very short supply. Another reason is that the few competent glass blowers who are available do not have enough equipment to work with. A competent glass blower is an asset to institutions and industries. He has potentials for self-employment and for employing other people. It is from these varying perspectives that the panel draws a new syllabus for glass blowing for the second semester of HND 1, in addition to expanding the syllabus for glass blowing in the second semester of ND II.

(c) Automation in GLT has become very important, and in recognition of this, items on automation were included in the syllabuses.

It does not appear that there are significant amendments, which have not been listed.

The reviewed curricula and guided syllabuses are herewith submitted.

Signed

1. S. O. AIKHOJE
2. ADEBAYO ADEYELOLA
3. IBRAHIM A. GODOWOLI
4. KABIRU ABDULLAHI
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8. S. E. OZOYA
9. OKEWOLE, A. I.
10. G. R. OLADIMEJI
11. ALIYU M. LEMU

Mr. Iheanyi Ibeji who joined the panel later was received and given an update of the work of the panel.

Course Code	Course Title	L	T	P	CU	CH	Prerequisite
GLT 111	General Laboratory Techniques I	1	0	0	1.0	15	

PROGRAMME: SCIENCE LABORATORY TECHNOLOGY (NATIONAL DIPLOMA)

COURSE: GLT III GENERAL LABORATORY TECHNIQUES

MODULE I: CARE MAINTENANCE OF LABORATORY WARES AND SIMPLE EQUIPMENTS

DDURATION: HOURS (WEEK) LECTURES 1.0 TUTORIALS: 0 PRACTICALS:

GOAL: This module is designed to introduce the students to the basic knowledge of laboratory wares and equipment.

On completion of this module, the student should be able to:

Know the use of laboratory wares and single lab oratory equipment

Understand the calibration to glass wares

Know the various uses of glass wares in the laboratory

Know the maintenance of la oratory balances

Understand the principles, applications and maintenance of microscopes

Know the maintenance of heating apparatuses in the laboratory

Know the maintenance of cooling equipments in the laboratory

Know the maintenance of temperature measurement equipment

Understand microtomy and maintenance of microtomy tools

Know basic electrical appliances

Understand the care and maintenance of ardor-visuals

PROGRAMME: SCIENCE LABORATORY TECHNOLOGY			
Course: General Laboratories Techniques		Course Code: GLT 111 Module I	Contact Hours: 15
Course Specification: (Module 1 – care and maintenance of lab wares & simple equipment)			
WEEK	General Objectives 1.0 Know the use of laboratory wares and simple lab. equipment		
	Special Learning Objective:	Teachers Activities	Resources
1	Identify the different types of laboratory glasswares e.g. beakers test tube, funnels, flask etc. State the uses of different laboratory wares in 1.1 Identify different types of fittings in the laboratory e.g. water, gas light etc. Identify the different types of grease and their application on joints. Prepare cleansing reagents for laboratory wares. Clean laboratory wares using cleansing agents. Explain the uses of parcel on centered glass, nickel and platinum. Store laboratory wares. Maintain laboratory wares.	Involve students in practical identification. Lecture Practical identification and sketch/illustration in the laboratory Laboratory identification Gets students involved in the preparation and use of cleansing agents. Teacher to demonstrate cleaning of sentered glass ware using crumic Hel water and organic advents. Lecture Teacher and students to make a study talk of the departmental store students to write an outline of their observation teacher to assess.	Beakers, barrette, pipette, test tube etc. Water fittings, gas fitting, light fitting. Grease, kipp apparatus condensers Containers, H ₂ 804 alcohol etc. Used or dirty sentered glass wares; cleansing agents, running tap water washing bowls and detergents.

WEEK	General Objectives 2.0 Understand the calibration of glasswares		
	Special Learning Objective:	Teachers Activities	Resources
4	Define calibration Distinguish between calibration and graduation. Explain the effect of heat on calibration of laboratory glasswares. Record fluid levels of calibrated glasswares e.g. water level, mercury level. Graduate simple laboratory glasswares using standard volumes.	Lecture Practical; calibration of burettes pipette and standard flask Teacher clamps two burette upright fills one with water another with mercury ask each student to read levels and record. Lecture Demonstration Show students how to graduate simple laboratory glass ware e.g. using the test tube.	Sensitive balance crumic acid still water weighing containers thermometers etc. Water and mercury returned stewels, burettes. Test tubes, clamps making pencils water etc.

WEEK	General Objective 3.0 Know the various uses of glassware in the laboratory		
	Special Learning Objective:	Teachers Activities	Resources
5	Identify types of glass wares suitable for storage in the laboratory. Identify types of glass wares suitable as containers e.g. for storage of photo-sensitive reagents and some acids. Identify other laboratory storage containers e.g. plastics and ceramics. State the precautions necessary in the storage of chemicals e.g. Hydrofluoric acid in plastic containers, sodium metal in paraffin and silver nitrate in amber containers	Lecture Lecture Involve students in practical identification Lecture	Reagent bottle amber glass containers plastics ceramics.

WEEK	General Objectives 4.0 Know the maintenance of laboratory balances		
	Special Learning Objective:	Teachers Activities	Resources
6	<p>Explain the working principles of the laboratory balance.</p> <p>Identify the various types of balance in use in the laboratory.</p> <p>Distinguish between accuracy and precision of a balance.</p> <p>Determine the sensitivity of a balance.</p> <p>Differentiate between analytical and top loading balances.</p> <p>Learn how to use operation manuals of balances.</p> <p>Describe the effect of shock, temperature, chemicals on the operation of balances.</p> <p>Re-calibration of balance using Internal weight Recalibration weight</p> <p>Identify substances using various balances.</p> <p>Check balances to know when they require servicing e.g. using standard masses.</p> <p>Install and test-run a balance.</p> <p>Carry out minor adjustment, repairs or replacement of parts on a balance.</p>	<p>Lecture</p> <p>Get students involved in practical identification of balances.</p> <p>Make students use different balance to take weight of different objects.</p> <p>Lecture and illustration.</p> <p>Lecture</p> <p>Involve students in the calibration of balances.</p> <p>Demonstrate cleaning of balances.</p> <p>Allow students to participate under strict supervision.</p>	<p>Balances</p> <p>Analytical balance Top loading balance operation manuals.</p> <p>Top loading balance Analytical balance Standard masses</p>

WEEK	General Objectives 5.0 Understand the principles application and maintenance of microscope		
	Special Learning Objective:	Teachers Activities	Resources
7	<p>Identify a simple microscope and its parts. List the various types of microscope in use in the laboratory. Describe the use of various microscope in 5.2 above. State the ranges of magnification of microscope. Outline the principles of operation of various types of microscope. Describe and apply the various procedure in the routine maintenance and minor of microscope.</p>	<p>Draw and label the compound light microscope on the lower table functions of parts for students. Assemble various types of microscope e.g. Daylight, light, stereo, projector, phase contrast etc. Student to draw label and indicate function. Lecture Clean optical parts lens time Use Xy lens sparingly where necessary Clean body with chamois cloth Lubricate moving parts.</p>	<p>Simple microscope compound microscopes Dark-field microscope etc. Different types of microscope. Dirty microscope lens tissue Chamois leather Xy lens Lubricating oil.</p>

WEEK	General Objectives 6.0 Know the maintenance of heating apparatus in the laboratory		
	Special Learning Objective:	Teachers Activities	Resources
8	<p>identify the various heating apparatus like burners, hot plates, autoclave etc. Describe the application of each type in 6.1 above. Heat water and other liquids, powder etc. using Bunsen burner, hot plates etc. Sterilize various object using autoclave. Heat and dry various object using oven. Describe and apply the various procedures in the routine maintenance and minor repairs of autoclave, oven and other laboratory heating apparatus.</p>	<p>Practical Display burners, heating mantles, water oil and sand baths heating oils. Explain principle and use Demonstrate use with any 2 above. Lecture and demonstration as above. Use portable autoclave and oven to sterilize some wasted glass wares. Student to note and submit a description of the demonstration exercise. Calibrate an autoclave.</p>	<p>Burner, hot plate autoclave, oven etc. Water bath heating mantle gas supply etc. Portable autoclave oven.</p>

WEEK	General Objectives 7.0 Know the maintenance of cooling equipment in the laboratory		
	Special Learning Objective:	Teachers Activities	Resources
9	Identify apparatus for cooling e.g. refrigerator, freeze drier, water circulators, ice making machine etc. Explain the principle of freezing. Explain the different application of cooling system in 7.1 above. Identify the various parts of the apparatus in 7.1 above. Describe and apply the procedure for the routine maintenance and minor repair of the apparatus in 7.1 above.	Laboratory identification of apparatus. Lecture Lecture Ensure that each student get access to the apparatus lighted in 7.1 above.	Refrigerator Freeze drier ice making machine etc.

WEEK	General Objectives 8.0 Know the maintenance of temperature measurement equipment		
	Special Learning Objective:	Teachers Activities	Resources
10	<p>Identify apparatus for temperature measurement e.g. thermometer, pyrometers, thermocouples.</p> <p>Explain the operating principles of temperature measuring devices listed in 8.1 above.</p> <p>Distinguish between the various temperature scales e.g. Fahrenheit, Kelvin Celsius etc.</p> <p>Measure temperature stating result in various unit listed in 8.3 above.</p> <p>Describe and apply the procedure for the routine maintenance and minor repair of the apparatus identified in 8.1 above.</p>	<p>Get students involved for practical identification of measuring equipment on display.</p> <p>Lecture</p> <p>Ask students to convert from one scale to another.</p> <p>Take temperature of some liquids/solid substances using the different types of temperature measuring equipment and compare readings.</p>	<p>Thermometer</p> <p>Thermocouples</p> <p>pyrometers etc.</p> <p>Water basin burner</p> <p>thermometer etc.</p>

WEEK	General Objectives 9.0 Understand microtomy and the maintenance of microtomy tools		
	Special Learning Objective:	Teachers Activities	Resources
11	<p>Identify different types of microsomes. Identify the different parts of microsomes and explain their functions. Explain the working principles of microsomes. Identify types of knives used in microsomy. Sharpen microtone knives. Describe paratten was embedded tissue. Cut sections Identify faults in section cutting and remedy the faults. Explain the care of microtomes and knives.</p>	<p>Lecture Practical – Display and explain different in crotons e.g. rocking, Rotatory sledge, sliding etc. Draw and label at least one. Lecture and illustration Sharpen microtome knife Lecture Practical – prepare an embedment of plant or animal tissue. Section the embedded tissue using one of the microtomes above. Lecture Practical – sharpen and smoothen blunt microtome knife.</p>	<p>Rocking, microtome Rotatory sledge microtome etc. Microtome knives. Sharpening some paratten wax tissue. Honing and stropping tools. Same as week 11. As above.</p>

WEEK	General Objectives 10.0 Know basic electrical appliances		
	Special Learning Objective:	Teachers Activities	Resources
13	<p>Explain the following terms. Alternative correct and direct current supplies. Low tension and high tension.</p> <p>List one example of the sources or supply listed in 10.1 above.</p> <p>Identify various types of distribution and connection. Identify the standard colour code.</p> <p>Explain the result of wrong wiring.</p> <p>Identify the different types of wiring.</p> <p>Explain the methods and importance of proper earthing.</p> <p>Identify different types of switches single pull double throw (SPDT), Double pull single throw (DPST) control gear, relays, cut outs etc.</p> <p>Identify different types of protective devices e.g. relays cut outs fuses etc.</p> <p>Draw symbols of electrical component.</p> <p>Apply such symbols in 10.1o above for circuit diagram.</p>	<p>Lecture Display Dry cells etc.</p> <p>Lecture and demonstration</p> <p>Lecture & practical show colour coded wires and resistors to students. Read resistor values for students. Assignment.</p> <p>Lecture and illustrate Construct with students on boards S.P.D.T., D.P.S.T. wirings. Test (i) with fuse on (ii) without fuse. Display charts of electrical components. Student to transfer in to their notices.</p>	<p>Dry cell Generating set NEPA</p> <p>Colour code Charts Fuses Relays Cut out etc. S.P.D.T. and D.P.S.T. switches relays etc. Switches, relays wires, bulbs, sockets etc. Symbols chart.</p>

WEEK	General Objectives 11.0 Understand the care and maintenance of audio-visual		
	Special Learning Objective:	Teachers Activities	Resources
15	<p>Describe the methods of routine maintenance of (i) overhead projectors (ii) lenses, recording and playback heads of tape recorders and compact disc.</p> <p>Undertake proper care and routine maintenance of the items listed in 11.1 above.</p> <p>Mend tapes and films.</p>	<p>Cleaning of lens Screen, body etc. Oiling of moving parts Demonstrate use. Lecture</p>	<p>Tape recorders compact disc Camera films etc.</p>

PROGRAMME: SCIENCE LABORATORY TECHNOLOGY (NATIONAL DIPLOMA)

COURSE: GLT III GENERAL LABORATORY TECHNIQUES I

MODULE II: SAFETY IN THE LABORATORY

DURATION: (HOURS/WEEK) LECTURES: 7 TUTORIALS: 0 PRACTICALS: 0

UNITS: 1.0

GOAL: This module is designed to acquaint the student with safety consideration in the laboratory

GENERAL OBJECTIVES

On completion of this module, the students should be able to:

- 1.0 Know common laboratory hazards
- 2.0 Understand basic safety rules and procedures in the laboratory
- 3.0 Understand the radiation
- 4.0 Understand the safety precautions against hazards from sealed and unsealed sources
- 5.0 Know the general and personal protection rules in the radiation laboratory
- 6.0 Know the disposal of radioactive wastes.

Course Code	Course Title	L	T	P	CU	CH	Prerequisite
GLT 111	General Laboratory Techniques I Module II	1	0	0	1	15	
	Safety in the laboratory						

PROGRAMME: SCIENCE LABORATORY TECHNOLOGY (ND)			
Course: GLT I		Course Code: GLT 111 Module III	Contact Hours: 5
Course Specification: (Module 1I Safety in the Laboratory)			
WEEK	General Objectives 1.0 Know the common laboratory hazards		
	Special Learning Objective:	Teachers Activities	Resources
1	List different types of laboratory hazards: Electrical, chemical, fire, Biological, mechanical etc. Describe the nature and causes of the hazards in 1.1 above. List examples of each of the types of hazards in 1.1 above.	Use question and answer techniques. Illustrate with examples. Use question and answer techniques.	

WEEK	General Objectives 2.0 Understand the basic safety rules in the laboratory		
	Special Learning Objective:	Teachers Activities	Resources
4	<p>List basic laboratory safety rules. Display charts showing safety symbols and rules. Interpret the symbols in 2.2. above. Describe the procedure for treating acid burns in the laboratory. Describe the procedure of treating cases of inhalation of swallowing of toxic gases and liquids in the laboratory. Classify fires. Extinguish various types of fires using extinguishers. Describe the procedure of treating burns from naked fire in the laboratory. List possible sources of microbial contamination of laboratory workers. Describe procedures to be adopted in the prevention of microbial contamination in the laboratory. Describe first aid measures to be taken in case of microbial contamination in the laboratory.</p>	<p>Demonstrate application Fix permanently in the laboratories. Use practical illustrations. Demonstrate how to flush water on the area affected. To illustrate how to use first aid in severe cases. Use colour coding on fire extinguishers to show different areas of application. Demonstrate how to extinguish different types of fires. Use the facilities in first aid box to demonstrate treatment. Use question and answer. Illustrate by use of hand gloves. Lecture with examples of actions to be taken</p>	<p>Laboratory safety wears and gears. Fire extinguishers. Tape water. First Aid Box Fire extinguisher Fire blanket Extinguishers sources of fire controlled. First aid Box. Hand gloves specimen preparation kit.</p>

WEEK	General Objectives		
	Special Learning Objective:	Teachers Activities	Resources
13	<p>Describe the procedure for treating electric shock in the laboratory.</p> <p>Describe the precaution against electric shock in the laboratory.</p> <p>List the content of the first aid box in the laboratory.</p> <p>Describe how to treat cuts and other minor injuries in the laboratory.</p> <p>Describe various methods of artificial respiration for the injured in the laboratory e.g. mouth to mouths cardiac compression</p>	<p>Illustrate use of an insulator to remove the victim from the electric source and use of first aid.</p> <p>Refer to safety regulation first aid.</p> <p>Use question and answer format.</p> <p>Use the facilities in the first aid box to demonstrate the treatment of injuries.</p> <p>Use students to demonstrate among themselves.</p>	<p>Pieces of dry wood or plastic first aid box.</p>

WEEK	General Objectives 3.0 Understand Radiation		
	Special Learning Objective:	Teachers Activities	Resources
14	Define Radiation List and describe types of radiation e.g. x-ray, gamma ray etc. Enumerate various types of radioactive sources e.g. uranium, thorium. Explain sealed and unsealed radioactive sources. Define basic radiation terms such as radiation absorbed dose maximum permissible level etc.	Use examples Use question and answer Show some practical examples Illustrate with examples.	Sealed Radioactive source unsealed radioactive sources. e

Course Code	Course Title	L	T	P	CU	CH	Prerequisite
GLT 121	General Laboratory Techniques I Preparation of Laboratory and Side Shelf reagents.	1	0	2	2	30	
	Module III						

PROGRAMME: SCIENCE LABORATORY (NATIONAL DIPLOMA)

COURSE: GLT 121 MODULE III GENERAL LABORATORY TECHNIQUES I

MODULE III: PREPARATION OF laboratory and Side Reagents

DURATION: (HOURS/WEEK) LECTURES: 1 TUTORIAL: 0 PRACTICALS: 2

UNIT: 1.0

GOAL: This module is designed to teach the student the preparation, storage and handling of laboratory solutions

GENERAL OBJECTIVES:

On completion of this module, the student should be able to:

- 1.0 Know the preparation of laboratory solutions and reagents
- 2.0 Know the different types of solvents and their applications.
- 3.0 Understand the storage, extraction, dispensation, disposal and recovery of chemicals in the laboratory
- 4.0 Understand the basic techniques of sampling.

PROGRAMME: SCIENCE LABORATORY TECHNOLOGY (ND)			
Course: GLT		Course Code: GLT 121	Contact Hours: 30 hours
Course Specification: (Module III & IV)			
WEEK	General Objectives 1.0 Know the preparation of solutions and reagents in the laboratory		
1	Special Learning Objective:	Teachers Activities	Resources
	Define standard solution e.g. Normal molar, saturated and supersaturated solution. Calculate the concentration of solution from a given assay. Describe the methods of preparation and standardization of solutions. Prepare and standardize various solutions. Label all prepared solution and reagents.	Lecture and practical Prepare 0.1m H ₂ SO ₄ 0.1m NaOH and Triturate.	Burettes, Pipettes, beakers, retort. Stand, volumetric flasks, chemicals.
WEEK	General Objectives 2.0 Know the different types of solvents and their applications.		
5	Special Learning Objective:	Teachers Activities	Resources
	Define a solvent List some known solvents. Classify solvents in 2.2 above e.g. organic in organic, and universal. State the application of solvents e.g. solid/liquid extraction. Apply solvents in extractions and on other cases.	Lecture and demonstration batch extraction	Soxhlets apparatus/petroleum ether.

WEEK	General Objectives 4.0 Understand the basic techniques of sampling		
	Special Learning Objective:	Teachers Activities	Resources
12-13	<p>List and explain types of sampling techniques e.g. riffle, coning, quartering etc.</p> <p>Explain the application of sampling techniques in 4.1 above.</p> <p>Explain the importance of paper sampling.</p> <p>Apply the techniques in 4.1 above in sampling in the laboratory and for laboratory analysis.</p>	<p>Lecture/practicals</p> <p>Ask students to collect soil samples.</p> <p>Prepare laboratory analytical sample from the above collection.</p>	<p>Large white sheets of paper or cardboard.</p> <p>Sets of series</p> <p>Cellophane/nylon bags.</p> <p>Weighing balance</p> <p>Oven.</p>

Course Code	Course Title	L	T	P	CU	CH	Prerequisite
GLT 121	Module IV: Separation Techniques and Sample Management	1	0	0	1.0	15	

PROGRAMME: SCIENCE LABORATORY TECHNOLOGY NATIONAL DIPLOMA

COURSE: GLT 121 121 General Laboratory Techniques I

MODULE IV: Separation Techniques and samples Management

DURATION: Hours/Weeks Lecture: 1 Tutorials: 0 Practicals: 2 Hours

UNIT: 2.0

GOAL: This module is designed to acquaint the student with aspects of separation techniques for purification of compounds and methods of managing samples and specimens in the laboratory.

GENERAL OBJECTIVES:

On completion of this module, the students should be able to:-

- 1.0 Understand the physical and chemical principles involved in the application of separation methods in the laboratory
- 2.0 Understand the collection, handling and preservation of laboratory specimens.
- 3.0 Understand the setting up and management of tropical aquarium and laboratory animals .
- 4.0 Know how to prepare a herbarium.

PROGRAMME: SCIENCE LABORATORY TECHNOLOGY (ND)			
Course: GLT		Course Code: GLT 121	Contact Hours: 15 hours
Course Specification: (Module IV Separation Techniques and Sample Methods)			
WEEK	General Objectives 1.0 Understand the physical and chemical principles involved in the application of separation methods in the laboratory.		
	Special Learning Objective:	Teachers Activities	Resources
1	Define chromatography Explain chromatography as a means of separating mixtures by the distributions of its components between a stationary and a mobile phase. Distinguish between adsorption chromatography (as in column, thin layer chromatography) and partition chromatography. (as in gas liquid chromatography). Define the terms R_f , R_x and retention volumes and time.	Lecture Teacher demonstrate adsorption and absorption using chalk and ink. Teacher demonstrate chromatography (separation) by use of in separation of plant chlorophyll pigments.	Gas liquid chromatograph and accessories.
2	Separate a mixture of material by means of gas liquid chromatography. Outline the major components of a gas chromatograph. Describe methods for the detection of colourless materials in paper and thin layer chromatography and solvents in G.L.C (Gas Liquid Chromatography). Detect colourless materials by means of paper and thin layer chromatography.	Lecture Teacher shows the G.L.A. to students. Teacher asks to sketch G.L.C. components, draw and label – indicating uses. Runs a chosen liquid (oil e.g. groundnut oil in the G.L.C. columns. Retrieve and interpret the chart with the students.	

WEEK	General Objectives		
	Special Learning Objective:	Teachers Activities	Resources
	<p>Describe methods for the detection of colourless materials in G.L.C.</p> <p>Describe the process of electrophoresis.</p> <p>Describe the chemical form of an acidic or basic ion exchange resin.</p> <p>Explain ion exchange resin as macromolecular substance which exchanges conic units with ions in the surrounding solution.</p> <p>Explain the term selectivity coefficient and distribution coefficient for an ion exchange material.</p> <p>Explain why the ability of a resin to exchange ions with those in dilute solution increases as the change in the solvated ions increases.</p> <p>Set up and use an ion exchange column.</p> <p>Define the terms bed volume and exchange capacity.</p> <p>Describe the process of regenerating an ion exchange resin.</p>	<p>Lecture and Demonstration</p> <p>Shows samples of chromatank, chromatography paper and separation solvents.</p> <p>Separates a food sample carbohydrate protein in T.L.C or c paper.</p> <p>Develops paper with Iodine (starch) or Nintrydrim – protein</p> <p>Lecture</p> <p>Shows the electrophoretic equipment.</p> <p>Draw and label.</p> <p>Passes sample of resin round.</p> <p>Prepare slurry for students to see.</p> <p>Runs a columns with selected sample and solvent.</p> <p>Locate the sample and solvent fronts.</p> <p>Calculate the R_f.</p> <p>Uses R_c to identify sample.</p>	<p>Gas Liquid chromatograph locating reagent.</p> <p>Electrophoretic equipment.</p>

WEEK	General Objectives		
	Special Learning Objective:	Teachers Activities	Resources

	<p>List laboratory and industrial applications of ion exchange resins.</p> <p>Describe the technique of solvent extraction.</p> <p>Explain the principle of partition law.</p> <p>Explain why it is more efficient to extract a solute from a solution by using two or more portions of an immiscible solvent than to use the same total volume in one bulk.</p> <p>Determine the extent of extraction of a material from one phase into a second phase applying the principle of partition law. (Distribution coefficient Liquid/Liquid phase).</p> <p>Describe the principle of Soxhlet extraction.</p> <p>Differentiate between batch and continuous extraction.</p> <p>Describe how acidic and basic solvents can be used to extract basic and acidic materials respectively.</p> <p>Describe the use of chelation to extract an ionic substance in a non-polar solvent.</p> <p>List and describe different techniques of distillation.</p> <p>Draw the apparatus assembly or able from simple distillation under reduced pressure.</p>	<p>Lecture and Demonstration</p> <p>Operates the deioniser top show students one use of column chromatography.</p> <p>Lecture and Laboratory work</p> <p>Demonstrate batch extraction using a separating funnel.</p> <p>Lecture</p> <p>Lecture</p> <p>Display Soxhlet's apparatus</p> <p>Draw a label</p> <p>Mount the Soxhlet's apparatus and use it to separate a given material e.g. soya-beans powder for oil content.</p>	<p>Ion-exchange resin</p> <p>Ion exchange column</p> <p>Ionic regenerators.</p> <p>Separating funnel</p> <p>Soxhlet extractor</p> <p>Heating mantle</p> <p>Running water.</p> <p>Soxhlet's</p>
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WEEK	General Objectives		
	Special Learning Objective:	Teachers Activities	Resources

	<p>Set up the distillation apparatus in 1.28 above for the purification of a flammable liquid.</p> <p>Describe the principle and process of fractional distillation.</p> <p>Describe the principle and process of steam distillation.</p> <p>Separate a mixture of 24 – dinitrophenols by steam distillation.</p> <p>Define an azeotrope as a constant boiling mixture, thstis, a mixture.</p> <p>List applications of the various distillation procedures in the industry.</p> <p>Define sublimation</p> <p>Describe the principle and process of sublimation as used in the purification of organic compound.</p> <p>List compounds that can be purified by sublimation.</p> <p>Design apparatus to be used for sublimation procedure.</p> <p>Describe the principles and process of crystallization as used in the isolation and purification of compounds.</p>	<p>Lecture and Demonstration</p> <p>Set up and use a simple distillation apparatus.</p> <p>Use it to explain the differences between it and</p> <ul style="list-style-type: none"> (i) steam distillation (ii) fractional (iii) reflux etc. <p>Lecture and demonstration</p> <p>Set up and use sublimation apparatus using Ammonium chloride or Xrstal Iodine.</p>	<p>Distillation apparatus</p> <p>Condenser (leibere)</p> <p>Ronw bottleneck flask (about 25ml).</p> <p>Burner/Heating mouth</p> <p>Receiver.</p> <p>Sublimation apparatus</p>
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WEEK	General Objectives		
	Special Learning Objective:	Teachers Activities	Resources

	Describe filtration as a process of separation and purification. Explain dialysis as a process of separation and purification.	Lecture	
WEEK	General Objectives 2.0 Understand the collection, handling and preservation of biological laboratory specimens		
11	Special Learning Objective:	Teachers Activities	Resources
	2.1 Describe and identify various types of traps for collecting plants and animal specimens for the laboratory. 2.2 Collect specimens of various types using traps. 2.3 Describe various ways of preserving and transporting plant and animal specimens to the laboratory. 2.4 Transport specimens to the laboratory in good conditions. 2.5 List and describe different methods of preserving plants and animal specimens. 2.6 Prepare and preserve animal/specimens in formalin by drying and by stuffing. 2.7 Display preserved specimen for effect. 2.8 Preserve and display plant specimen.	Lecture and demonstration of method of preserving specimen. Display collection tools Draw and label. Take students to the field for collection. Back to laboratory teacher demonstrate and preserves – plant material e.g. <u>sida acuta</u> and animal material e.g. cockroach (<u>Pleriplaneta americana</u>) by (a) wet method (b) pinning Give assignments to students for collection/preservation of (a) tools/frogs. (b) Preparation of skeleton.	Various biological specimen – plants and animals. Formalin Stuffing materials

WEEK	General Objectives 3.0 Understand the setting up and management of tropical aquarium and animal house		
	Special Learning Objective:	Teachers Activities	Resources

14	Special Learning Objective:	Teachers Activities	Resources
	3.14 Ensure that the animal cage is clean and well ventilated. 3.15 Distinguish between male and female species of each animal by observation. 3.16 Observe animals carefully to determine when to mate them use breeding table. 3.17 Explain methods used in the laboratory for mating animals. 3.18 State the advantages and disadvantages of mating animals artificially. 3.19 State and apply the various methods of humane killings of animals e.g. physical killings, like electrocution stunning and chemical killings like chloroforming	Lecture and Demonstration Send students to field to collect toads/frogs. Demonstrate in class the humane killing methods esp. chloroforming	Animal cage.

WEEK	General Objectives 4.0 How to prepare a herbarium		
	Special Learning Objective:	Teachers Activities	Resources

15	4.1 Define a herbarium. 4.2 State the essential requirement of a herbarium. 4.3 Prepare a herbarium. 4.4 Demonstrate good maintenance of a herbarium.	Lecture and Demonstration Send students out to collect plant materials. Demonstrate mounting plants materials for herbarium. Ask each student to prepare to prepare a given specimen against next class. Tours the herbarium with students of use students to build one for the establishment.	A functional herbarium
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Course Code	Course Title	L	T	P	CU	CH	Prerequisite
GLT 211	General Laboratory Techniques III	1	0	0	1.	15	GLT 111

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PROGRAMME: SCIENCE LABORATORY TECHNOLOGY (NATIONA DIPLOMA)

COURSE: GLT 211 GENERAL LABORATORY TECHNIQUES II

MODULE V: PHOTOGRAPHY AND AUDIO-VISUALS

DURATION: HOURS/(WEEK) LECTURER: I TUTOTIALS: 0 PRACTICAL: 1

GOAL: This module is designed to enable student take photographer and process films

GENERAL OBJECTIVES:

On completion of this module, the student should be able to:

- 1.0 Understand the techniques involved in taking photographs
- 2.0 Know the chemicals and materials used in film processing
- 3.0 Know the techniques of the operating principles of D/Camera

PROGRAMME: SCIENCE LABORATORY TECHNOLOGY (ND)			
Course: GLT		Course Code: GLT 211 Module V	Contact Hours: 15 hours
Course Specification: Module V Photography of audio-Visuals			
WEEK	General Objectives 1.0 Understand the Techniques involved in taking photographs		
	Special Learning Objective:	Teachers Activities	Resources

1	1.1	Define photography and distinguish between amateur and technical photography (i.e. photomicrography, photomicrography).	Illustrate with photographs.	
	1.2	Explain the functions of the mechanical and optical parts of the camera and enlarger.	Use diagrams exploded using audio visual.	Camera enlarger
	1.3	Explain the following terms used in photography film types/speed, positive, negative numerical aperture, focal number, depth of field.	Lecture with some examples.	Positive film Negative film
3-4	1.4	Load, set and use the camera, expose the film of different film speeds and distances.	Demonstration first by teacher thereby students.	Camera film
	1.5	Explain why films are loaded in dim light or total darkness.	Make ref to light sensitive materials.	
	1.6	Revised and unload exposed films from camera and explain why the film must be rewound.	Demonstration	Camera with exposed film.

WEEK	General Objectives 2.0 Know the chemicals and materials used in film processing		
	Special Learning Objective:	Teachers Activities	Resources

5-7	2.1	List materials used for film processing e.g. developers bath and fixers.	Use question and answer format.	Chemicals
	2.2	Explain the functions of each materials listed in 2.1 above.	Use examples	
	2.3	Prepare the chemicals listed in 2.1 above.	Practicals lesson	
	2.4	Outline the materials and equipment used for film processing and state the functions of each item.	Lecture	
8-9	2.5	Develop and expose films using appropriate chemicals and equipment.	Practical lesson	Chemicals and materials
	2.6	List the various grades of printing papers and explain how the texture of printing paper affects the quality of the final print.	Use question and answer format	
	2.7	Process slide films	Practical lesson	Chemicals, materials and films
10-13	2.8	Mount and use slide films with slide projector.	Demonstration	Slide projector slide
	2.9	Service a camera and enlarger.	Practical lesson	Camera Enlarger Service Kit.
	2.10	Describe the general layout of a darkroom.	Use diagrams on the Board.	Chalkboard

WEEK	General Objectives 3.0 Know the techniques of the operating principles of D/camera
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	Special Learning Objective:	Teachers Activities	Resources
13-15	3.1 Show students a Digital Camera and how it is operated.	Practical demonstration	A working digital camera
	3.2 Show students plastic ID card producing equipment.	Organise a visit	A computer connecting accessories.
	3.3 Explain Digital Camera applications in the printing technology.	Illustrate with examples	Print out from Digital and analogue camera
	3.4 Explain with example the use of Digital Camera in (a) Telephony (b) Modern close © Circuit Television	Lecture	A close circuit television camera and monitor

PROGRAMME: SCIENCE LABORATORY TECHNOLOGY (NATIONAL DIPLOMA)

COURSE: GLT 211 GENERAL LABORATORY TECHNIQUE II

MODULE VI: WOOD WORK AND METAL WORK

DURATION: HOURS/WEEK: LECTURE: 1 TUTORIALS: 0 PRACTICALS: 3

UNITS: 2.0

GOALS: To acquaint the students with basic procedures in wood work and metal work

GENERAL OBJECTIVES:

- 1.0 Understand safety precaution in the workshop.
- 2.0 Know common woodwork hand tools and equipment.
- 3.0 Know the application basic woodwork tools and equipment.
- 4.0 Understand the method of producing timber to a given shape.
- 5.0 Know the physical properties of ferrous and non-ferrous metal in use.
- 6.0 Know the production methods of different types of metal.
- 7.0 Know the techniques of producing basic tools.
- 8.0 Know the technique of metal joining processes.

Course Code	Course Title	L	T	P	CU	CH	Prerequisite
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GLT 211	General Laboratory Techniques II Woodwork and Metal work	1	0	3	2	30	
	Module VI						

PROGRAMME: SCIENCE LABORATORY TECHNOLOGY (ND)		
Course: GLT	Course Code: GLT 211 Module VI	Contact Hours: 30 hours

2	<p>1.5 Describe and display various warning posters for prevention of accidents in the workshop.</p> <p>1.6 Explain the rules and regulations governing the following in the work shop.</p> <ul style="list-style-type: none"> Clothing and health hazards. Workshop hygiene Movement and other behaviours of workers in a workshop. Materials, handling Storage and use of hand tools Machine operations. Fire. 	<p>Lecture and Demonstrate the use of typical protective materials.</p> <p>Emplaces that display of various warning posters for prevention of accidents is important.</p>	
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WEEK	General Objectives 2.0 Know common wood work hand tools and equipment
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	Special Learning Objective:	Teachers Activities	Resources
3	2.1 Identify the following wood work tools. Geometrical and marking out tools of squares, dividers, and gauges. Planning tools e.g. jack plane, smooth plane, spoke shave etc. Impelling tools e.g. hammer, mallet Cutting tools e.g. saw-hand, back tenon, trip, chisels, firmer,	Get students involved in practical identification of tools listed.	Metal cramps, saw planes, chisel, gauges, boring tools squares, divider, drill bit etc
4	pairing and mortice, knives, marking-knife, boring ratchet and wheel brace bit, drills and counter sinks. Pneumatic tools.	Get students involved in practical use of tools listed.	- do -.

WEEK	General Objectives 3.0 Know the application of basic wood work tools and equipment		
	Special Learning Objective:	Teachers Activities	Resources

5	<p>3.1 Describe the use of tools listed in 2.1 above.</p> <p>3.2 Maintain all tools mentioned in 2.1 in good working conditions by</p> <p>(a) Sharpening plane cutters, chisels drills and saw teeth.</p> <p>(b) Sharpening of print tools, clearing and lubricating tools before they are stored away.</p>	<p>Lecture</p> <p>Select typical tools and demonstrate how maintenance is done.</p>	<p>Metal cramps,. Saw, planes, chisel, gauges, boring tools, squares drill bit etc.</p>
WEEK	General Objectives 4.0 Understand the method of producing timber to a given shape.		
6	<p>Special Learning Objective:</p> <p>4.1 Explain the principles of cutting wood to size using hand saw.</p> <p>4.2 Saw timber to a given length and width.</p> <p>4.3 Plane timber to size following the proper sequence.</p> <p>(a) planning the face side and mark</p> <p>(b) planning the face edge square to the face side.</p> <p>(c) Gauge to correct width and remove waste.</p> <p>(d) Gauge to correct thickness and remove waste.</p> <p>(e) Plane one end.</p> <p>(f) Cut and plane to correct length.</p> <p>4.4 Produce simple objects e.g. T-square, meter rule box etc.</p>	<p>Teachers Activities</p> <p>Lecture with illustrations</p> <p>Get student involved in cutting planning and production of simple objects.</p>	<p>Resources</p> <p>Band saw cross cutting circular saw</p> <p>Surface planning etc.</p> <p>Gauges</p> <p>Hammer</p> <p>Try square</p> <p>Rules etc.</p>

WEEK	General Objectives 5.0 Know the physical properties of ferrous and non-ferrous metals in common use		
	Special Learning Objective:	Teachers Activities	Resources

8	<p>5.1 Explain the following general physical properties of metals.</p> <p>(a) Ductility (b) Malleability (c) Strength (d) Toughness (e) Brittleness (f) Elasticity (g) Plasticity</p> <p>5.2 Verify ductility and toughness by notching and hammering.</p> <p>5.3 Verify malleability and brittleness by hammering.</p> <p>5.4 Describe the basic composition and properties of plain carbon steels, cast iron and alloy-steels.</p>	<p>Lecture</p> <p>Get student involved in practicals of using hardness testing machine and tools listed.</p>	<p>Lathe machine, milling machine, cutting tools, milling cutters, Hack saw Hardness testing machine cutting fluid. Etc.</p>
WEEK	General Objectives 6.0 Know the production method of different types of metals		
10	<p>Special Learning Objective:</p> <p>6.1 Describe</p> <p>(a) The copla method of manufacturing cost iron.</p> <p>(b) The blast furnace method of manufacturing pig-iron.</p> <p>(c) The direct reduction method of manufacturing steel.</p> <p>6.2 Identify various hand tools and machine in a metal workshop.</p>	<p>Teachers Activities</p> <p>Lecture Get student involved in practicals Identification of hand tools and machine workshop.</p>	<p>Resources</p> <p>Hand tools e.g. plier, vernier calipers, depth gauges, spanners etc.</p> <p>Machines e.g. lathe milling machine Grinding machine Power saw machine etc.</p>

WEEK	General Objectives 7.0 Know the applications of ferrous and non ferrous metals		
11	Special Learning Objective:	Teachers Activities	Resources
	7.1 Explain the choice of metals for different applications. 7.2 List examples of tools and equipment made from various steel and cast iron.	Lecture with demonstrations	Milling cutters, saws, Ball bearing, punch shear blade, break drum etc.
WEEK	General Objectives 8.0 Know the techniques of producing basic tools.		
12	Special Learning Objective:	Teachers Activities	Resources
	8.1 Explain the use of measuring tools in production 8.2 Make different sizes of holes using drilling tools. 8.3 Grind different tools using grinding tools 8.4 Produce cylindrical and conical objects using lathe machine. 8.5 Make horizontal and inclined planes using milling machine. 8.6 Make simple sheet metal object e.g. tray lidless box, funnel etc. 8.7 Make bolts and nuts, spanners etc.	Lecture with demonstration Get students involved in practical demonstration of measuring tools, drilling tools, grinding tools and turning operations. Get students involved in practicals using milling machine.	Measuring tools e.g. tape rule, steel rules, micrometers, calipers etc. Machines e.g. grinding machine lathe machine. Milling machine Milling cutters Cutting tools Hand tools etc.

WEEK	General Objectives 9.0 Know the techniques of metal joining processes.		
	Special Learning Objective:	Teachers Activities	Resources
14	<p>Explain metal joining methods e.g. welding, brazing, soldering, adhesive joining and mechanical joining. List the major applications of the method listed in 9.1. above.</p> <p>Explain the common types of mechanical joining e.g. screws, bolts, rivets, pinurknuekle joint etc. List the main types of materials used in making metal-arc welding.</p> <p>List the component of oxy-acetylene welding set. Sketch and label the structure of oxy-acetylene flame.</p>	<p>Lecture with demonstrations</p> <p>Show student finished product of the processes</p> <p>Lecture with demonstrations</p>	<p>Welding machine elect rides, filler rod oxy-acetylene welding set, sparke lighter, Bolts and nuts riveting pins screw etc.</p> <p>- do -</p>

PROGRAMME: SCIENCE LABORATORY TECHNOLOGY (NATIONAL DIPLOMA)

COURSE: GLT 211 GENERAL LABORATORY TECHNIQUES II

MODULE VII: VACUUM TECHNIQUES

DURATION: HOURS/WEEK LECTUE: 1 TUTORIALS: 0 PRACTICALS: 2

CONTACT HOURS: 1 HOUR OF LECTURES/2 HOURS OF PRACTICALS PER WEEK

COURSE UNIT: 1.0

GOAL: This module is designed to acquaint the student with the basic principle of vacuum techniques.

GENERAL OBJECTIVES:

On completion of this module the student should be able to:

- 1.0 Know the principles of vacuum production
- 2.0 Know common types of vacuum pumps
- 3.0 Know the use of vacuum ganges.

Course Code	Course Title	L	T	P	CU	CH	Prerequisite
GLT 221	General Laboratory Techniques II	1	0	2	2	45	

	Module VII						
	Vacuum Techniques						

PROGRAMME: SCIENCE LABORATORY TECHNOLOGY		
Course: Vacuum Techniques	Course Code: GLT 221 Module VII	Contact Hours: 45 hours

Course Specification:			
WEEK	General Objectives 1.0 Know the principle of Vacuum Production.		
	Special Learning Objective:	Teachers Activities	Resources
1-2	1.1 Classify vacuum pressure gauges e.g. low, medium high and ultra high.	Lecture Show gauges to students	Vacuum pressure gauge
	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.	Lecture	
3	1.4 Explain the effects of temperature on the relationship between pressure (P) and the number of molecules (M) within a giving vacuum system.	Lecture	
	1.5 List the various component of a simple vacuum set – up.		
4	1.6 Explain the sequence of operation of a simple vacuum system.	Lecture and demonstration Get students involved in the operation of vacuum systems.	Vacuum pump
	1.7 Operate a simple vacuum system		.

WEEK	General Objectives 2.0 Know common types of vacuum pumps
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5	Special Learning Objective:	Teachers Activities	Resources
	2.1 List common types of water jets; rotary and diffusion pumps.	Lecture	Rotary pump Diffusion pump
	2.2 Describe the application of each of the pumps in 2.1. above.	Emphases areas of application of pumps.	
6-7	2.3 Operate the pumps in 2.2. above.	Lecture and practical. Ensure that each student has access to and operate a pump.	Rotary pump
WEEK	General Objectives 3.0 Know the use of vacuum gauges		
8	Special Learning Objective:	Teachers Activities	Resources
	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.	Lecture Show students some of the gauges listed.	Mcleod gauge Vacustat Pirani gauge U-tube manometer
	3.2 Explain the principle of operation of the gauges in 3.1. above.	Lecture and demonstration Demonstration	
	3.3 Demonstrate the use of the gauges in 3.1 above.	Ensure that each student has access to the gauges.	- do -

WEEK	General Objectives
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	Special Learning Objective:	Teachers Activities	Resources
13	3.4 Explain the care and handling of the gauges in 3.1.	Lecture Get students involved in the care and handling of gauges.	- do -
	3.5 Explain leak detection e.g. by the use of High Frequency tester (Test-coil).	Use leak detectors for the explanation.	Test – coil
	3.6 Detect vacuum leaks using leak detectors.	Lecture Demonstrate the use of vacuum leak detectors.	Test - coil
14-15			

PROGRAMME: SCIENCE LABORATORY TECHNOLOGY (NATIONAL DIPLOMA)

COURSE: GLT 221 GENERAL LABORATORY TECHNIQUES II

MODULE VIII: GLASS BLOWING I

DURATION: HOURS/WEEK LECTURE: 1 TUTORIALS: 0 PRACTICALS: 3

UNITS: 1.0

GOAL: This module is designed to introduce the student to the technique of simple glassblowing.

GENERAL OBJECTIVES

On completion of this module the student should be able to:

- 1.0 Know the different types of glasses used as laboratory wares
- 2.0 Know glass blowing hazards and precautions
- 3.0 Know the construction of simple glasswares

Course Code	Course Title	L	T	P	CU	CH	Prerequisite
GLT 221	General Laboratory Techniques II	1	0	3	2.0	60	

	Module VIII						
	Glass Blowing I						

PROGRAMME: SCIENCE LABORATORY TECHNOLOGY		
Course: GLT	Course Code: GLT 221	Contact Hours: 60 hours

Course Specification: Glass Blowing			
WEEK	General Objectives 1.0 Know the different type of glasses used as laboratory wares		
	Special Learning Objective:	Teachers Activities	Resources
1	1.1 List types of glasses suitable for laboratory glasswares e.g. borosilicate, soda lime (soda glass), silica glass	Lecture and demonstration Teacher bring samples to class to show students.	Soda glass, Borosilicate and silica glass.
2	1.2 State properties of glasses in 1.1. above e.g. transparency and durability etc. 1.3 Identify types of glass by chemical and physical methods.	Teacher uses the samples brought to class to explain. Passes samples round the class. Lecture and practical demonstration with soda and borosilicate with rods.	Hot plate phenolphthalein Tri-chloroethylene Beaker (soda/Pyrex).

WEEK	General Objectives 2.0 Know glass hazards and precautions		
	Special Learning Objective:	Teachers Activities	Resources

3	2.1 List hazards associated with gas e.g. explosion, toxicity, fire etc.	Lecture Teacher tabulates hazards and corresponding solutions.	
4	2.2 Enumerate safety measures adopted in glass blowing e.g. use of didymium goggles and handling gloves etc.	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.

WEEK	General Objectives 3.0 Know the construction of simple glass wares
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	Special Learning Objective:	Teachers Activities	Resources
5	3.1 Identify various tools and equipment used in glass blowing workshops.	Lecture and practical demonstration.	Glass cutting knife
	3.2 Describe and apply glass cutting techniques.	Teacher parades a number of these tools.	Calliper gauges
	3.3 Describe and apply various methods of glass manipulation e.g. simple point pulling.	Teacher asks students to tabulate tools draw and label, and indicate uses.	Three way fuel gas filling top
	3.4 Join two glass tubes.	Lecture and practical demonstration. Teacher demonstration and construction of bulbs bands and joints T, Yate.	Glass inspection polarizer
6-8	3.5 Blow bulbs at the end and in the middle of tubes.	Lecture practical demonstration as above.	Cork borer set.
9-10	3.6 Construct T. Y joints.	Teacher asks students to do the constructions in turns. Teacher goes round correcting and encouraging.	Cork borer set.
11-12	3.7 Construct U bends		Rotary air blower e.g. compressors types EB 3B
13-14	3.8 Construct simple glass wares e.g. pipettes, burettes, and test tube.		Tweezers
	3.9 Calibrate the glass wares stated in 3.8 above.		Glass blowing hanging tools (cones)
15	3.10 Anneal glass apparatus after construction.		Glass blowing tapers 13x13mm.
			Diamond glass cutter
			Burn sen burner for bench annealing
			Oxygen/air/gas burners
			Wooden corks (Assorted)

PROGRAMME: SCIENCE LABORATORY TECHNOLOGY (HIGHER NATIONAL DIPLOMA)

COURSE: GLT 311 LABORATORY MANAGEMENT

DURATION HOURS/WEEK LECTURE 2

UNITS: 2.0

GOAL: This course is designed to provide the student with the knowledge and skills of laboratory management.

GENERAL OBJECTIVES:

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

- 1.0 Know types of laboratories and their furnishings and fittings
- 2.0 Understand laboratory layout
- 3.0 Understand the principles of designing laboratory stores
- 4.0 Know the correct methods and places of installing
- 5.0 Understand the management of stores
- 6.0 Understand the principles of store keeping
- 7.0 Knew the acquisition, storage and use of technical information
- 8.0 Understand record keeping in the laboratory
- 9.0 Understand the importance of discipline in the laboratory
- 10.0 Understand routine administrative function in the laboratory

Course Code	Course Title	L	T	P	CU	CH	Prerequisite
GLT 311	LABORATORY MANAGEMENT	2	0	0	2	30	

PROGRAMME: PHARMACEUTICAL TECHNOLOGY HIGHER NATIONAL DIPLOMA			
Course: General Laboratory Techniques		Course Code: GLT 311	Contact Hours: 30
Course Specification: Laboratory Management			
WEEK	General Objectives 1.0 Know types of laboratory there furnishings and fittings		
	Special Learning Objective:	Teachers Activities	Resources
1	1.1 Explain the term ^laboratory^. 1.2 List different types of laboratories e.g teaching laboratory, seseaksi laboratory etc. 1.3 State the features of different types of laboratories. 1.4 Explain the factors to be considered when designing a laboratory e.g. nature of work, space and funding etc. 1.5 Explain how funding affects the designing of laboratories.	Lecture/Demonstration. Visit to various types of laboratories	
	1.6 Draw sketches of typical laboratory layout. 1.7 Identify laboratory furniture e.g. benches, floors, sink and drainage etc. 1.8 List suitable materials for the laboratory (i) Bench tops (ii) Floors (iii) Seeks. 1.9 List reasons for the choice of materials in 1.7 above. 1.10 List essential laboratory fittings e.g. waters, electricity, gas, vacuum lines, steam, time chamber etc. 1.11 Explain the importance of the fittings in 1.9 above.	Lecture with demonstration. Visit to various types of Laboratories to illustrate various types of floors, sick, furniture taps etc.	

WEEK	General Objectives 2.0 Understand Laboratory Layout		
3-4	<p>2.1 Describe the dimension of a standard laboratory work bench, specifying width, length, height and spacing, and types of arrangement e.g. Island penning sular etc.</p> <p>2.2 Describe the services and fittings, obtainable on laboratory bench tops.</p> <p>2.3 Describe the methods of providing lighti8ng and ventilation in a laboratory.</p> <p>2.4 Describe methods of evaluating illumination and efficiency of light fittings in a laboratory.</p> <p>2.5 Explain the importance of lighting and ventilation in a laboratory.</p> <p>2.6 Draw the layout of a typical laboratory, showing the essential services.</p>	Lecture with charts to illustrate various types of benches e.g Island, peninsular, services etc.	Charts
WEEK	General Objectives 3.0 Understand the Principles of designing laboratory stores		
5	<p>3.1 List the factors that should be considered in the design of laboratory store e.g. type of store, location, lighting, shelves etc.</p> <p>3.2 Explain the importance of factors in 3.1 above.</p> <p>3.3 Draw the layout of a typical laboratory store.</p>	Lecture with illustration.	Charts

WEEK	General Objectives 4.0 Know the correct method and places for in stalling (I) Balances (ii) barometers, (iii) galvanometer, (iv) Distilling with (v) Don Exchange resin.		
6	4.1 Describe the correct sitting of a balance room in the laboratory e.g. proximity to users. 4.2 List the essential features of a balance room. 4.3 Explain the effect of vibration, tem feature and dust on the balance. 4.4 Explain how the effect in 4.3 above can be minimised.	Lecture with demonstration of equipments e.g balances barometers, galvanometers, distil less, Don Exchange etc	Resin balances barometers galvanometers distilless Don – Exchange resin
7	4.5 Illustrate diagrammatically the methods of supporting balances to minimize vibration. 4.6 Support balances to minimize vibration. 4.7 Describe methods of transporting and installing mercury barometers. 4.8 Install mercury barometers.	Lecture with demonstration of equipments	Do-Exchange resin Resist. Balances barometers distillers
8	4.9 Describe the effect of vibration of galvanometers. 4.10 Explain how the effect in 4.9 above in minimized. 4.11 List types of laboratory stills and de-ionises. 4.12 Describe the methods of installing stills and de-ionises as in 4.11 above. 4.13 Explain the uses of stills and ionizes.	Lecture with demonstration of equipments Lecture with demonstration of equipment and illustrating with use of charts	Barometers Galvanometers Distillers Don-Exchange resins. Balances Barometger Galvanometer

WEEK	General Objectives 5.0 Understand Management of stores		
9	Special Learning Objective:	Teachers Activities	Resources
	5.1 List types of stores e.g. con troll store, main store and dispensing store.	Lecture and demonstration with slide or overhead projector.	Slide projector or Overhead projector.
	5.2 Explain the activities that takes place in the stores listed in 5.1 above e.g receiving, storing and issuing of materials etc.		
	5.3 State the features of stores in 5.1 above.		
	5.4 Explain the importance of the features stated in 5.3 above.		
WEEK	General Objectives 6.0 Understand the Principles of Storekeeping		
10	Special Learning Objective:	Teachers Activities	Resources
	6.1 Explain the functions of store keeper.	Lecture and demonstration slide/or overhead projector.	Slide projector or overhead projector.
	6.2 Explain the legal liabilities of the storekeeper.		
	6.3 Explain the use of his/store cards inventory.		
	6.4 Explain government regulations relating to import.		
	6.5 Outline the procedure for the purchase of various materials for the store.		
	6.6 Identify the various types of documents for ordering receiving and paying for goods e.g. order form, invoice, and delivery note etc.		
	6.7 Explain the importance of the documents listed above.		

WEEK	General Objectives 5.0 Understand Management of stores		
11	Special Learning Objective:	Teachers Activities	Resources
	7.1 List sources of information for the laboratory e.g. reference books, journals catalogue etc.	Lecture, give assignments	
	7.2 Explain the importance of the source in 7.1 above.		
	7.3 Describe different methods of storing technical information e.g. file, computer, micron film, tapes etc.		
	7.4 Explain the methods of retrieving, technical information e.g film projector, video display, Book Borrowing etc.		
	7.5 Store and retrieve technical information for the laboratory.		
	7.6 Explain the use of technical information sources e.g. data and statistical books, trade catalogues etc.		
WEEK	General Objectives 8.0 Record keeping		
12	Special Learning Objective:	Teachers Activities	Resources
	8.1 List types of laboratory records e.g. equipment loan book, accidents etc.	Lecture, give assignments	
	8.2 Explain the importance of each type of record.		

WEEK	General Objectives 9.0 Understand the importance of discipline in the laboratory		
	Special Learning Objective:	Teachers Activities	Resources
13	9.1 Explain the significance of hierarchy in staff structure.	Lecture with illustrations	Charts
	9.2 Explain the need for discipline in the laboratory environment.		
	9.3 Explain qualities of leaderships and good examples as a basis for disciplinary practices.		
	9.4 Evaluate (qualities) methods of appreciation and criticisms as they relate to discipline e.g commendation for good job, polite, correction etc.	Lecture with illustrations	Charts
	9.5 Describe the methods of achieving good communication between staff and students.		
	9.6 Explain the importance of a good student/staff relationship.		

WEEK	General Objectives 10.0 Administrative functions		
15	Special Learning Objective:	Teachers Activities	Resources
	10.1 List the minimum staff strength in the laboratory. 10.2 Explain the importance of poor staffing. . 10.3 Determine the optimal staff/student disposition in a typical laboratory. 10.4 List basic staff of a laboratory. 10.5 List factors to be considered for interviews for laboratory staff. 10.6 Explain how the factor listed in 10.5 above can be used in interviews for laboratory staff.	Lecture with illustrations	Charts

PROGRAMME: SCIENCE LABORATORY L TECHNOLOGY (HIGHER NATIONAL DIPLOMA)

COURS: GLT 312 INSTRUMENTATION (GENERAL)

DURATION: HOURS/WEEKS LECTURE: 2 TUTORIALS: 0 PRACTICALS: 2

UNIT: 2.0

GOAL: This course is designed to provide the student with thorough understanding of the principle of operation, use and maintenance of measuring and analysing instruments.

GENERAL OBJECTIVES

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

- 1.0 Understand the operation, use and care of basic measuring instrument
- 2.0 Know types of signal generator in the laboratory
- 3.0 Know the types of pressure measuring instruments
- 4.0 Know the types of recorders and reproducers
- 5.0 Know the types of power supply units in the laboratory
- 6.0 Understand the essentials of trouble-shooting techniques

Course Code	Course Title	L	T	P	CU	CH	Prerequisite
GLT 312	General Instrumentation	2	0	3	2	75	

PROGRAMME: SCIENCE LABORATORY TECHNOLOGY			
Course: General Laboratory Techniques		Course Code: GLT 312	Contact Hours: 75
Course Specification: General Instrumentation			
WEEK	General Objectives 1.0 Understand the principles and instrumentation of colorimetry and spectrophotometry		
	Special Learning Objective:	Teachers Activities	Resources
1	1.1 Identify basic measuring Instruments e.g moving coil, moving Iron, thermocouple oscilloscope, digital meters. 1.2 Classify measuring instruments e.g. analogue and digital meters. 1.3 List an example of each type in 1.2 above.	<ul style="list-style-type: none"> • Use question and answer techniques • Lecture • <u>Practicals</u> Get students involved in classification of Analogue and Digital equipment 	<ul style="list-style-type: none"> • Analogue voltmeter • Digital voltmeter • Power supply (D.C.) • Connecting wires • Bread boards • Resistors • Signal generator • Oscilloscope
2-3	1.4 Describe with the aid of diagrams the construction of the instruments in 1.1 above. 1.5 Describe with the principle of operation of the Instruments in 1.1 above. 1.6 Explain the terms: <ol style="list-style-type: none"> (i) Multimeter (ii) Multirange (iii) Autoranging 	<ul style="list-style-type: none"> • Use question and answer techniques • Lecture • <u>Practicals</u> Use multimeter to show the effect of terms stated in 1.5. 	<ul style="list-style-type: none"> • Multimeter (Digital) • Avometer

3-4	<p>1.7 Carry out set-zero and calibration adjustments in the instruments in instruments in 1.1</p> <p>1.8 Measure:</p> <p>(i) Voltage</p> <p>(ii) Current</p> <p>(iii) Resistance using the appropriate instrument in 1.1 above.</p> <p>1.9 Measure frequency, amplitude, phase relationship of signals.</p>	<ul style="list-style-type: none"> • Use question and answer techniques • Lecture with worked example • <u>Practicals/Demonstration</u> Measure Voltage, Current parallel circuit of resistors multimeter and power supply. 	<ul style="list-style-type: none"> • Analogue voltmeter • Digital voltmeter • Power supply (D.C.) • Connecting wires • Bread boards • Resistors • Signal generator • Oscilloscope • Power Supply
WEEK	General Objectives 1.0 Understand the principles and instrumentation of colorimetry and spectrophotometry		
4-5	<p>Special Learning Objective:</p> <p>1.10 Construct measuring Instruments e.g. thermocouple, potentiometer.</p> <p>1.11 Carry out measurements using the instruments in 1.10 above.</p> <p>1.12 Carry out routine care of the instruments in 1.11 above.</p>	<p>Teachers Activities</p> <ul style="list-style-type: none"> • Lecture • <u>Practicals</u> Use different urines to construct thermocouple Get students involved in routine care of Laboratory Instruments 	<p>Resources</p> <ul style="list-style-type: none"> • Thermocouple • Potentiometer • Digital meters • Bread board • Power Supply

WEEK	General Objectives 2.0 Know types of signal generators in the Laboratory		
4-5	Special Learning Objective:	Teachers Activities	Resources
	2.1 Classify signal generators e.g. how frequency, high frequency, variable frequency etc. 2.2 State the different types of waveforms produced by signal generators in 2.1 above e.g. sine wave, square wave, saw tooth etc. 2.3 Describe with the aid of suitable diagrams the operation of the signal generator listed in 2.1 above. 2.4 Describe a typical application of each type of signal generator listed in 2.1 above. 2.5 State the use of a signal general in fault-finding, receiver dignment e.t.c.	<ul style="list-style-type: none"> • Lecture • <u>Practicals</u> Display and sketch types of waveform on oscilloscope. Measure Amctitude and frequency of a sine wave. Measure and sketch a d.c. waveform. 	<ul style="list-style-type: none"> • Signal generator • Double beam Oscilloscope • Power Supply
WEEK	General Objectives 1.0 Understand the principles and instrumentation of colorimetry and spectrophotometry		
6-7	Special Learning Objective:	Teachers Activities	Resources
	3.1 Identify the different types of instruments used in measuring pressure e.g. barometers, manometers, pressure gauges etc. 3.2 Classify the instruments in 3.1 above in relation to their operating principles. 3.3 Describe the principle of operation of the instruments in 3.1 above. 3.4 Measure pressure using any of the instruments in 3.1 above.	<ul style="list-style-type: none"> • Lecture/Demonstration • <u>Practicals</u> Measure pressure using manometer and Bourdon gauge. 	<ul style="list-style-type: none"> • Manometer • Barometer • Pressure gauges • Autoclaves

WEEK	General Objectives 1.0 Understand the principles and instrumentation of colorimetry and spectrophotometry		
	Special Learning Objective:	Teachers Activities	Resources
7-8	4.1 Identify the different types of recorders and reproducers e.g. chart audio video projectors etc. 4.2 Describe the principle of operation of the recorders and reproducers commonly used in the Laboratory.	<ul style="list-style-type: none"> • Demonstration principles using resources. 	<ul style="list-style-type: none"> • Tape recorder • Overhead projector • Slide projector • Compact Disk player • Video recorder.
	4.3 Describe typical applications of the recorders and reproducers in 4.2 above. 4.4 Record and reproduce reproduce using the recorders and reproducers in 4.2 above. 4.5 Carry out routine care of the recorders and reproducers in 4.2 above.	<ul style="list-style-type: none"> • Lecture/Demonstration • <u>Practicals</u> Get students involved in recording 	<ul style="list-style-type: none"> • Overhead projector • Tape recorder • Slide projector • Compact Disk

WEEK	General Objectives 5.0 Know types of power supply units inn the Laboratory		
	Special Learning Objective:	Teachers Activities	Resources
9-10	5.1 Identify types of power supply unit e.g. mains-derived, direct current, batteries etc. 5.2 Classify direct current supply e.g. low voltage, high voltage, stabilized voltage. 5.3 Explain with the aid of diagrams how a.c is converted to d.c.	<ul style="list-style-type: none"> Lecture <u>Practicals</u> Construct mains derived power supply and measure the output of a battery. 	<ul style="list-style-type: none"> Power supply Breadboard Transformer Diodes Multimeter Oscilloscope
10-11	5.4 Construct typical power supply units. 5.5 Outline the precautions to be observed when using power supply units. 5.6 Apply the use of power supply units	<ul style="list-style-type: none"> <u>Practicals</u> Use constructed power supply to power a circuit. 	<ul style="list-style-type: none"> Transformer Diodes Breadboard Capacitors Resistors Regulators Multimeter

WEEK	General Objectives 6.0 Understand the essentials of trouble shooting techniques		
	Special Learning Objective:	Teachers Activities	Resources
11-12	<p>6.1 Identify tools for trouble-shooting e.g. service manuals, multimeter, signal generators etc.</p> <p>6.2 Obtain necessary information from the operator and from service Manuals about a given instrument.</p> <p>6.3 Check: (a) Continuity (b) availability of power etc in the instruments in 6.2 above</p>	<ul style="list-style-type: none"> Lecture Practicals Troubleshoot faults in equipment using service manuals, multimeters and oscilloscopes. 	<ul style="list-style-type: none"> Service manual Multimeter Screw driver Allen keys Oscilloscope
12-13	<p>6.4 Trouble-shoot instrument such as overhead projector, PH meter etc .</p> <p>6.5 Detect a defective modules or parts e.g. by signal injection, part substitution, etc in instruments using the tools in 6.1 above.</p> <p>6.6 Repair or replace the defective module part in 6.4 above.</p>	<ul style="list-style-type: none"> Practicals Students should isolate defective modules by the use of oscilloscopes and multimeters. Replace defective component by the use of soldering iron. 	<ul style="list-style-type: none"> Multimeter Soldering iron Oscilloscope Signal generator PH meter Overhead project.

PROGRAMME: SCIENCE LABORATORY TECHNOLOGY (HIGHER NATIONAL DIPLOMA)

COURSE: GLT 321 BIOLOGICAL AND CHEMICAL INSTRUMENTATION

DURATION: HOURS/WEEK LECTURE: 1 TUTORIALS: 0 PRACTICALS: 4

UNITS: 3.0

GOAL: This course is designed to enable the students understand the use of instruments for chemical analysis.

GENERAL OBJECTIVES

On completion of this course, the student should be able

- 1.0 Understand the principles and instrumentation of spectrophotometer and colorimetry
- 2.0 Know the operation and care of flame photometer and raman spectrometers
- 3.0 Know the operation and care of Atomic absorption spectrophotometers (AAS)
- 4.0 Know the operation and care of the re-ray spectroscopy
- 5.0 Know the operation and care of: electrolytic conductivity bridge; coulometer titration; PH meter; autotitrator; polarograph
- 6.0 Know the operation and care of radio active detectors and counters
- 7.0 Understand the operation and care of gas chromatographic equipment, fluorimeter, polarimeter and refractometer
- 8.0 Know the concept of hydrogen ion concentration.
- 9.0 Know the various types of electrodes used in measuring ions like fluoride, nitrates a gas etc.
- 10.0 Know use of microscopes
- 11.0 Know the principles of autoradiography
- 12.0 Know the use and maintenance of camera Lucida
- 13.0 Know the use and maintenance of colony counter
- 14.0 Know the use and maintenance of autoclave, centrifuge and incubator

Course Code	Course Title	L	T	P	CU	CH	Prerequisite
GLT 321	Biological and Chemical Instrumentation	4	0	3	3	75	

PROGRAMME: SCIENCE LABORATORY TECHNOLOGY			
Course: General Laboratory Techniques		Course Code: GLT 321	Contact Hours: 75
Course Specification: Biological and Chemical Instrumentation			
WEEK	General Objectives 1.0 Understand the principles and instrumentation of colorimetry and spectrophotometry		
	Special Learning Objective:	Teachers Activities	Resources
1	1.12 State the wave length within the electromagnetic spectrum. 1.13 Distinguish between wavelength of light within the visible region and invisible region. 1.14 Explain the similarities in the working principle of the colorimeter and spectrophotometer. 1.15 Identify the various parts of a colorimeter. 1.16 Explain the functions of the parts in 1.4 above. 1.17 State basic similarities and differences between a colorimeter and spectrophotometer. 1.18 Explain the limitations of colorimeter in microbiological studies. 1.19 Carry out measurement using colorimeters./ 1.20 Carry out routine maintenance on the colorimeter e.g. care of filters and cuvettes. 1.21 Explain the term spectrophotometry. 1.22 List the various sources of light for spectrophotometric determination.	Lecture and demonstration of the use of item listed under resources. Involve students in maintenance and care of instruments.	Colorimeter Spectrophotometer Filters.

WEEK	General Objectives		
2	Special Learning Objective:	Teachers Activities	Resources
	1.23 Describe diffraction grating 1.24 Explain the functions of diffraction grating in spectrophotometry. 1.25 Explain the term interference filter. 1.26 State the function of optical filter in spectrophotometry. 1.27 State the basic laws of spectrophotometry viz: Bonger lambert's law, Beer's law. 1.28 Explain the working principles of the spectrophotometer. 1.29 List the functions of the parts in the optical system of a sopectrophotometer. 1.30 List the different types of detections used in spectrophotometry. 1.31 List the functions of parts in the optical system of a spectrophotometer. 1.32 List the different types of detection used in spectrophotometry.	Use diagrams and sketches. Use questions and answer techniques. Illustrate with sketches. <u>Practical</u> Determine concentration using spectrophotometer. Change bulbs and clean dust deposited in the monochrometer using belows	Relevant Transparencies Overhead projector. Screw driver Fine brush Bellow brush Lens tissue

WEEK	General Objectives		
	Special Learning Objective:	Teachers Activities	Resources
	1.33 determine concentration of samples applying Beer – Lamberts law and using spectrophotometer. 1.34 Carry out minor maintenance work on the spectrophotometer e.g. dusting, replacement of lamps etc.		
WEEK	General Objectives Know the operation and care of flame photometers and raman spectrophotometer		
	Special Learning Objective:	Teachers Activities	Resources
3	2.1 Explain the principle of operation of the flame photometer: 2.2 Identify the various parts of a photometer. 2.3 State the functions of the various parts of atomizer e.g. carbon rod. 2.4 State the similarities and differences between the spectrophotometer and flame photometer. 2.5 List the errors inherent in practical flame photometry and how they can be corrected particularly as applied to biology. 2.6 Explain how to correct the errors in 2.5 above. 2.7 Determine sodium, potassium and calcium using flame photometer emission spectrum.	Lecture and demonstration Practicals Use flame photometer to carry out analysis of metals. Clean atomizer using cleaning probe.	Atomiser cleaning device. Lomp knose plier Star screwdriver Calibrator

WEEK	General Objectives		
4	Special Learning Objective:	Teachers Activities	Resources
	2.8 Describe and carry out typical maintenance routines for the flame photometer e.g. clearing deposits from the atomizer.	Lecture and Demonstration Practicals	Service manual Atomiser cleaning device Lens tissue.
	2.9 Identify parts of the Raman Spectrometers.	Use lens leisure on the optics	
	2.10 Explain the functions of the parts in 2.9 above.	Clean dust deposited in the monochrometer	
	2.11 Record spectria of known compound using Raman Spectrophotometer.	Involve students in activities.	
	2.12 Carry out routine maintenance on Ramn Spectrophotometer.		
WEEK	General Objectives 3.0 Know the operation and care of Atomic Absorption Spectropentometer (AAS)		
	Special Learning Objective:	Teachers Activities	Resources
	3.1 Draw a schematic labeled diagram of the AAS.	Lecture and Demonstration	
	3.2 Identify the parts of an AAS e.g. extension sources.	Explain each block in	Analytic
	3.3 Describe the working principle of each of the component parts of the AAS (especially the hollow cathode lamp).	practicals the diagram measure	Control
	3.4 Outline the steps for operating the AAS.	absorbance using AAS.	
	3.5 Measure the absorbance of a sample of known concentration using the AAS.		
	3.6 Carry out routine maintenance on an AAS.		

WEEK	General Objectives 4.0 Know the operation and care of the X-ray Spectroscope		
	Special Learning Objective:	Teachers Activities	Resources
5	<p>4.1 Identify the parts of the X-ray spectroscope.</p> <p>4.2 Describe the parts listed in 4.1 above.</p> <p>4.3 Draw a block diagram of an X-ray spectroscope.</p> <p>4.4 Describe the operation and working principles of the units such as collimation, filters, analyzing crystals and detectors.</p> <p>4.5 Measure the absorption of a given sample using the X-ray instrument and also by varying the filters.</p> <p>4.6 Draw Nondispersive X-ray absorption meter.</p> <p>4.7 Carry out routine absorption measurement as in 4.5 above.</p> <p>4.8 List the parts of an X-ray fluorescence spectrometer.</p> <p>4.9 Identify and describe parts of an X-ray fluorescence spectrometer.</p> <p>4.10 Carry out routine care of the instrument e.g. cleaning of filters, verification of optical instruments.</p> <p>4.11 Analyse given samples using the x-ray fluorescence spectrometer.</p>	<p>Lecture/Demonstration</p> <p><u>Practicals</u> Carry out the tasks stated 4.4 and 4.5. And supervise students in doing the same. Explain each unit of the diagram.</p> <p>Get students involved in cleaning of filters and optics</p>	<p>X-ray fluorescence spectrometer Filters.</p> <p>Lense tissue</p>

WEEK	General Objectives 5.0 Know the operation and care of analytical instruments		
	Special Learning Objective:	Teachers Activities	Resources
	<p>5.1 List the component parts of:</p> <ul style="list-style-type: none"> (i) Electrolytic conductivity bridge (ii) Coulometric titration (iii) Autotitration (iv) Ph meter (v) Polarograph. <p>5.2 Identify and describe the various parts of the instruments in 5.1 above.</p> <p>5.3 Explain the principle of operation of the instruments in 5.1 above.</p> <p>5.4 Carry out various measurements using the instruments in 5.1 above.</p> <p>5.5 Carry out routine care of the instruments in 5.1 above by e.g. ensuring that</p> <ul style="list-style-type: none"> (a) The cells are properly connected (b) The electrodes are activated (c) The instruments are switched off when not in use etc. 	<p>Lecture and Demonstration</p> <p><u>Practicals</u> Get students involved in measurements using items stated in the Resources Column.</p>	<p>Conductivity Bridge Coulometric Titration Autotitrator PH meter Polarograph</p>

WEEK	General Objectives 6.0 Know the operation and care of radioactive detectors and counters		
7	Special Learning Objective:	Teachers Activities	Resources
	<p>6.1 List the various radioactive detectors and counters viz photographic envision, ionization chambers and proportional counters, scintillation counters, semi-conductor detectors Geiger-muller counter.</p> <p>6.2 Explain the operation of each detector and counter in 6.1 above.</p> <p>6.3 Obtain accurately the counts per second of a radioactive source (emitter) using a gas counter.</p> <p>6.4 Measure counter per sec of a betaemitter using scintillating counter.</p> <p>6.5 Measure counts per sec for an emitten using proportional counters.</p> <p>6.6 Carry out routine care of detectors and counters in 6.1 above.</p>	<p>Lecture and Demonstration</p> <p><u>Practicals</u> Get students involved in measurements using items stated in the Resources Column.</p> <p>Emphasize importance of routine maintenance</p>	<p>Radioactive sources Geiger muller counter Conisation counter Proportional; counter Semiconductor detector</p>

WEEK	General Objectives 7.0 Understand the operation and care of gas chromatographic equipment fluorimeter polarimeter and refractometer		
	Special Learning Objective:	Teachers Activities	Resources
8	7.1 Explain gas chromatography 7.2 Identify the parts of: (i) gas chromatograph (j) fluorimeter (k) Polarimeter (l) Retractorimeter 7.3 Explain the working principles of each instruments in 7.1. above. 7.4 Carry out measurements using instruments in 7.1. above. 7.5 Carry out routine care and maintenance contains of instruments in 7.1. above e.g. cleaning of prism with sense tissue, ensuring that the polarimeter, tube are clean and do not with bear hands.	Lecture and Demonstration <u>Practicals</u> Get students involved in the use of items in Resources column. <u>Practicals</u> Get students involved in care and routine maintenance of equipment listed in 7.2.	Gas chromatograph Fluorimeter Polarimeter Retractorimeter.

WEEK	General Objectives 8.0 Know the concepts of hydrogen in concentration.		
	Special Learning Objective:	Teachers Activities	Resources
9	8.1 Explain the term pH 8.2 Explain why the pH scale ranges from 0 to 14. 8.3 State Bronsted – Lowry theory of acid and base. 8.4 Calculate the pH of an acid and a base applying the theory in 8.3. above. 8.5 Explain the functions of buffer with example. 8.6 Determine the pH of a substance using a pH meter. 8.7 Enumerate the main problems involved in pH measurement. 8.8 Explain how the problems in 8.10 above are overcome. 8.9 Describe the potentionmetric method of determination of pH. 8.10 Carry out routine maintenance of pH-meter e.g. cleaning and reactivation of the electrodes.	Lecture/Demonstration Measure pH of different solutions. Allow students to repent measurements and determination Reactivate pH electrode and clean as required. Use sketches for illustration. Allow students to practice	PH meter Buffer tablets

WEEK	General Objectives 9.0 Know the various types of electrodes used in measuring ions like fluoride, nitrate gas etc.		
	Special Learning Objective:	Teachers Activities	Resources
10	9.1 Identify ion – selective electrodes 9.2 State the uses of ion – exchange electrodes 9.3 Explain the basic principles of operations of an ion-selective electrode. 9.4 Explain the relationship between activity and concentration of an ion. 9.5 List the various types of gas measuring electrodes. 9.6 Identify an oxygen electrode. 9.7 Identify the various of an oxygen electrode. 9.8 Measure accurately oxygen concentration using the gas measuring electrodes. 9.9 List and describe electrodes for pH measurement e.g. glass, combination 9.10 Describe the routine maintenance of electrodes e.g. store in distilled water, use correct concentration of reactivator. 9.11 Carry out maintenance of electrode including recharging.	Lecture and Demonstration <u>Practicals</u> Measure oxygen concentration using electrodes. Lecture Emphasize the importance of routine maintenance.	Fluoride electrode Ion-selective electrode Oxygen electrode Glass electrode Combination electrode

WEEK	General Objectives 10.0 Know the use of microscopes		
	Special Learning Objective:	Teachers Activities	Resources
	10.1 Define microscopy 10.2 List various techniques of microscopy e.g. bright field, dark field, etc. 10.3 Explain the techniques in 10.2 above. 10.4 Identify various types of microscopes 10.5 Identify the parts of the microscopes in 10.4 above. 10.6 Explain the principles of operation of the microscopes in 10.4 above (elementary treatment only). 10.7 View objects under the microscopes. 10.8 Carry out routine maintenance of microscope e.g. cleaning and lubrication.	Lecture and Demonstration <u>Practicals</u> Demonstrate use of various types of microscope View objects under the microscope. Clean microscopes using large tissue.	Binocular microscope Phase contrast accessories Allen key set Grease Lense tissue

WEEK	General Objectives 11.0 Know the principle of autoradiography		
12	Special Learning Objective:	Teachers Activities	Resources
	11.1 Explain autoradiography 11.2 Identify the components used in autoradiography 11.3 Describe the applications of autoradiography 11.4 Demonstrate the techniques of autoradiography.	Lecture and Demonstration Illustrate with sketches	
WEEK	General Objectives 12.0 Know the use and maintenance of photomicrographic equipments		
	Special Learning Objective:	Teachers Activities	Resources
	12.1 List the applications of photomicrography equipment 12.2 Explain the working principles photomicrography equipment 12.3 Describe the working parts of a photomicrography equipment 12.4 Maintenance and carry out minor repairs of a photomicrography equipment.	Lecture and Demonstrate techniques by the use of camera mounted on microscope	Photomicrography equipment

WEEK	General Objectives 13.0 Know the use and maintenance of colony counter		
13	Special Learning Objective:	Teachers Activities	Resources
	13.1 Identify types of bacterial colony counters 13.2 Identify the parts of the counter in 13.1 above. 13.3 Explain the function of each part in 13.2 above. 13.4 Describe the principle of operation of the colony counter. 13.5 Count bacteria colonies using colony counter. 13.6 Carry out routine maintenance and repair of colony counters.	<u>Practicals</u> Count bacteria using the equipment in the resources column Carry out the replacement of bulb.	Colony counter
WEEK	General Objectives 14.0 Know the use and maintenance of autoclave, centrifuge and incubator		
14	Special Learning Objective:	Teachers Activities	Resources
	14.1 State the functions of (a) Autoclave (b) Centrifuge (c) Incubator. 14.2 Identify the parts of the instruments in 14.1 above. 14.3 Explain the functions of the parts in 14.2 above. 14.4 Sterilize, centrifuge and incubate using autoclave centrifuge and incubator. 14.5 Carry out routine maintenance of the instruments in 14.1.	Lecture Demonstration Practicals Use autoclave with materials & control Use centrifuge for separation Grow organism using incubator	Autoclaves Centrifuge Incubators

WEEK	General Objectives 15.0 Understand the principle of automation and its significance in chemical analysis		
	Special Learning Objective:	Teachers Activities	Resources
15	15.1 Know the importance of automation 15.2 Explain the following terms as they relate to automation. (i) Precision (ii) Reability (iii) Speed (iv) Accuracy 15.3 Know the tasks involved in automation e.g. Dispensing of samples and Reagent in precise, predetermined volume (i) Mixing of samples with Reagent (ii) Incubation (iii) Recording of absorbance (iv) Calculation and determine results (v) Printing the results 15.4 Differentiate between semi automated and fully automated analysers e.g. Batch analyzer, semi automated, random access. 15.5 Know the terminologies used in automation.	Lecture Demonstration <u>Practicals</u> Analyse samples using (i) Semi automated machine (ii) Batch analyzer (iii) Random access analyzer.	Automated Chemistry Analyzer.

PROGRAMME: SCIENCE LABORATORY TECHNOLOGY HIGHER NATIONAL DIPLOMA

COURSE: GLT 322 GLASS BLOWING II

DURATION: HOURS/WEEK LECTURE: 0 TUTORIALS: 0 PRACTICALS: 3

UNIT: 2.0

GOAL: This course is designed to provide the students with the knowledge and skill of constructing, repairing and maintaining some common laboratory glass wares.

GENERAL OBJECTIVES

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

- 1.0 Know how to construct common laboratory glasswares.
- 2.0 Know how to repair and maintain laboratory glasswares.

Course Code	Course Title	L	T	P	CU	CH	Prerequisite
GLT 322	Glass Blowing II	0	0	3	1	45	

PROGRAMME: SCIENCE LABORATORY TECHNOLOGY (H.N.D.)			
Course: General Laboratory Techniques		Course Code: GLT 322	Contact Hours: 45
Course Specification: ADVANCED GLASS BLOWING			
WEEK	General Objectives 1.0 Understand the principles and instrumentation of colorimetry and spectrophotometry		
	Special Learning Objective:	Teachers Activities	Resources
1	1.1 Advance construction of joints (i) Straight joints (ii) Y-joints (iii) X-joints	Practical construction to be done by student under teachers' supervision, after the teachers few practical examples.	Glass tubes Blow Lamp Hand Gloves Safety goggles
2	1.2 Construct bends e.g (i) L-bends (ii) U-bends (iii) Spiral etc. 1.3 Blow bulbs e.g (i) end bulbs (ii) Middle bubble etc	Practical construction to be done under-teachers supervision.	Tweezers Glass tubes Blow lamp Hand gloves safety goggles carbon plate.
4	1.4 Make e.g (i) flanges (ii) Pulling shoulder (iii) Jet (iv) Stirres e.g (v) (ordinary stirres, flat end, and L-shape etc)	Teacher to set practicals by practical construction to be done by teacher & as example for students to copy.	- do -
5 6-7	1.5 Pulling capillary tubes 1.6 Making seals e.g glass-glass, metal – glass, and internal seal	Make capillary tubes and explain the process. Explain importance of seals. Make typical seals to demonstrate process first place for student to see	Glass tube Burner safe goggles Hand gloves

8-9	<p>1.7 Construct</p> <ul style="list-style-type: none"> (i) tubes/boiling tubes (ii) Burettes (iii) Pipettes (iv) Viscometer (v) Condenser (vi) Measuring Cylinders (vii) Ampoules (viii) Melting paint tubes etc. 	Construct at least three items and allow students to construct some.	- do -
10-11	1.8 Graduate and calibrate glass wares mention in 1.7 above.	Calibration construction carried out by to be the teacher in the first place for students to repeat.	Engraving pencil Hydrogen flouride, glass wares with faded graduation
12	1.9 Restore faded graduation marks on items in 1.7 above.	- do -	

WEEK	General Objectives 2.0 Know how to repair and maintain laboratory glass wares		
	Special Learning Objective:	Teachers Activities	Resources
13	2.1 Detect Cracks and leakages in glass wares.	Teacher to demonstrate few examples and allow students to practice doing same.	Test – coil Glass wares with racks and leakages.
14	2.2 Repair simple glass items e.g test tubes, burettes, pipettes measuring cylinders etc.	- do - - do -	Partly broken glass wares, Annealing oven, Bunsen burner.
15	2.3 Heal cracks in glass wares.		- do -

LIST OF EQUIPMENT FOR HND I GLASS BLOWING

- (a) Carbon Rods, flates an rimmers
- (b) Carbon Moundds (inner and outer moulder,
- (c) core and socket making pliers
- (d) Flask holders for vacuum flake, grand joint flask
- (e) Glam donkey roller table
- (f) Table swi
- (g) glam coal winder
- (h) Anneaby oven (hood type)
- (i) furnace (above 1200°c
- (j) Cutty and capping machine
- (k) Diamond cutters
- (l) Glam blowing touches (Assorted)
- (m) Culty knives
- (n) cone and socket grinding machine
- (o) Lathe machine and set of tools
- (p) Didymauin goggles
- (q) Glam drilling machine
- (r) Strain viewer
- (s) Cork burer Shaper
- (t) Cork lampressor

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